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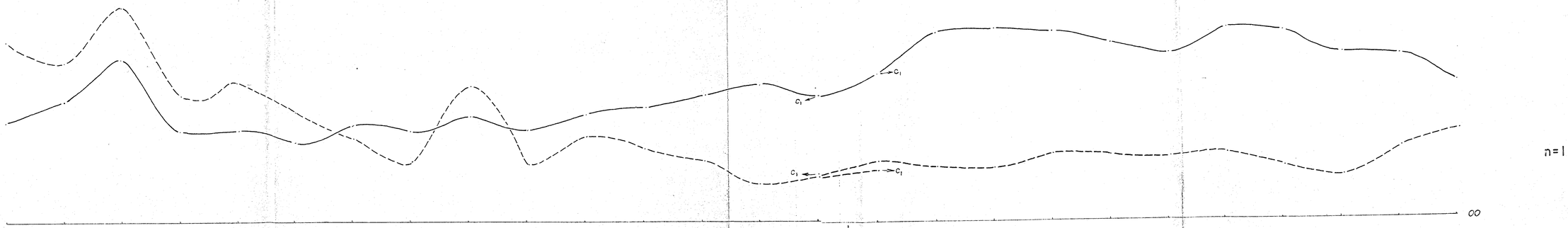
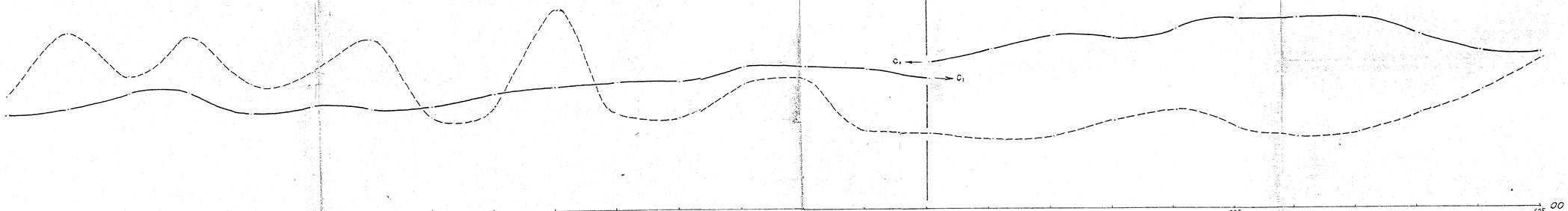
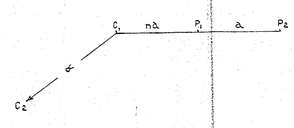




BASE LINE

B.L. BEARING 360° T

LEGEND



Chargeability – Scale 1" = 2 millisecs.

Resistivity – Scale 1" = 100 ohm metres.

Work undertaken by
BARRINGER RESEARCH LTD, Toronto, Canada.

DeNIZA MINING CORPORATION

ROPER – AREA 1

INDUCED POLARIZATION & RESISTIVITY SURVEY

POLE-DIPOLE

JULY-AUG. 1967	Scale 1" = 400'	DWG. 5-179-27

HOPE NE QUADRANGLE
ARIZONA - YUMA CO.,

R 13 W

R 12 W

McMullen Valley

Harquahala Mts

Harrisburg Centennial Valley

Prospects

Garden Eagle Mine

Martin Peak

Sore Fingers

Buckeye

Salome

Wenden

Well

BM 1707

BM 1895

BM 1794

BM 1462

USLM 1738

Words Ranch

Harrisburg Cem

Trail

Jeep Trail

TO PPM

TO PPM

> PPM

CONTAMINATION

TOT CU

HOPE NE 7.5' 1000'

HARAQUAHALA 0814

YUMA Co., ARIZONA

norandex inc

Tucson District

113,33
-241

HOPE NW QUADRANGLE
ARIZONA - YUMA CO.

R 13 W

R 14 W

Granite Wash Pass

Gravel Pit

Gravel Pit

Pyramid Peak 2140

ATCHISON

SANTA FE

JEEP TRAIL

UPPER

VABM Bradford 1468

BM 1531

T 4 N

T 3 N

TOT CU

TO PPM

TO PPM

> PPM

CONTAMINATION

TOT CU

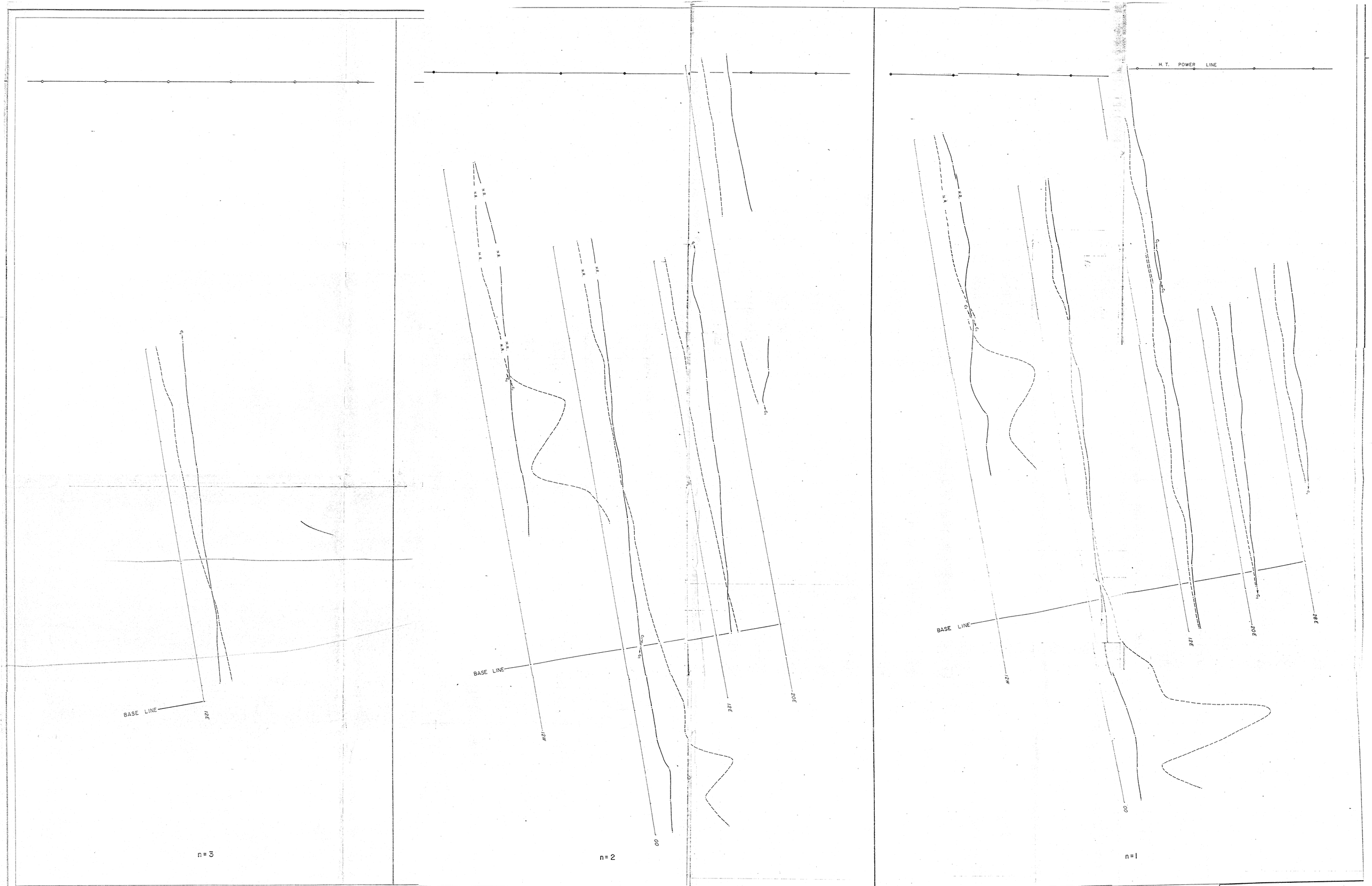
HOPE NW

1"=2000'

ARIZONA
NORMINDEX

3314

1372



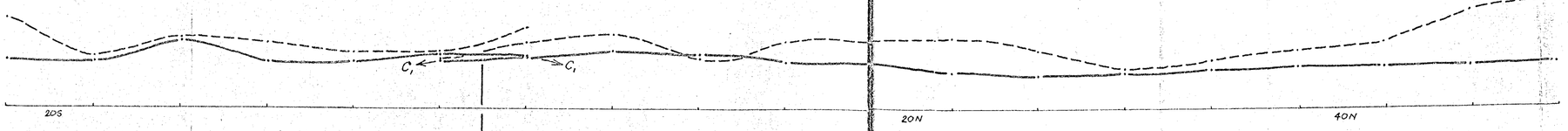
LEGEND

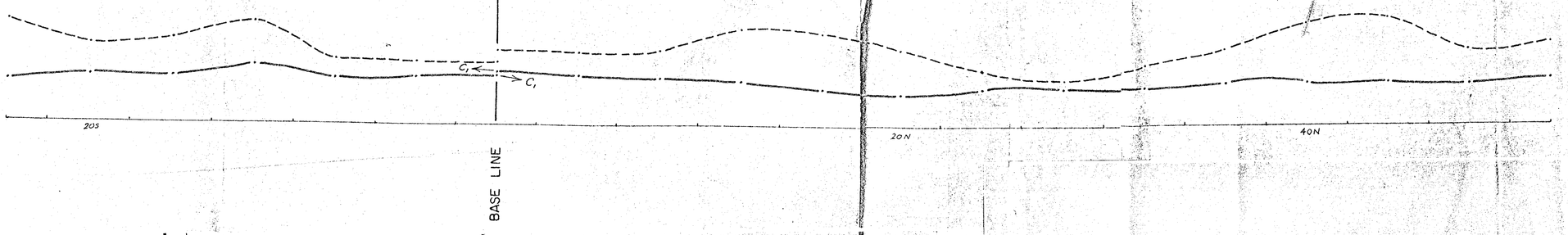
Chargeability – Scale 1" = 2 millisecs.

Resistivity – Scale 1" = 100 ohm metres.

Work undertaken by
BARRINGER RESEARCH LTD, Toronto, Canada.

DeNIZA MINING CORPORATION		
ROPER – AREA 2		
INDUCED POLARIZATION & RESISTIVITY SURVEY POLE-DIPOLE		
JULY-AUG. 1967	Scale 1" = 400'	DWG. 5-179-2





BASE LINE

B.L. BEARING 80° T

LEGEND

C_1 na P_1 a P_2

Chargeability - Scale 1"= 5 millisecs.

Resistivity - Scale 1"= 500 ohm metres

Work undertaken by
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DeNIZA MINING CORPORATION

ROPER - AREA 3

GROUND GEOPHYSICAL APPRAISAL

I.P. - RESISTIVITY POLE-DIPOLE

JULY-AUG. 1967 | Scale 1"= 400' | DWG. 5-179-2

W. D. Roper & Associates
Salome Property
1116 1st Ave. Safford, Ariz.

REPORT ON THE ELLSWORTH MINING DISTRICT

YUMA COUNTY, ARIZONA

INTRODUCTION

The Ellsworth Mining District lies completely within the Hope Quadrangle in Yuma County, Arizona and encompasses the Little Harquahala Mountain Range. The area was brought to the attention of this author by Mr. W. R. Denyer of Salt Lake City early in 1969 when he submitted some 2645 unpatented mining claims owned by a large group of individuals represented by Mr. John Frost and Mr. W. D. Roper. Subsequently, a brief examination was made and it was recommended that additional work be done. This work was started in late February 1970 and continued through May.

The study covered approximately 140 square miles and encompassed most of the Hope Quadrangle. This included not only the submitted claims but other properties within this area.

Since mining activity in this immediate area has been curtailed for many years only limited interest has been recently shown as is evidenced by the scarcity of published information covering this district. The only detailed report available was by H. Bancroft published in 1911 and was limited to the old Harquahala Mine and immediate vicinity. Even this report was concerned primarily with the ore deposit and discussed the surrounding geology only briefly.

Due to the size of the area studied, the limited time available, and the fact that the author was working alone, much detail concerning structure and smaller features did not fall within the scope of this phase of the project. Thus the report will deal with the gross features principally.

LOCATION

The subject area starts about 2 miles south of the small town of Salome, Arizona which is on U. S. Highway 60 - 70 some 105 miles west of Phoenix and 60 miles east of Blythe, California. It includes parts of T5N, R13W, T4N, R14W, T3N, R14W, T4N, R12W and all of T4N, R13W and T3N, R13W. These latter two townships are not completely subdivided. All lie within the Yuma County, Arizona borders.

TOPOGRAPHY AND ACCESSIBILITY

The topography of the district is one of moderate relief with elevations ranging from a low of 1300 feet in the broad valley areas to a maximum of 3000 feet in the rugged mountains. Deep washes, which run only intermittently bisect the mountains and drain toward the south. There is one perennial stream that borders the northwest corner of the area. All irrigation water comes from deep wells.

The main road that runs south from Salome cuts the mapped area approximately in half. This is an improved graveled road and is readily traversable except when flooding conditions prevail. A large portion of the region is not accessible by vehicle although there are many unimproved roads and jeep trails into all but the most rugged parts of the area.

CLIMATE AND VEGETATION

Temperatures here are similar to those in other parts of the desert regions, ranging from the upper 40° to over 110° during the summer months. Annual rainfall is less than 10 inches and snow is a rarity.

Plant life is quite abundant and is typical of the southwest desert regions. Many varieties of cactus abound here including mainly the large, suguaro, barrel, hedge hog, prickly pear, occotillo, cholla, buchhorn and pin cushion varieties. There is also creosote bushes, ironwood and Palo Verde trees as well as many plants and smaller species of brush not recognized by the author.

HISTORY

Only two mines have actually produced enough ore from the Ellsworth mining district to be worthy of note. The Harquahala (Bonanza) described by Bancroft was located in 1888 and produced for several years while changing ownership three different times. The only values of consequence in the ore were in gold and total production reached a reported $3,631,000 before the mine closed.

The other mine known as the Golden Eagle and located about 1 mile north of the Harquahala produced during the same period for a very short time. Production figures were not available but values again were assumed to be in gold. However, Bancroft states "The ores here carried pyrite, chalcopyrite and very small amounts of other copper sulphides". He reports assay ranging from 0.25% to 4.84% copper, 1.32 oz. to 2.88 oz. silver and 0.40 oz. to 1.12 oz. gold. None of the copper or silver was recovered according to the report.

There are numerous other workings throughout the district that no doubt have had limited production. Most are assumed to have been worked for the gold content in the very prominent quartz veins that occur here in abundance. Many prospect holes have also been dug on mineralized showings, some quite recently.

Two holes were drilled by the Frost-Roper group. One hole on the south property went to 600 feet using rotary tools, except for the last 5 feet which was cored. Some of the cuttings still remained around the drill site and were checked. These showed the section penetrated was mainly sedimentary and was not mineralized. The hole, according to Mr. Frost bottomed in limestone but this could not be verified since the core was not available for inspection. The second hole was drilled approximately one mile north of the first hole near the new highway right-of-way. This hole penetrated about 400 feet of metamorphosed volcanics then 169 feet of highly altered intrusives which probably correlates with the Mesozoic quartz monzanite described later in this report. The bottom 10' of this hole was assayed and showed .067% Cu.

GENERAL GEOLOGY

Regionally the area studied for this report lies well within the boundaries of the Texas structural zone and near the western border of the Wasatch - Jerome orogen. These large structural features and their relation to the copper deposits of the Southwest are discussed by Harrison A. Schmitt in his paper, "The Porphyry Copper Deposits in their Regional Setting", which is part of the publication "Geology of the Porphyry Copper Deposits Southwestern North America". His discussion points out the importance of these major structural features in choosing locations possibly favorable for copper deposition.

Structural features in the mapped area tend to correlate with those described by Mr. Schmitt as common to regions that fall within the

borders of both the Texas and Wasatch - Jerome orogens. A system of N - NW trending faults has displaced rocks of all ages in the Hope Quadrangle. The presence of a thick section of Carboniferous sediments strongly suggest that thrusting has occurred which Schmitt mentions in four relatively small areas along the Texas zone. It should be noted that much evidence to support the thrust theory is lacking in the Little Harquahala area, but in the Harquahala Mountains northeast of this district Eldred D. Wilson explains the Paleozoic sediments here as the upper plate of a thrust fault. Also along the Bill Williams River to the north, thrusting has occurred over a rather extensive area.

Faulting with an E - W trend also has taken place, but is not as prominent. These faults appear to be older than the N - NW trending system.

Rocks exposed in the area range from Paleozoic sediment through Mesozoic intrusives, volcanics and metasediments to Tertiary volcanics. The age assignment of the various rock units was made by Eldred D. Wilson and the accuracy of these assignments was not verified; however, the evidence noted in the field does not necessarily disagree with Wilson. Further study and some work on age determinations may alter this somewhat.

The oldest rocks exposed here are a section of limestones with some interbedded quartzites which are conglomeratic in part, argillaceous shales and a thin section of dolomite. The age of this unit was determined by N. H. Darton who stated "In the flanking limestones south of Martin Peak I found fossils of Carboniferous age."

These rocks form the most prominent topographic feature in the district, the rather high, rugged NE trending ridges of the Little Harquahala Mountains. Generally the strike of these beds is N 55 - 60° E with a dip of 50 - 60°NW. Locally, however, the beds are badly contorted and show complete attitude reversals.

Where the limestones are in contact with the intruding quartz monzonite they have been metamorphosed to a pinkish colored marble. Also some skarn zones were noted but are not extensive.

The intrusive rocks shown on the Yuma County geologic map have been classified as Mesozoic granites. The study, however, has revealed that there are at least three different intrusive units and although a thin section study by Mr. Hossein Salek of the University of Utah classifies two of the specimens taken from different areas as quartz monzonites, the megascopic appearance and characteristics of these rocks indicate two completely different units. The third intrusive was classified by Mr. Salek as a fine grained granodiorite.

The sequence of these intrusions is not clear at this time. Evidence does, however, indicate that the northernmost quartz monzonite intruded the granodiorite which intruded the more wide spread coarser grained quartz monzonite porphyry found to the east and south.

Overlying the intrusives is a section of volcanics composed of mainly andesites and rhyolites. These rocks outcrop along the west and south sides of Harquar Peak and also in two areas immediately south of the main NE trending ridge of the Little Harquahala Mountains. Another outcropping of these volcanics can be found at the extreme southwest corner of the mapped area.

These volcanics are in turn overlain by an assemblage of metamorphosed sediments, comprised mainly of quartzites, schists, slates and hornfels with some volcanics, mostly andesites, probably occurring as sills.

Another series of sediments which are somewhat metamorphosed outcrops near the north end of the district, along the west side, in a series of rather low rounded hills and to the extreme south where they form a prominent NW trending ridge. This unit includes, quartzites that form bold rugged outcrops, slates, sandstones and some thin limestone sections that are mainly lenticular. Some of the shales in the southern area are somewhat schistose. Also exposed in this same region is a bed of arkosic sandstone that has been metamorphosed to a point that it resembles a fine grained plutonic rock. This is possibly the youngest unit exposed in the area with the exception of the Tertiary volcanics and the recent alluvium.

The Tertiary volcanics are mostly vesicular basalt and outcrop prominently in a series of rather high NW trending ridges along the eastern side of Upper Bouse Wash. They also form the more prominent part of the N - S trending mountain range immediately north of the new highway in the western part of the mapped area.

Rocks of all ages in this district with the exception of the Tertiary volcanics have been cut by a series of basic dikes that strike generally in a NW direction. Also, some plugs were noted especially in the vicinity east of the Rio Del Monte Mine. Many quartz veins ranging from a few inches to several feet in width are exposed in this same area. These are older than the basic dikes having intruded only

the quartz monzonite porphyry. This same situation occurs in the southern part of the mapped area where this intrusive is exposed. The general strike of these veins is N 50 - 60 E with dips from vertical to 60° NW.

PALEOZOIC ROCKS

Sediments

The limestones of this section have a rather wide color range from grays to browns and are thinly to thickly bedded. Certain sections weather to a dark dirty brown and form near vertical ledges. Some of the beds are dolomitic. A section of pinkish colored marble occurs at the contact with the quartz monzonite porphyry.

The interbedded quartzites are brown to reddish brown rather thinly bedded and partially conglomeratic.

Shales which are also interbedded with the limestones are dark gray and in places appear silty.

MESOZOIC ROCKS

Schists

The rocks of the unit are an assemblage of schists, slates, hornfels and quartzites with some volcanics occurring as sill-like features.

These rocks have been intensely metamorphosed and structurally deformed to such a degree that recognition of rock types is extremely difficult megascopically.. Much fracturing has occurred, obliterating most of the original bedding features. The quartzites form bold outcrops and in most instances are quite massive,weathering to a dark dirty brown.

One small unit appears to be tuffaceous and is nearly white in color with limonite staining on all fracture surfaces.

Sediments

Although this grouping has been mapped as sediments, much of the section shows the rocks to have been metamorphosed to some degree. The unit includes quartzites, slates, shales (partically schistose), sandstones, limestones and one bed of metamorphosed arkose or arkosic sand.

The quartzites, which are most prevalent, are buff in color weathering to a dark brown. They are thin to medium bedded and cap most of the ridges.

Gray and dark gray slates are interbedded with limestones that are mostly lenticular in occurrence. These limestone beds are light brown to medium gray and are dense to finely crystalline. No fossils were found.

An argillaceous shaly section which is partially schistose occurs in the southern part of the area. This unit is light greenish gray in color and scattered throughout are large pyrite crystals which are mostly altered to limonite. Some copper oxides are present as small blebs apparently associated with limonite which may have been small concretions in the host rock.

Underlying this sequence is a light greenish-gray to gray arkose or arkosic sandstone that has been somewhat metamorphosed. Quartz crystals are prominent and biotite is easily recognized and is presumed to be secondary. This unit also outcrops due north at Harquar Peak.

Volcanics

Two rock types make up this sequence. A dark gray to gray porphyritic andesite and a light buff to nearly white rhyolite. The andesite is probably the more recent, since, where exposed in a low ridge south of The Needle, it apparently overlies the rhyolite.

These volcanics are rather wide spread, outcropping south of the main ridge of the Little Harquahala Mountains and to the south and west of Harquar Peak.

Intrusives

Quartz Monzonite Porphyry

This intrusive outcrops over more of the mapped area than any other rock type. It is mainly coarse to medium grained and ranges in color from dark greenish gray to gray to salmon pink. In all areas it is porphyritic with large phenocrysts of orthoclase up to 1 1/2 inches in length. The plagioclase and quartz crystals are more or less equigranular and vary from medium to coarse in grain size. The principal mafic mineral is biotite with minor amounts of horneblende.

Thin sections were made of this intrusive from samples taken in four different localities. These are described under Sample Nos. 7, 8, 10 and 11 in the appended report by Mr. Hossein Salek.

Granodiorite

The granodiorite has a grayish color and is fine grained. The feldspars are not recognizable in a hand specimen. Quartz is present but makes up less than 10 percent of the rock. Both biotite and horneblende are easily discernible.

This is described as Sample No. 6 by Mr. Salek.

Quartz Monzonite

This rock is nearly white, equigranular and medium grained. Both orthoclase and plagioclase can be recognized and are present in nearly equal amounts. Quartz is also a constituent but makes up less than 10 percent of the rock. The only mafic minerals easily recognized in the hand specimen were biotite and horneblende with biotite the most abundant.

See Sample No. 4 for a description of the thin section.

TERTIARY ROCKS

Volcanics

Volcanic rocks in this group are mapped by Wilson as Quaternary and/or Tertiary but for the purpose of this report all are considered as Tertiary. These consist mainly of basalts which are mostly scoriaceous. In part, however, they are very dense with only minor biotite phenocrysts occurring. Near the west center part of the district a buff colored welded tuff outcrops forming some low almost isolated mounds.

Dikes and Plugs

Many dark green to brownish green dikes have cut all the rock units except the younger flow rocks. These are probably diabase and in part are porphyritic. Plugs of the same composition are also present in the areas previously mentioned.

A large NW trending dike outcrops prominently in the western part of the district. This dike is composed of light gray rhyolite and has intruded the sediments.

Both aplite and pegmatite dikes were found intruding the quartz monzonite in the northern area.

STRUCTURE

The dominant structural feature in the Ellsworth Mining District is the thrust faulting which apparently is responsible for the present position of the Paleozoic sediments. Since local evidence substantiating this thrusting is obscured, the direction can only be assumed. To the northeast in the Harquahala Mountains a similar sedimentary section is exposed and Wilson shows this as being thrust in from the southeast. However, the beds in the Ellsworth District dip to the northwest in what appears more as a monoclinal fold. Thus it would be reasonable to assume that this is the direction from which the sediments were displaced.

A series of N - NW trending faults has shifted nearly all rocks in the region. Mainly these faults appear to be normal in occurrence with the downdropped block to the west. One fault zone, however, which passes near The Needle, apparently is down-dropped to the east. Shearing has accompanied this movement and is mentioned by Bancroft as the zones in which the ore is deposited in the Harquahala mine area. These shears strike N - S according to his report. The amount of displacement accompanying this movement could not be determined in any of the faulted areas.

E - NE faulting has also occurred, but is not as prominent. One zone along which considerable shearing has taken place was found northwest of the Harquahala Mine. Here the older quartz monzonite porphyry is in contact with the younger volcanics and metasediments. If movement along this fault was of sufficient magnitude it may well have down dropped the Paleozoic sediments to the south so that subsequent errosion and alluvial deposition would obscure evidence of the thrusting that is believed to exist here.

ECONOMIC GEOLOGY

Mineralization

The most common minerals found throughout the district are the copper oxides, malachite and chrysocolla. Other secondary copper minerals include chalcocite, cuprite and tenorite. Pyrite, chalcopyrite and gold are the principal primary minerals. Silver and lead have been reported but were not identified by the author.

The copper oxides occur mainly as fracture coating and are found in many places throughout the area; mostly in the mineralized shear zones. They also form halos surrounding chalcocite and chalcopyrite centers in the mineralized quartz veins and veinlets. In the southern part of the area malachite and chrysocolla were found as small scattered blebs associated with limonite concretions in a siltstone.

In the NW 1/4 Sec. 32, T5N, R13W both secondary and primary copper minerals were found in small quartz veinlets and stringers occurring in the quartz monzonite porphyry. This area is badly fractured and the rock shows some alteration. The general trend of the zone is N 60 - 70° W and covers an area about 1000 feet wide and 2000 feet long.

Approximately 1 mile north of the Harquahala mine a rather deep cut has been made in a mineralized zone in the coarse grained quartz monzonite. Pyrite is disseminated throughout the rock along with minor amounts of chalcopyrite. Some manganese is also present. The quartz monzonite porphyry is badly altered. Some chalcanthite, the copper sulphate, has been deposited on the walls of this cut. This appears to be a shear zone and is probably similar to those mentioned by Bancroft as containing the ore in the Harquahala mine.

In the previously described E - NE zone west of the Harquahala mine copper also occurs in quartz veinlets within the sheared area. No primary copper minerals were found but some free gold was observed. The country rock here is also the quartz monzonite porphyry mentioned above.

Near the Rio Del Monte mine copper oxides were found in a highly altered zone adjacent to a large quartz vein. This zone, where exposed, varied from 2 to 3 feet in width. No sulphides were recognized. Further to the east in this same section several quartz veins were found that were mineralized. Chalcopyrite surrounded by chalcocite which had in turn been altered to chrysocolla occurred as scattered blebs throughout the vein. Veins similarly mineralized are also present in the southern portion of the mapped area.

A northwest trending shear zone exists in the southern sector southeast of Black Rock Hills. Malachite and Chrysocolla occur mainly as fracture coatings along this zone. Two shafts have been sunk and two short adits driven in this area. One shaft is fairly deep and apparently intersected a highly mineralized vein. This vein contains both malachite and chrysocolla as well as chalcocite and some cuprite. Much hematite and limonite, along with specularite is also present. The gangue minerals are calcite, quartz and barite. No width or direction could be determined but it is assumed that the vein would strike N 20° - 30° W since this is the trend of the shear zone at the surface.

There are many other mineralized occurrences throughout the district, but those described above are the most significant. With the exception of the zone described in Sec. 32 the mineralization appears to be controlled by shearing rather than rock type. Bancroft, in his report

on the Harquahala, explains that "The ore shoots seem to have occupied zones of shearing extending through the sedimentary series of intercalated limestone, shale and quartzite into the basal granite". There is no mention of any replacement of the limestones and no evidence was found on the surface that would indicate this situation exists. The few skarn zones noted were not extensive and were not mineralized.

Alteration

Alteration of the rocks in and around the mineralized zones varies greatly. In Sec. 32 Salek notes in the thin section (see Sample No. 5) the biotite crystals are mostly altered to chlorite and minor quantities of sericite, clays, epidote and iron oxides are present. The report by Bancroft says the coarse grained granitic looking rock, which has been severely crushed and fractured, has pyrite deposited along the brecciated zones which are now filled with sericite.

Epidote is common in many of the areas as a calcite. In most of the samples examined in thin section chorite, sericite and clays are the alteration products.

CONCLUSIONS

Although the examination conducted in the Ellsworth Mining District was limited in scope, enough evidence was observed to convince the author that further work is warranted. The area studied falls well within those large structural zones that are considered favorable for large porphyry copper deposits. Thrusting and shearing also are present and although the thrust plane could not be seen in the district it must exist and may well be mineralized as it is to the north along the Bill Williams River. The sheared zones have already proven to be well

mineralized and somewhat productive. Further, copper mineralization was found in the quartz monzonite which also shows some alteration in Section 32.

It has been well established that all the major porphyry copper deposits in Arizona are associated closely with intrusives that are Late Cretaceous - Early Tertiary (Laramide) in age. Although no rocks of this age are known to outcrop in the Ellsworth District, it must be considered that they may exist at depth. Wilson has mapped a Laramide granitic series about 5 miles north of Highway 60 - 70 and another east of the Hope Quadrangle in T5N, R11E.

Sample #4 Salome - Very Slightly Altered Quartz-Monzonite

In the thin-section the rock consists of subhedral crystals of plagioclase (andesine and oligoclase), subhedral to anhedral crystals of k-feldspar, anhedral crystals of quartz, and subhedral crystals of mafic minerals (biotite, hornblend, and diopside). Feldspar grains are slightly altered to sericite, clay minerals, and calcite. Mafic minerals are slightly altered to chlorite. Rutile, leucoxene, zircon, apatite, and magnetite are present as accessory minerals in the rock. A trace of hematite was noted.

Sample #5 Salome - Monzonite

In the thin-section this rock consists of subhedral crystals of plagioclase (andesine and oligoclase), quartz, biotite (most grains are altered to chlorite), hornblend, and diopside. Minor quantity of sericite and traces of clays, epidote, rutile, leucoxene, iron oxides, and pyrite are present.

Note: Fractured and broken grains in the rock due to the stress.

Sample #6 Salome - Slightly Altered, Fine-Grained Granodiorite

In the thin-section this rock consists of plagioclase, k-feldspar, quartz, biotite, hornblend, and diopside. Most feldspar grains are slightly altered to sericite, clays (low), and calcite. Some mafic minerals are partially replaced by chlorite and iron oxides, Traces of rutile, leucoxene, and apatite are present. A few grains of pyrite were noted.

Sample #7 Salome - Medium-Grained, Moderately Altered Rock (Probably Monzonite)

In the thin-section this rock consists of subhedral crystals of plogioclase (andesine and oligoclase), k-feldspar, quartz (clusters and veinlets), biotite, and muscovite (probably secondary). Sericite, clays (low), calcite, chlorite, and iron oxides are present as secondary minerals. Rutile, apatite, zircon, magnetite, and leucoxene are present as accessory minerals.

Sample #8 Salome - Slightly to Moderately Altered Monzonite

In the thin-section this rock consists of subhedral grains of plagioclase, subhedral to anhedral grains of k-feldspar, quartz (fine-grained, clusters, and veinlets), and mica (biotite and muscovite). The feldspar grains are slightly to moderately altered to sericite, calcite, and clay minerals (low). Some biotite grains are slightly altered to chlorite and iron oxides. A few grains of magnetite, rutile, leucoxene, apatite, and zircon are present.

Note: Fractured, brokem, and bended grains in the rock due to the stress.

Sample #9 Salome - Slightly Altered-Granodiorite

In the thin section this rock consists of plagioclase (some grains are zoned), k-feldspar, quartz, and mafic minerals (hornblend, diopside, and biotite). The feldspar and mafic minerals are slightly altered to the secondary minerals. Sericite, clays, chlorite, and carbonate are the secondary minerals. Magnetite, zircon, apatite, rutile, and leucoxene are present as accessory minerals in the rock.

Sample #10 Salome - Medium-Grained, Moderately Altered Rock (Probably Quartz-Monzonite)

In the thin-section this rock consists of moderately altered grains of feldspar (plagioclase and k-feldspar) and mafic minerals (biotite, hornblend, and diopside). Quartz is present in the section as fine grains, clusters, and veinlets. Sericite, chlorite, calcite, and epidote (low) are present as secondary minerals in the rock. A few grains of magnetite, apatite, rutile, and leucoxene are present.

Sample #11 Salome - Slightly to Moderately Altered Monzonite (Quartz-Monzonite)

In the thin-section this rock consists of plagioclase (oligoclase and andesine), k-feldspar, quartz (clusters and veinlets), and biotite. Most grains of feldspar and biotite are slightly to moderately altered to the secondary minerals. The secondary minerals are sericite, chlorite, calcite, and clays (low). Magnetite, sphene, rutile, leucoxene, apatite, and zircon are present as accessory minerals in the rock.

Note: Fractured and broken grains in the rock due to the stress.

Rocky Mountain Geochemical Corporation

2050 EAST 14TH STREET
TUCSON, ARIZONA 85719

Phone 622-5702
Area Code: 602

CERTIFICATE OF ANALYSES

Date December 3, 1971

Client Newmont Exploration, Ltd.
P.O. Box M
San Manuel, Arizona 85631

Report on: 29 Samples
Submitted by: Mr. Hugh Steele
Date Received: November 20, 1971
Analysis: Copper
Remarks: Copper was determined by atomic absorption.

Job No. 71-12-3T Invoice No. TU-2844
cc: Enclosed
RMGC: SLC
file
MHH:rg

Sample No.			ppm Copper
W.R.3	1	0 - 10'	60
"	2	10 - 20' etc.	30
"	3		30
"	4		40
"	5		40
"	6		45
"	7		40
W.R.3	8		30

All values are reported in parts per million unless specified otherwise. A minus sign (-) is to be read "less than" and a plus sign (+) "greater than." Values in parenthesis are estimates. This analytical report is the confidential property of the above mentioned client and for the protection of this client and ourselves we reserve the right to forbid publication or reproduction of this report or any part thereof without written permission.

ND = Non Detected | 1 ppm = 0.0001% | 1 Troy oz./ton = 34.28 ppm | % Mo. x 1.6683 = $\%MoS_2$

Sample No.		ppm Copper
W.R.3	9	20
"	10	65
"	11	30
"	12	20
"	13	20
"	14	30
"	15	30
"	16	85
W.R.3	17	50
WR1	1	80
"	2	150 = .015%
"	3	50
"	4	30
"	5	40
"	6	10
"	7	50
"	8	35
"	9	20
"	10	95
"	11	85
WR1	12	40

ROCKY MOUNTAIN GEOCHEMICAL CORPORATION

Tucson, Arizona December 3, 1971

By _____

Martin H. Hibbetts

M29mc

Rocky Mtn Geochem

Sample No.	ppm Copper	ppm Molybdenum	ppm Gold	ppm Silver	
2071	40	6	-0.1	-1	[illegible]
2072	75	-1	-0.1	-1	[illegible] schist
2073	20	4	-0.1	-1	[illegible]
2074	10	-1	-0.1	-1	[illegible] zone, [illegible] schistose
2075	100	-1	-0.1	-1	[illegible] from tunnel
2076	-5	-1	-0.1	-1	[illegible] from 2074 [illegible], schistose
2077	20	-1	-0.1	1	[illegible] from 2075 [illegible] bio, Amph.
2078	30	-1	-0.1	-1	Argillized zone 50' N from 2076
2079	-5	-1	-0.1	-1	[illegible] from 2077 [illegible]
2080	30	-1	-0.1	-1	[illegible] tunnel
2081	20	1	-0.1	-1	[illegible] tunnel [illegible] sed(?)
2082	15	-1	-0.1	-1	[illegible] from [illegible] sed - [illegible] for [illegible] stone?
2083	50	-1	-0.1	-1	[illegible] from tunnel [illegible] sample site [illegible] shear [illegible] uning.
2084	10	8	-0.1	-1	[illegible] limonite [illegible] shear zone
2085	30	4	-0.1	-1	200' [illegible] from 2083 [illegible]
2086	50	10	-0.1	-1	200' [illegible] from 2084 argill. [illegible] zone
2087	5	1	-0.1	-1	Ridge [illegible] from [illegible] see map [illegible]
2088	105	7	-0.1	-1	100' S of 2086 Dark [illegible] - schistose
2089	10	10	-0.1	-1	Alteration halo around sil. zone 100' S of 2087
2090	10	10	-0.1	-1	NE shearing, strong sil.
2091	20	1	-0,1	-1	silicified zone
2092	80	-1	-0.1	-1	Mod. [illegible] - schistose sed(?)
2093	150	4	-0.1	-1	30' S of shaft -
2094	520	5	-0.1	-1	30' [illegible] shaft - see map
~~2455~~	~~50~~	~~5~~	~~-0.1~~	~~-1~~	Unmineralized dump material

MAGMA COPPER COMPANY - San Manuel Division

MINE ASSAY CERTIFICATE

H. T. Steele

DATE 10/11/68

DATE	SAMPLE NO	CU % TOTAL	CU % OXIDE	Au oz.	Ag oz	% Mo			
	L-1	0.65		Trace	0.10	0.013			
	2	0.12 .10 check		"	0.20	0.010			
	3	0.22		"	0.10	0.003			
	4	0.[illegible] .05 check		"	Trace	0.002			
	5	0.06		"	"	0.002			
	6	0.27		"	0.10	0.002			
	7	0.17		0.38	0.76	0.004			
	8	0.03		0.01	1.10	0.002			
	9	0.05		0.01	0.10	0.004			
	10	0.08		Trace	Trace	0.001			
	11	0.04		"	"	Nil			
	12	0.04		"	"	0.001			
	13	0.04		"	0.02	Nil			
	14	0.03		"	Trace.	0.001			

F-SC13

[signature]

CHIEF CHEMIST

MAGMA COPPER COMPANY, San Manuel Division

MINE ASSAY CERTIFICATE

H. T. Steele

DATE 11/3/68

Width ~~DATE~~	SAMPLE NO	CU % TOTAL	CU % OXIDE	% Mo					
grab	L-1			0.013	Laura #? Grab from dump @ pit by road.				
grab	2			0.010	In Wash, Chalcopyrite in black sed's				
4º	3			0.003	Incl. Shaft 15' below Collar, East wall				
grab-25'	4			0.002	Pit on ridge - grab across bottom				
grab	5			0.002	Patch of Arg. Alteration N.W. of pit				
250'	6			0.002	chips along wall of Wash. - Lim. Stained tilted Sed's				
grab	7			0.004	Dump @ shaft @ S. end. Rio Del Monte property				
grab	8			0.002	Dump @ shaft in Alt. Sed's south of Mathews house				
chips	9			0.004	Small qtz veins west of Rotary Drill hole				
15'	10	Same Finger Area		0.001	Lim. St. Sed's in Arroyo S.E of the Needle				
50'	11	↓		NIL	chips of alt. Seds 250' NE of L-10, along arroyo				
chips	12			0.001	Coarse gr. Granite				
200' ±	13			NIL	chips of granite from dozer scrape along ridge				
grab	14			0.001	Limonite after pyrite in siltstone? beneath Limestone				

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[signature]

CHIEF CHEMIST

MAGMA COPPER COMPANY, San Manuel Division

MINE ASSAY CERTIFICATE

H. J. Steele DATE 10/8/68

DATE	SAMPLE NO	CU % TOTAL	CU % OXIDE	[illegible]	[illegible]				
	L-1			TRACE	0.15				
	2			TRACE	0.20				
	3			"	0.10				
	4			"	TRACE				
	5			"	"				
	6			"	0.10				
	[illegible]			0.50	0.75				
	[illegible]			0.01	1.10				
	[illegible]			0.01	0.10				
	[illegible]			TRACE	TRACE				
	[illegible]			"	"				
	[illegible]			"	"				
	[illegible]			"	0.05				
	12			"	TRACE				

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[signature]
CHIEF CHEMIST

MAGMA COPPER COMPANY, San Manuel Division

MINE ASSAY CERTIFICATE

H. J. Steele - Re-Run samples DATE 10/14/68

DATE	SAMPLE NO	CU % TOTAL	CU % OXIDE						
	L - 2	0.10							
	L - 4	0.05							

dark copper

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[signature]
CHIEF CHEMIST