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SUMMARY OF INVESTIGATION

COPPER CREEK PEDIMENT PROJECT

PINAL COUNTY, ARIZONA

By

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Cyprus Mines Corporation

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INTRODUCTION

The purpose of this report is to summarize the exploration activities undertaken by Cyprus Mines Corporation during 1971 and 1972 at the Copper Creek Pediment Project, Pinal County, Arizona. The program was directed by Messrs. E. A. Schmidt, Richard W. Thomssen and Peter Chapman, who were assisted by Messrs. Ed Kahoe, Bill Dinsmore and Vern Wallace at various times during the course of the Project.

The prospect is situated in the Bunker Hill mining district on the east side of the San Pedro Valley. The latter is one of the major northwest-trending lineaments in southeast Arizona. The prospect area lies between the major Kalamazoo - San Manuel ore body and the Copper Creek porphyry copper deposit presently being jointly explored by Humble and Refining Company and Newmont Mining Company. Access to the project is provided by several well maintained dirt roads from Mammoth. The nearest population and business center is Tucson about 45 miles to the southwest which can be reached following State Highway 77 (Figure 1).

Interest was stimulated in this area when it was recognized that several aeromagnetic anomalies published by the USGS and located on the pediment showed a very close similarity to magnetic anomalies coinciding with the multimillion ton Kalamazoo - San Manuel ore body and also with the Copper Creek porphyry copper discovery to the east.

Furthermore, a Bear Creek churn drill hole bored in 1955 and located at the flank of one of the main magnetic lows on the pediment reportedly intercepted minor amounts of chalcopyrite from 1150' to the bottom of the hole at 1939 feet. Mineralization was believed to occur in altered Glory Hole volcanics, but assays were not available.

During the spring of 1971 Cyprus acquired a commanding land position on two of the negative magnetic anomalies. The main portion of the land holding was optioned from Su Can Ltd. on very favorable terms and includes 242 unpatented Beth claims and 3 state leases. This claim block covers the largest of the 3 magnetic anomalies in section 19. The other two anomalies were covered by Cyprus claims (205 CCP claims) and by state leases. The entire land position covers all and parts of sections 11, 12, 13, 14, 23, 24, 25, 26, 35 and 36, T. 8 S., R. 17 E., all and parts of sections 7, 8, 9, 16, 17, 18, 19, 20, 21, 29, 30, T. 8 S., R. 18 E., parts of section 1 and all of section 2, T. 9 S., R. 17 E., and parts of section 6, T. 9 S., R. 18 E. The majority of the claims and all of the state leases are within the 7 1/2 minute USGS Clark Ranch quadrangle and a few claims extend into the adjacent 7 1/2 minute Holy Joe Peak quadrangle to the north. Subsequently, 8 churn drill holes were bored in 1972 partly to test the magnetic anomalies, and partly to validate state leases.

The results of this drilling program are discussed in detail below. Total expenditures charged to the Copper Creek Pediment program amounted to \$198,348.

GENERAL GEOLOGIC SETTING

The Copper Creek Pediment project is situated on a vast gravel covered pediment sloping westward from the Galiuro Mountains toward the San Pedro Valley. The pediment is underlain by 850 to over 2,000 feet of Gila conglomerate consisting of a well-indurated, coarse cobble and boulder conglomerate facies, and a well-bedded, poorly indurated gypsiferous sand and silt lacustrine facies in the San Pedro Valley. The Gila conglomerate conceals every exposure except for a few upfaulted (?) mid-Tertiary volcanic blocks consisting of rhyolite, latite and andesite flows and tuff breccias in Zapata Wash and Whitlock Wash. Immediately east of the project area is the Copper Creek district characterized by a complex Laramide-age intrusive sequence (68 m.y.) consisting of various quartz diorite granodiorite and quartz monzonite stocks. On the geologic map, these various rock types have been collectively named Copper Creek granodiorite. The latter intruded the Cretaceous Glory Hole volcanics made up largely of andesite and latite agglomerates. Near the contacts with the Laramide igneous rocks, the Glory Hole volcanics are strongly silicified and contain 1 - 2% disseminated pyrite. Both, the Copper Creek intrusive rocks and the Glory Hole volcanics are in turn cut by numerous quartz latite porphyry dikes and irregular intrusive masses that generally show a considerable amount of sericitization. Some of the latite porphyry bodies show a distinct northwest to easterly trend; others occur without any preferred orientation.

Innumerable breccia pipes measuring from a few feet to over 100 feet in diameter occur throughout the Copper Creek area (see Geologic Map, in pocket). The pipes consist for the most part of sub-to well-rounded Glory Hole and granodiorite fragments, completely altered to quartz and sericite and embedded in a sericitic fragmental matrix.

The breccia pipes appear to be the youngest manifestation of the magmatic intrusive event because they transect Glory Hole volcanics, Copper Creek granodiorite and latite porphyry masses. The pipes also served as ready channel ways for the escaping hydrothermal solutions. To north of the Copper Creek area proper along the base of the Galiuro Mountains occur exposures of Precambrian Pinal Schist (Dry Camp Canyon), diabase, faulted segments of the Younger Precambrian Apache Group, Cambrian Abrigo Formation, Devonian Martin Formation and Mississippian Escabrosa Limestone. A large exposure of Pinal Schist occurs also on the eastern side of Sombrero Butte.

Isolated exposures of gray sandstone, siltstone and conglomerate northeast of the Bluebird mine have tentatively been assigned to the Cretaceous Pinkard Formation following Simons' designation. The Pinkard is a well recognized formation in the Morenci district about 70 miles to the northeast, but it has as yet only been scantily recognized in the Galiuro Mountains and Klondyke areas (Simons, 1964). An isolated exposure of a gently dipping clean, pebbly sandstone mass on the west slope of Sombrero Butte has also been tentatively correlated with the Pinkard Formation. This sandstone is overlain by the lower andesite unit of the Sombrero Butte section, and thus may represent a topographic high during deposition of the andesite. The lower contact of the sandstone is obscured for the most part, but some high angle faulting is present.

Overlying all the above mentioned rock types is the complex post-ore, mid-Tertiary extrusive Galiuro volcanic sequence exposed primarily in the Galiuro Mountains but also in faulted remnants along Zapata and Whitlock Wash and comprising the volcanic sequence at Sombrero Butte. The Sombrero Butte section has been studied by Schmidt and Chapman in some detail in order to establish a reference for the volcanic rocks intersected

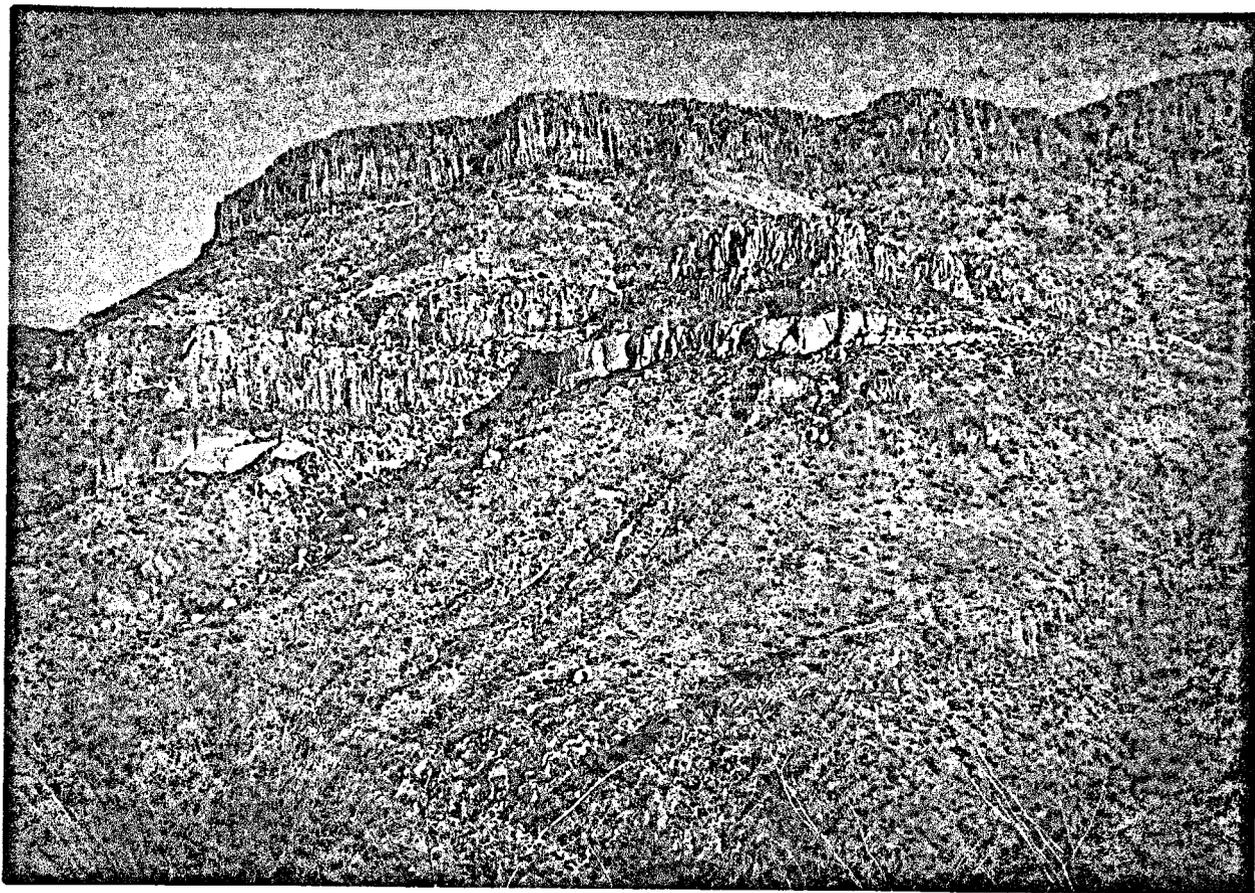


Figure 2. Sombrero Butte

Lower andesite forms basal slopes overlain by tan, cliff-forming lithic tuff and vitrophyre. Tuff is overlain by succession of rhyolite flows with vitrophyre, andesite porphyry, and upper cliff-forming rhyo-dacite flow with basal vitrophyre. Vertical relief is 1900 feet.

in drill hole CCP-1 located 3 miles west of Sombrero Butte. The base of the Sombrero Butte volcanic sequence is a massive, fine grained, olivine bearing andesite forming flows, flow breccias and agglomerates. The andesite is capped by a distinct 25 - 50 foot yellow gray lithic pumice tuff and 5 - 10 foot black vitrophyre unit which can be followed uninterrupted along the west slope of the mountain. Several rhyolite flows and flow breccias separated again by vitrophyres constitute the middle portion of the sequence which are in turn overlain by a distinctly porphyritic andesite. The upper part is a dense, cliff-forming rhyodacite flow capped by a thin veneer of ash flow tuff. A thin band of pumice tuff and vitrophyre separates the porphyritic andesite from the cliff-forming rhyodacite (Figure 2). Sombrero Butte is a large fault block presumably separated from the main Galiuro Mountain range during the Basin and Range tectonic event, an event that also caused the formation of the northwest-trending San Pedro graben.

The basal andesite (T1a) in the Sombrero Butte section could well be the equivalent of the lower andesite (Tgla) described by Simons in the nearby Galiuro Mountains, but not enough field work was carried out to varify this relationship.

The moderately to steeply dipping normal fault along the eastern slope of Sombrero Butte is a regional tectonic feature that can be followed to the northwest for several miles along strike. In the Copper Creek area, the fault separates Gila Conglomerate from mineralized Glory Hole volcanics (see geologic map, in pocket) indicating that the entire pediment has been down dropped to the west in late Tertiary time (Basin and Range orogeny). In light of this structural setting, the magnetic anomalies on the pediment were considered important exploration targets for potentially displaced mineralized intrusive or volcanic rocks of the Copper Creek district.

MINERALIZATION

The Copper Creek (Bunker Hill) district is well-known for its numerous mineralized breccia pipes containing primarily copper and molybdenum mineralization. Over 100 pipes were mapped by Kuhn (1941) but not every breccia pipe contains economic sulfide mineralization. Quartz - sericite - alteration is intense in these features and locally tourmaline becomes an important matrix constituent. There does not appear to be a definite structural alignment of the pipes nor a definite association with either Copper Creek granodiorite or Glory Hole volcanics. However, in many cases latite porphyry dikes and irregular intrusive masses occur in close vicinity of the breccia pipes.

The district enjoyed considerable mining activity beginning in 1863 with silver and gold prospecting, followed intermittently by various mining companies exploiting specific breccia pipes primarily for copper and silver. A mill was built in the early teens on Copper Creek treating ore taken from the American Eagle and Old Reliable mines. During the thirties, the Childs - Aldwinkle mine was worked by the Arizona Molybdenum Corporation extracting massive coarse grained molybdenite (about 6.9 million pounds), copper (5.8 million pounds) and silver (27,000 ounces). Production from this mine alone calculated at present metal prices amounts to \$14,675,000.

Renewed exploration was stimulated in the late fifties and early sixties by Magma Mining Company and Bear Creek Mining Company, and more recently a serious effort is being made to develop deep, disseminated porphyry copper type mineralization in a joint venture between Newmont Mining Company and Humble Oil and Refining Company. The in-place leaching program recently initiated at the Old Reliable mine by Ranchers Exploration appears to be successful, and Philips Dodge is probing potentially mineralized

granodiorite and Glory Hole volcanics beneath post-ore volcanic cover in the Galiuro Mountains. A few miles to the east Superior Oil is involved in a similar exploration venture. Sulfide mineralization and quartz-sericite alteration is not confined to the breccia pipes, but also extends into the surrounding host rock. Limonite filled fractures and fissure veins cutting Copper Creek granodiorite and Glory Hole volcanics are systematically oriented in an easterly direction. Some of the altered latite porphyry dikes follow the same easterly trend, but near the western edge of the outcrop area in the vicinity of the boundary fault they swing into a more northwesterly direction (see geologic sketch map, in pocket). Structural evidence thus indicates that sulfide mineralization in the Copper Creek area has at least in part been controlled by an easterly trending tension direction that guided the ingress of hydrothermal solutions. One phase of the Copper Creek granodiorite stock has been dated radiometrically at 68 m.y. thus conforming to the generally metal - bearing Laramide-age magmatic pulse in southern Arizona.

SUMMARY AND CONCLUSION

Interest in the Copper Creek Pediment area was stimulated in 1971 by the recognition of several aeromagnetic lows that superficially resembled anomalies associated with the nearby San Manuel - Kalamazoo and Copper Creek porphyry copper deposits. A low level magnetic re-survey undertaken by Cyprus over a 420 square mile area varified and accentuated the older magnetic pattern. Subsequently, several drilling targets were selected on magnetic lows and adjacent highs.

Cyprus obtained a commanding land position on the pediment by optioning 242 unpatented mining claims and 5 state leases from Su Can Ltd. on reasonable terms, by staking 205 unpatented claims adjacent to the Su Can ground, and by acquiring 2 state leases. An additional block of CCP claims was staked on a magnetic low south of Mammoth.

The prospect area is entirely covered by Plio - Pleistocene Gila conglomerate. A major northwest - trending Basin and Range type normal fault separates the Gila from mineralized Glory Hole volcanics and Copper Creek granodiorite (68 m.y.) as well as mid-Tertiary Galiuro Volcanics at Sombrero Butte.

Drill hole CCP-1 was placed within the magnetic low in section 19 to explore for a potentially altered and mineralized intrusive mass at depth or a displaced mineralized segment of the Copper Creek area. The hole intersected a complex sequence of rhyolite - latite flows and flow breccias, andesite flows, lithic tuffs and tuff breccias, and an intrusive rhyolite porphyry at the bottom of the rock column. All the rocks are part of the mid-Tertiary post-ore Galiuro Volcanic sequence. The 2500 foot section of volcanic rocks is considered to be the causative body for the magnetic anomaly. Drill holes CCP-2 and 4 were collared in magnetic lows and highs, respectively, and both bottomed in Gila conglomerate at 2000 feet. Drill hole CCP-3 is located on a positive magnetic anomaly and bottomed at

1694 feet in micaceous rhyolite tuff after penetrating 1428 feet of Gila conglomerate.

Drill hole CCP-6 is the only one intersecting oxidized and locally sericitized Glory Hole volcanics, averaging in part 16 ppm Cu and 3 ppm Mo. The hole was bottomed at 1196 feet in unmineralized Glory Hole volcanics.

A gravity traverse along the Copper Creek road strongly suggests the presence of high density bedrock segments in the vicinity of CCP-4 beneath the Gila conglomerate. The steep gravity gradients indicate rugged pre-Gila topographic relief, extensive block faulting, or a combination of both.

In view of the negative drilling results it is difficult to justify additional expenditures for a continuing deep drilling program on the pediment. The tested magnetic anomalies are not a reflection of buried mineralized and altered intrusive bodies, but reflect a thick accumulation of post-ore volcanic material. It is recommended that at the end of the agreement period, Cyprus terminates its option and that no further exploration work be carried out on the Su Can claim group.

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RESULTS OF DRILLING

Rotary drill hole CCP-1 is located on the Beth 29 claim near the center of section 19, T. 8 S., R. 18 E. at an elevation of 3,448.1'. The hole was placed near the middle of the magnetic anomaly about 1/2 mile south of the old Bear Creek drill hole. CCP-1 intersected Gila conglomerate to 845 feet, and then transected a complicated sequence of Galiuro volcanic rocks including latite tuff, welded and flow banded rhyolite, latite porphyry, andesite porphyry, a mixture of lithic tuff and sandstone blocks, and near the bottom an intrusive rhyolite porphyry. The hole was rotary drilled to 1,599 feet with spot coring from 1,120' to 1,125' and from 1,594 to 1,599'. Beyond 1,599' the hole was deepened to 3,398' with a conventional core drill (see summary log).

The drill hole intersected a total of 2,553' of post-ore Galiuro volcanic rocks widely exposed several miles to the southeast in the Galiuro Mountains. A large section of similarly flow banded and flow brecciated rhyolites and latites, as well as an intrusive rhyolite porphyry has been recognized by R. W. Thomssen in Kielberg Canyon 15 miles to the southeast during his Gold Mountain investigation in 1971 (R. W. Thomssen and K. Jones, 1971). The encountered section, however, bears very little resemblance to the well stratified, gently eastward dipping sequence of volcanic rocks mapped by Schmidt and Chapman at Sombrero Butte which is located only 3 miles east of CCP-1. Thus, it is evident, that the rocks encountered in CCP-1 do not simply represent a downfaulted segment of the Sombrero Butte section, but more likely indicate

the presence of a rhyolitic intrusive center. The steep flow banding in the densely welded rhyolite in the upper part of the volcanic sequence suggests that CCP-1 drilled through the flank of a volcanic dome. The presence of numerous diabase and quartzite inclusions and entire blocks of sandstone (Cretaceous Pinkard [?] Formation) measuring tens of feet in diameter in rhyolitic tuff suggest that either the Precambrian or some of the Cretaceous rocks do exist at some depth in the vicinity of CCP-1. According to R. W. Thomssen, the rhyolite porphyry near the bottom of the hole is certainly an intrusive rock causing some of the brecciation and disturbance recognized higher up in the drill hole. The overlying lithic tuff could represent a tuffisite mobilized by escaping gases during the intrusion of the rhyolite porphyry. In any event, the negative magnetic anomaly centered over CCP-1 in section 19 can adequately be explained by the presence of at least a 1/2 mile column of post-ore rhyolitic intrusive and extrusive volcanic rocks.

Rotary drill hole CCP-2 is located on the CCP 104 claim in the NW 1/4 Sec. 6, T. 9 S., R. 18 E. at an elevation of 2,994.2 feet. The hole bottomed at 1,980 feet still in Gila conglomerate after penetrating a sequence of interbedded conglomerate and sand. The numerous sandy layers encountered suggest that CCP-2 is located near the edge of the lacustrine basin in the deeper portion of the San Pedro graben (see geologic map). CCP-2 was located on a negative magnetic anomaly (so-called 2% area), however the absence of any bedrock at the bottom of the hole makes it difficult to interpret this anomalous feature.

In view of the drill results from CCP-2 it was decided not to test the magnetic anomaly south of Mammoth at this time, because the anomaly's position in the center of the San Pedro Valley suggested a depth to bedrock of at least several thousand feet. Subsequently, the group of CCP claims was abandoned.

Rotary drill hole CCP-3 is located on a narrow aeromagnetic high near the center of section 18, T. 8 S., R. 18 E. at an elevation of 3,739.8 feet. The hole collared in Gila conglomerate composed of a mixture of Galiuro and Glory Hole volcanic fragments. At 1,428' the hole intercepted light pinkish gray pumice tuff with small lithic fragments. From 1,590' to the bottom of the hole at 1,690' the rock is a dark yellow-brown micaceous rhyolite tuff with little free quartz. These tuff units are part of the Galiuro volcanic sequence.

A descriptive drill log of CCP-3 is given below:

<u>Interval</u>	<u>Footage</u>	<u>Rock Type</u>
1 - 1377'	1377'	Gila conglomerate; mixture of Galiuro and Glory Hole volcanics
1377 - 1408'	31'	Gila conglomerate; composed predominantly of dark brown micaceous latite tuff
1408 - 1420'	12'	Gila conglomerate; mainly Galiuro volcanic fragments
1420 - 1430'	10'	<u>Core Section:</u> 1420 - 1428 Gila conglomerate; up to 2" angular fragments of Galiuro and Glory Hole volcanics in sandy tuffaceous matrix; faint bedding at 1422' dips 20°
1430 - 1500'	70'	1428 - 1430' lithic pumice tuff and tuff breccia Light pinkish gray pumice tuff with small rock fragments
1500 - 1506'	6'	<u>Core Section:</u> light pinkish gray pumice tuff containing up to 1" pumice and small rhyolite fragments, tuff is cut by one 4 mm chalcedony veinlet, dip 75°

1506 - 1590'	84'	Light pinkish gray pumice tuff; becomes more reddish from 1550 to 1590'
1590 - 1665'	75'	Dark yellow brown micaceous latite tuff with golden biotite and little free quartz
1665 - 1690'	25'	No cuttings - lost complete circulation

Bottom of Hole

The micaceous latite tuff encountered near the bottom of CCP-3 is very similar in appearance to the micaceous tuff seen in CCP-1 just beneath the Gila conglomerate (see cross-section A-A'). The pink pumice tuff overlying the micaceous latite tuff in CCP-3 is, however, missing in CCP-1 and probably wedges out in that direction. It is uncertain whether an extensive rhyolite section similar to the one in CCP-1 underlies drill hole CCP-3. The lack of a distinct negative magnetite anomaly in the vicinity of CCP-3 seems to negate the presence of much rhyolitic material here.

Rotary drill hole CCP-4 is located in the NE 1/4 of section 13, T. 8 S., R. 17 E. near the Copper Creek road about 3/4 of a mile west of CCP-3 at an elevation of 3,684.9 feet. The hole started and bottomed in Gila conglomerate at a depth of 2,000 feet. The Gila conglomerate contains a high percentage of Glory Hole volcanic fragments especially in the last 1,000 feet of the hole. It is very likely that CCP-4 is situated on the hanging wall side of a north-trending normal fault which would account for the unsuspected increase in the thickness of Gila conglomerate between CCP-3 and CCP-4 (see cross-section B-B').

Rotary drill holes CCP-5, 7 and 8 were bored to validate exploration rights in 3 state sections. Drill hole CCP-5 is located in the SW 1/4 of Sec. 29, T. 8 S., R. 18 E. at an elevation of 3,667.1 feet along the Bunker

Hill road. The hole bottomed at 600 feet in Gila conglomerate and validates the state lease in the W 1/2 of Section 29.

Rotary drill hole CCP-7 is located in the SW 1/4 of Section 8, T. 8 S., R. 18 E. along the Copper Creek road at an elevation of 4,052.3 feet. The hole bottomed at 360 feet in Gila conglomerate and it validates the lease of the SW 1/4 in State Section 8.

Rotary drill hole CCP-8 is located in the NW 1/4 of Section 17, T. 8 S., R. 18 E. along the Copper Creek road at an elevation of 3,997.8 feet. The hole also bottomed at 360 feet in Gila conglomerate, and it validates the lease of the NW 1/4 in State Section 17.

Rotary drill hole CCP-6 is located near the eastern edge of Section 16, T. 8 S., R. 18 E. in Mulberry Wash below the Bunker Hill road at an elevation of 3,829.5 feet. The hole is positioned at the base of Sombrero Butte, and it is the only one that intersected a considerable section of Glory Hole volcanics (see summary log). CCP-6 was rotary drilled to 930 feet and then deepened with a core drill to 1,196'. The hole is situated on the hanging wall side of a major north-trending and westward dipping fault zone exposed about 500 feet up in the wash from CCP-6. The fault separates brecciated andesite porphyry (Galiuro volcanics) in the hanging wall from oxidized and iron stained Glory Hole volcanics in the footwall (see geologic sketch map). Drill hole CCP-6 collared in well-indurated Gila conglomerate but transected brecciated andesite from 125 to 183 feet before going into non-porphyrific olivine andesite. The latter is the basal unit of the Sombrero Butte volcanic section. At 735' the hole

entered oxidized Glory Hole volcanics consisting of a reddish brown andesite with abundant epidote along fractures and isolated blebs. The rock changes gradually into a latite agglomerate below 835' with moderate amounts of transported hematite on steep fractures. Sericitic alteration (bleaching) and considerable shearing is present between 1,088 and 1,147' before the rock changes into a very firm andesite porphyry without epidote and iron oxide. The hole bottomed in the unaltered andesite porphyry.

Drill cuttings from the lower 50 feet of the hole (Glory Hole volcanics) and a 5 foot core section were geochemically analyzed for copper and molybdenum. The core section (Glory Hole volcanics: 800 - 805') assayed 5 ppm Cu and 2 ppm Mo. The drill cuttings (880 - 930') average 16 ppm Cu and 3 ppm Mo except for one interval (910 - 915') which assayed 150 ppm Cu and 2 ppm Mo. The generally low values reflect complete oxidation of the rock. No assays are available from the cored interval (930 - 1,196').

GRAVITY SURVEY

During the second week of January 1973 Heinrichs Geosurveying Company of Tucson, Arizona completed a 7 mile gravity traverse along the Copper Creek road. The traverse started at River Road in the San Pedro Valley and ended in Glory Hole volcanic outcrop in section 9, T. 8 S., R. 18 E. It was the objective to decipher the subsurface bedrock configuration beneath the thick cover of Gila conglomerate in the vicinity of drill holes CCP-3 and 4 and to either side of them. A letter report by Heinrichs Geos. is attached.

The gravity profile clearly suggests that the pediment area is not underlain by a simple wedge-like body of Gila conglomerate thickening westward toward the main basin, but that the configuration of the subsurface is considerably complicated by faulting and pre (?) - Gila topography. The gravity low in the vicinity of drill hole CCP-3 reflects the deep cover of Gila conglomerate amounting to 1428 feet in CCP-3. The gravity high in the vicinity of CCP-4, however, is difficult to explain with respect to our drilling results. The hole bottomed at 2000 feet in Gila conglomerate which by itself should not give rise to such a gravity anomaly. The steep gravity gradient between holes 3 and 4 could well be a reflection of northwest-trending faulting, dropping the western side downward relative to the block containing hole CCP-3 as shown in cross-section B-B'.

The gravity highs around hole CCP-4 and to the west of it must reflect considerably denser material with respect to Gila conglomerate located north or south of the Copper Creek road or beneath the bottom of CCP-4. This denser material could be a series of rhyolite - andesite flows (Galiuro Volcanics) as exposed in Zapata Wash to the northwest (see geologic map). The pronounced gravity low at 12000 E appears to reflect the central portion of the San Pedro Valley (graben) filled with poorly indurated gypsiferous

sand and silt. Thus, the deepest portion of the Valley does not coincide with the course of the present San Pedro River which is over 2 miles to the west of the trough.

Whether the irregularity in the gravity profile is primarily due to extensive block faulting within the pediment or primarily due to pre-Gila topographic relief is difficult to determine. I suspect that a combination of both of these factors is the cause for the obtained data.

SECOND VERTICAL DERIVATIVE MAP

A second derivative map has been prepared from the original aeromagnetic data. In principle, the second derivative emphasises local anomalies and de-emphasises regional anomalies. Theoretically, it is a measure of the changes of magnetic gradients and the derived anomalies are coincident with the nonlinear part of the observed total field map. In essence, the second derivative should delineate the horizontal boundaries of the magnetic causative bodies much more effectively than does the total field magnetic map.

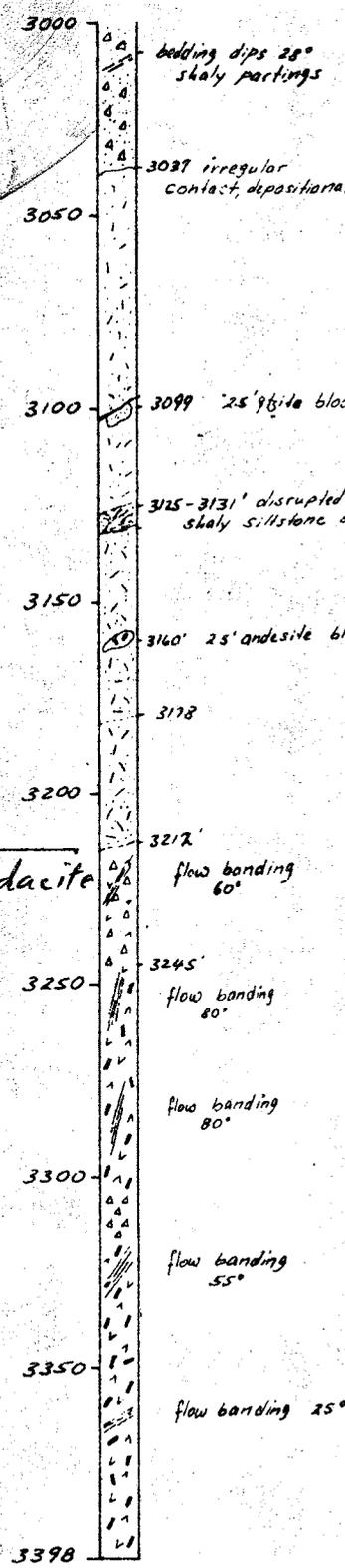
A comparison of the two maps, however, clearly shows that the strong negative anomaly in section 19 has been nearly obliterated on the second derivative map. The reason for this is presently not well understood. Several northwest-trending magnetic highs, however, are evident on the second derivative map, one of which coincides with the gravity high in the vicinity of CCP-4. This pattern suggests, that several elongated blocks of higher density and magnetite content relative to the Gila Conglomerate are present in the subsurface. These blocks may very well be displaced segments of Precambrian diabase or Pinal Schist which are extensively exposed several miles north in the Holy Joe Peak quadrangle.

Summary Log DDH CCP-1
Copper Creek Pediment Project
Pinal County, Arizona

Scale: 1" = 50'

Inclination: vertical

ERS 1/73
RWT 6/72



Lithic Tuff - to 3000'
similar to above, locally CaCO₃ in vts.
and matrix; andesite fragm. up to 1 ft.

Sandstone breccia - to 3037'
It brown to reddish tan w/ under fragm. below
3029'

Lithic Tuff - to 3178'
reddish brown, tuffaceous matrix,
strongly clay altered matrix;
fragm. mainly fine gr. porphyritic
andesite w/ few rounded quartz grains

Below 3099' - tuff contains 50% gts. -
sandstone - ferruginous siltstone
fragm. and 50% vesicular porphyr.
andesite & minor diabase fragm.
- few gts. mong. (Oracle granite &)
fragm.

Below 3155' - tan, welded sandstone
tuff fragm. increasing
some CaCO₃ in matrix
fragm. average 1 ft. diam.

Lithic Tuff (light brown) - to 3212'
clay altered tuffaceous matrix
mainly welded tuff & andesite porph.
fragments; few gts. and siltstone fragm.
reddish diabase throughout. 1/2" diam.

Rhyolite intrusive breccia - to 3245'
It pink gray, finely banded w/ sandstone,
gts., biotite and sphere phenocrysts,
contains lithic tuff fragm.

Below 3245' to bottom of hole
Rhyolite porphyry
It violet gray, finely banded, porphyritic,
w/ sandstone, gts., biotite, sphere phenocrysts,
few alt. diabase fragm.
phenocrysts increase in size and
amount downward
- general increase of dense Mn Ox
along open fract., locally also
replacing diabase fragm.

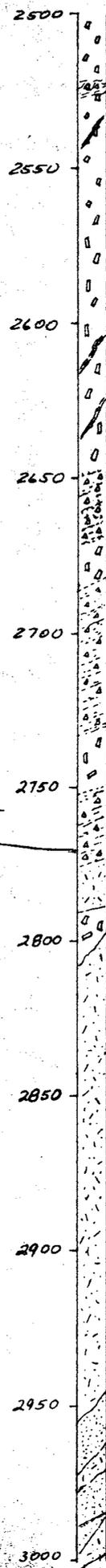
rhyolite-dacite

Apparently no fragments of Glory Hole volc. or schist
just Galileo Volc., diabase, quartzite, minor ls + Oracle Cr.?(Qm)

Summary Log DDH CCP-1
 Copper Creek Pediment Project
 Pinal County, Arizona

Sheet 6 of 7
 scale: 1" = 50'
 vertical
 EAS 4/72
 RWT 6/72

andesite
 vole agglom



Porphyritic andesite (?) -
 - about 50% vol. plagioclase (2-4mm) set in maroon-red matrix (oxidized);
 - abund. glassy olivine blebs (2-3mm), some hornblende
 ∴ lower andesite of Galileo volcanic sequence?
 slight increase in phenocryst size downward porphyritic andes. to 2647'
 rock contains abund. 18-14% CaCO₃ vhs., sharp

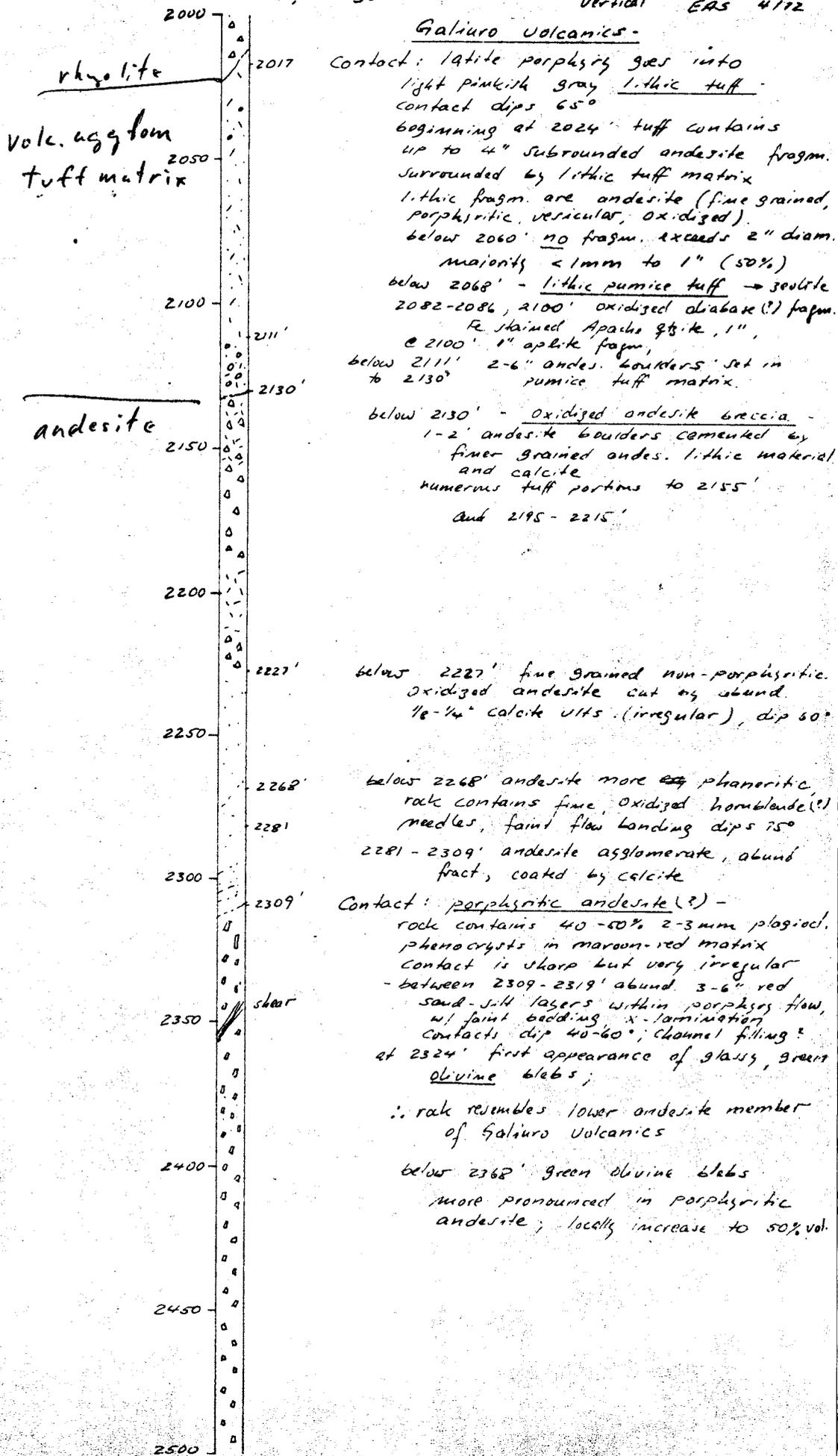
2521' Flow breccia
 2526'
 2538' 3" breccia dike w/ andes. & quartzite fragm.
 2610' 3" breccia dike w/ andes. porph. & quartzite fragm.
 2630' 6" breccia dike w/ andes. - quartzite fragm. up to 3" diam. sheared contacts
 2647' Andesite Flow Breccia - to 2668'
 red brown porphyritic andes. fragm. in andesite matrix
 2668'
 2682' Porphyritic andesite - to 2682'
 similar to above
 @ 2670' 2" fine grained breccia dike
 2700' Andesite Flow Breccia - to 2731'
 green gray to red brown andes. porph. fragm. set in lt. reddish brown andes. matrix
 - thin CaCO₃ coating on steep fract.
 2731'
 2748' Porphyritic andesite - to 2748'
 similar to above
 2773' Andesite Flow Breccia - to 2773'
 similar to above
 2787' Lithic tuff - to 2787' w/ andes. porph. and lt. gray welded tuff fragm. - few diabase - quartzite fragm. frags up to 2". sheared upper contact w/ pink zeolite
 2799.5' Porphyritic andesite w/ 1-3mm plag. + olivine phenos. to 2799.5'
 2850' Lithic pumice tuff - to 2950'
 lt. red brown to pink w/ +3" frags., later decrease to 0.5" below 2820'; pumice and few diabase, quartzite and limest. fragm. in fine tuff matrix. Abund. porph. andes. & latite fragm.
 - possibly intrusive upper contact!
 2888' fragm. - matrix ratio 3:1 below 2888'
 2900' fragm. size increases to ± 2" below 2913'
 2913' - mod. CaCO₃ on steep fract.
 2926' @ 2926' reduced to BX wire line
 2929-2935' CaCO₃ & quartz. cement fragments fragm. very fine from 2943' to contact
 2950' Contact: Lithic tuff - Sandstone (quartzite)
 dips 35°, irregular
 2965' } lithic tuff - sheared upper contact (58°), depositional (?) lower contact (shear)
 2971' }
 bedding 33°
 2991' } Sandstone - to 2991' - fine to med. gr. lt. brown to tan
 sheared contact 60° - little sericite after feldspar, minor Fe ox. brecciated toward bottom w/ reddish clay-sand matrix sheared; fine quartz on fract.
 - bedding 33° at bottom of unit.

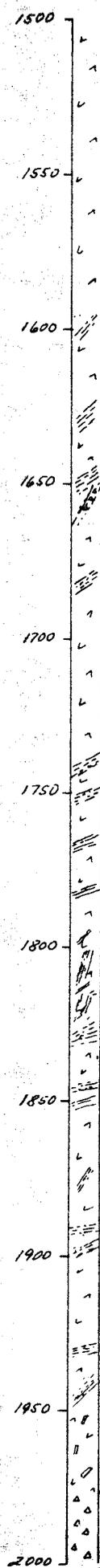
Summary LOG DDH CCP-1
Copper Creek Pediment Project
Pinal County, Arizona

Sheet 5 of 7

Scale: 1" = 50'

Vertical EAS 4172





Galuro Volcanics -
 pinkish gray to lavender gray
 welded rhyolite, rock is very
 firm

Note: below 1595' NX wire line core

purplish gray banded rhyolite
 rock is very firm containing 2-4mm
 sanidine phenocrysts;
 elongated vesicles are lined with
 euhedral quartz

Flow banding gradually flattens

2 ft. breccia zone; at 1595' - 45°
 w/ clay matrix " 1625' - 40°
 " 1680' - 30° ; flow banding
 is finer, intricate

1681-1711' strong fracturing
 w/ local brecciation, dip 75-85°

below 1665' 1-2% golden biotite in
 indiv. flakes

below 1711' rock firm again -
 contains abund. irregular
 gray chalcedonic layers

several fracture zones lined with
 euhedral quartz @ 1734-1756'
 1758-1766'
 1770-1776'

1795-1823' flow banding becomes very irregular
 and swirly, poorly defined, consists of
 broad irregular gray chalcedony bands
 - banding steepens locally to 75°

below 1823' flow banding regular again -
 flattening to 20° @ 1857'

below 1859' distinct flow banding diminishes,
 to 1870' broad chalcedony bands disappear,
 rock more porphyritic, 10-15% sanidine

1874-1885' fracture zone - 50% core recovery
 1892-1900' abund. MnOx in open fract. w/ Sb.
 rock firm, 10-15% sanidine, 1-2% biotite

distinct banding to 1947'

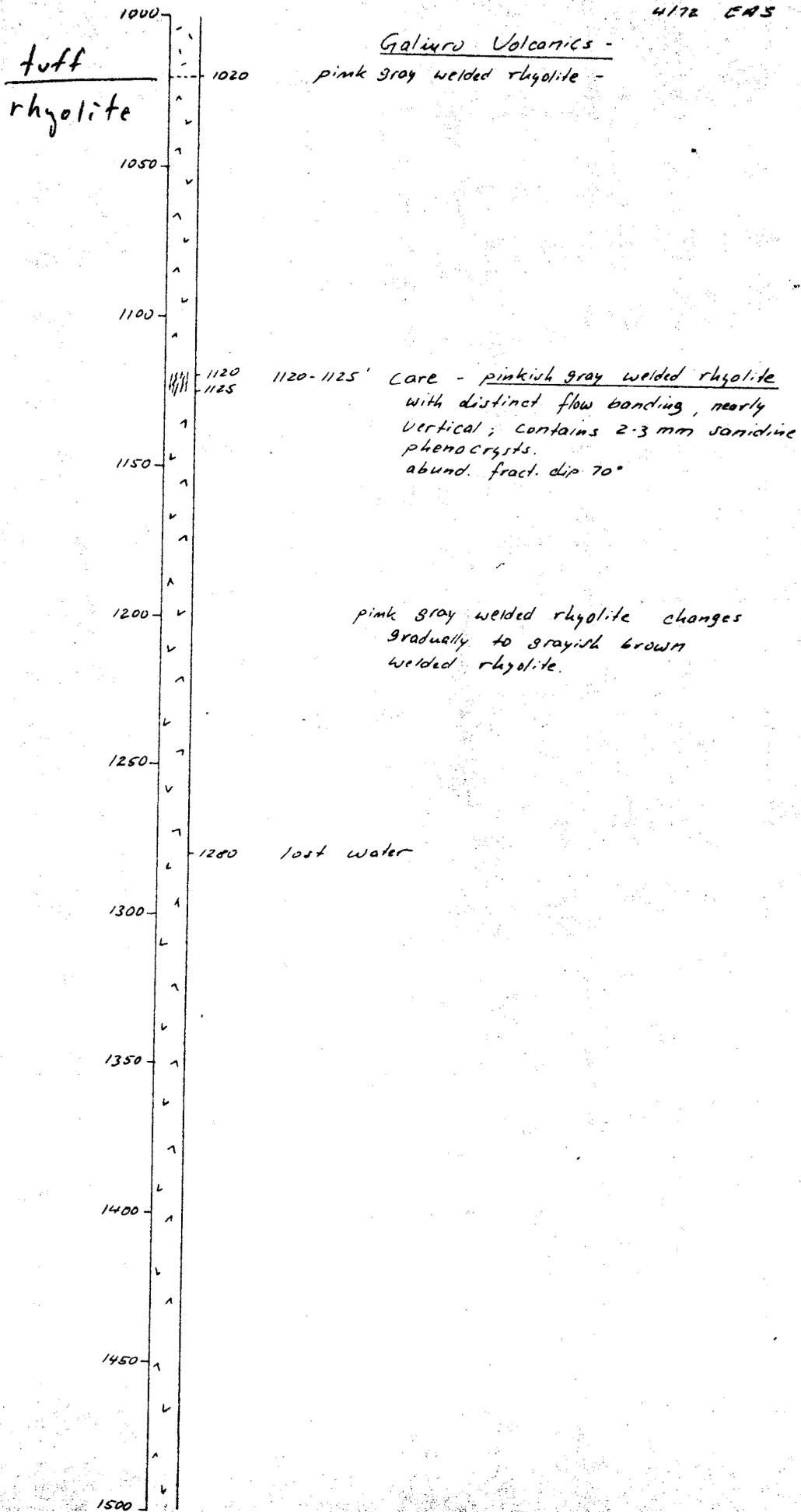
below 1947' rock porphyritic, 10-15% sanidine
 in red brown matrix, little biotite,
 no chalcedonic banding
 latite (?) porphyry

1977-2017' auto-brecciation with calcite
 1987-2004' steep fracturing last core

Summary Log DDH CCP-1
Copper Creek Pediment Project
Pinal Co, Arizona

Sheet 3 of 7
Scale: 1" = 50'

4172 EAS

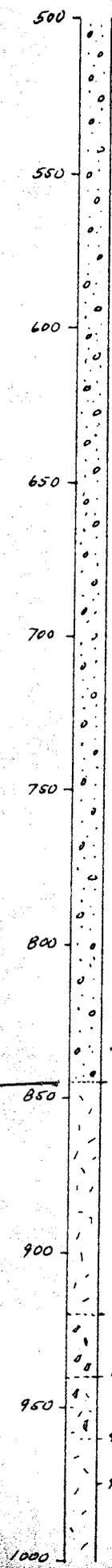


Summary Log DDH CCP-1
 Copper Creek Pediment Project
 Pinal Co., Arizona

Sheet 2 of 7

Scale: 1" = 50'

vertical 4126172 EAS



Gila Conglomerate -

same as above
 conglomerate continues to 845'
 at 845' get into Galiuro Volcanic
 sequence

Gila
 Tuff

Galiuro Volcanics -

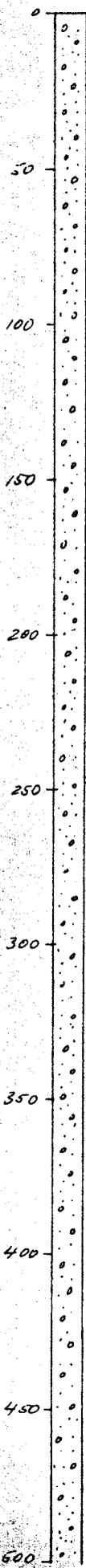
Latite
 (Rhyolite) tuff - yellow brown, soft
 contains abund. golden biotite
 cont. to 920'

- 920-940' brown to black vitrophyre, glassy matrix with few sanidine (?) crystals
- 940-960' vitrophyre - yellow brown tuff mixture
- 960-975' brick red rhyolite tuff with few vitrophyre fragm., soft.
- 975-1020' yellow gray rhyolite tuff with free quartz, some biotite

Summary Log DDH CCP-1
Copper Creek Pediment Project
Pinal County, Arizona

Sheet 1 of 7

Scale: 1" = 50'
vertical 4172 ERS



Note: Hole has been churndrilled to 1595' with spot core from 1120-1125'.

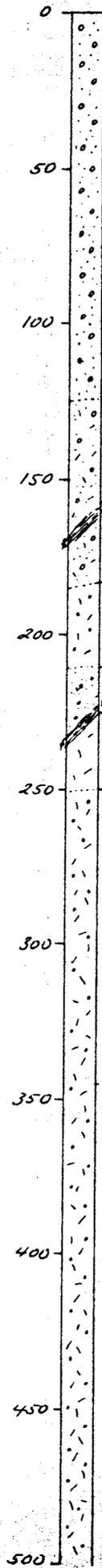
Gila Conglomerate -

very coarse unsorted cobble and boulder conglomerate containing predominantly Galiuro volcanic fragments and some Glory Hole volcanic fragments especially in the lower portion of the conglomerate sequence.

Summary Log DDH CCP-6
 Copper Creek Pediment Project
 Pinal County, Arizona

Scale: 1" = 50'
 Vertical

EAS 1173



Note: Hole has been Churndrilled
 from 0 - 930' with spot core
 from 800-805'.
 Diamond drilling proceeded from 930-1196'
 3" casing to 930'.

Gila Conglomerate 0-125'

very coarse, unsorted cobble and boulder
 conglomerate containing Galiuro and
 Glory Hole volcanic fragments.

Gila Conglomerate 125-183'

rich in dark reddish brown andesite fragments
 160-165' clay zone, Fault 2 - no cuttings

Galiuro Volcanics 183-735'

Olivine andesite, medium gray
 slightly magnetic

210-225' yellow brown tuff w/ vitrophyre fragm.

225-230' orange red tuff w/ abund. clay, Fault 2

230-250' oxidized andesite w/ few tuff fragm.

250-735' Olivine andesite -
 dark reddish brown to grayish brown
 appears oxidized;
 - below 345' abund. chalcidonic fragm.

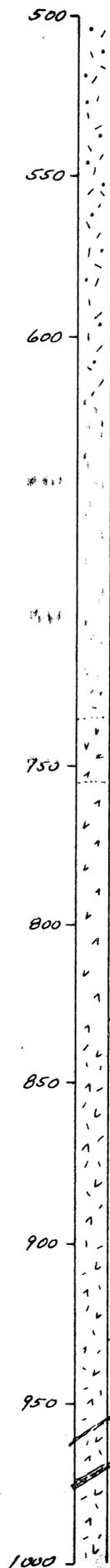
345' abund chalcidonic
 fragm. below 345'

Summary Log DDH CCP-6
Copper Creek Pediment Project
Pinal County, Arizona

Scale: 1" = 50'

Vertical

RWT 6/1972
EAS 1/1973



Olivine andesite - Galiuro Volcanics

dark reddish brown to grayish brown
predominantly oxidized

735' deep red oxidation of andesite
upper part of Glory Hole Volcanics?

below 755' Glory Hole Volcanics

oxidized, dense, fine grained andesite
with abund. epidote

800-805' spot core
reddish brown, fine grained andesite w/ abund. epidote
and red hematite along steep fract.
numerous dissem. epidote specks in rock
andesite is locally auto brecciated w/ calcite in matrix

835' No sulfides visible

below 835' - rock becomes grayish tan latite (?)
containing abund. epidote
rock appears fragmental w/ varicolored
chert (?) and siltst. fragm.

930 Latite agglomerate - grayish tan, firm, abund. andesite fragm. 1/4-1/2",
numerous epidote blebs replace l. thick fragm.
epid. disappears below 1000' w/ increase
in chlorite.

1" gouge, 20°

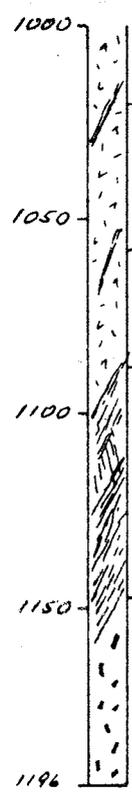
2" crushed zone, 25°

- mud amount exotic hematite on steep fract.
- rock is locally shattered & cemented by
CaCO₃ and FeOx

Summary Log DDH CCP-6
 Copper Creek Pediment Project
 Pinal County, Arizona

Scale: 1" = 50'
 Vertical

RWT 6/72
 EAS 1/73



Latite agglomerate - cont. to 1088'

1020' 2" shear zone
 80°

1058' 1" gouge zone, 85°

1088 - 1147' Sericitic latite agglomerate - lt. gray to yellow.

brown, generally sheared w/ clay and sericite,
 mod. Fe ox staining,
 fragments appear bleached, sericitized w/
 few limonite specks

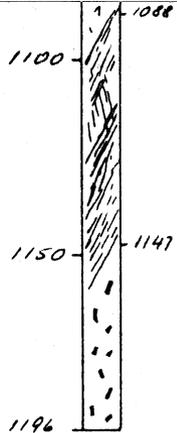
- upper contact is 1' clay gouge; rock below sheared,
 steep slickens. fract.

- lower contact sheared w/ 7/8" ss and

1147 - 1196' Andesite porphyry -

grayish green to reddish brown; flow breccia
 w/ increasing coarse porphyry;
 steep fract. lined w/ drusy qtz. and MnOx
 ≈ 3% white feldspar phenocrysts (2mm)
 in dk reddish brown matrix.

Bottom of hole



Bottom of hole

1088 - 1147'

Sericitic latite agglomerate - Lt. gray to yellow.

brown, generally sheared w/ clay and sericite,
mod. Fe ox staining,
fragments appear bleached, sericitized w/
few limonite specks

- upper contact is 1' clay gouge; rock below sheared,
steep slickens. fract.

- lower contact sheared w/ 1/4" gss vit

1147 - 1196'

Andesite porphyry -

grayish green to reddish brown; flow breccia
w/ increasing coarse porphyry;

steep fract. lined w/ drusy qtz and MnOx

≈ 3% white feldspar phenocrysts (2 mm)
in dk reddish brown matrix.

- track is locally shattered & cemented by $CaCO_3$ and $FeOx$
 - mud amount exotic hematite on steep fract. in chlorite.
 epid. disappears below 1000' w/ increase
 numerous epidote blebs replace lithic fragm.
 - grayish tan, firm, abund. andesite fragm. 1/4-1/2" latitic agglomerate

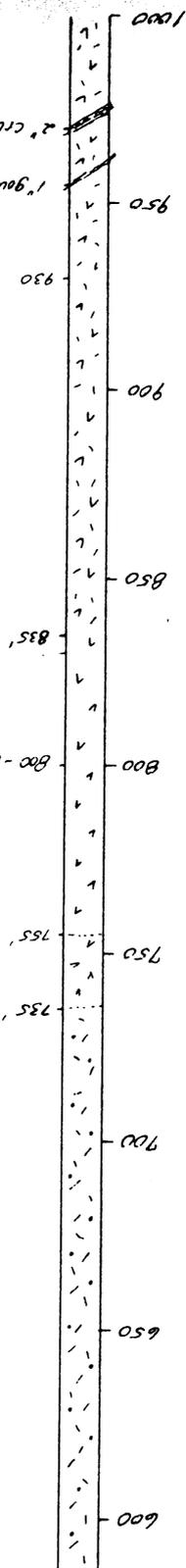
2" crushed zone, 25"
 1" gouge, 20"

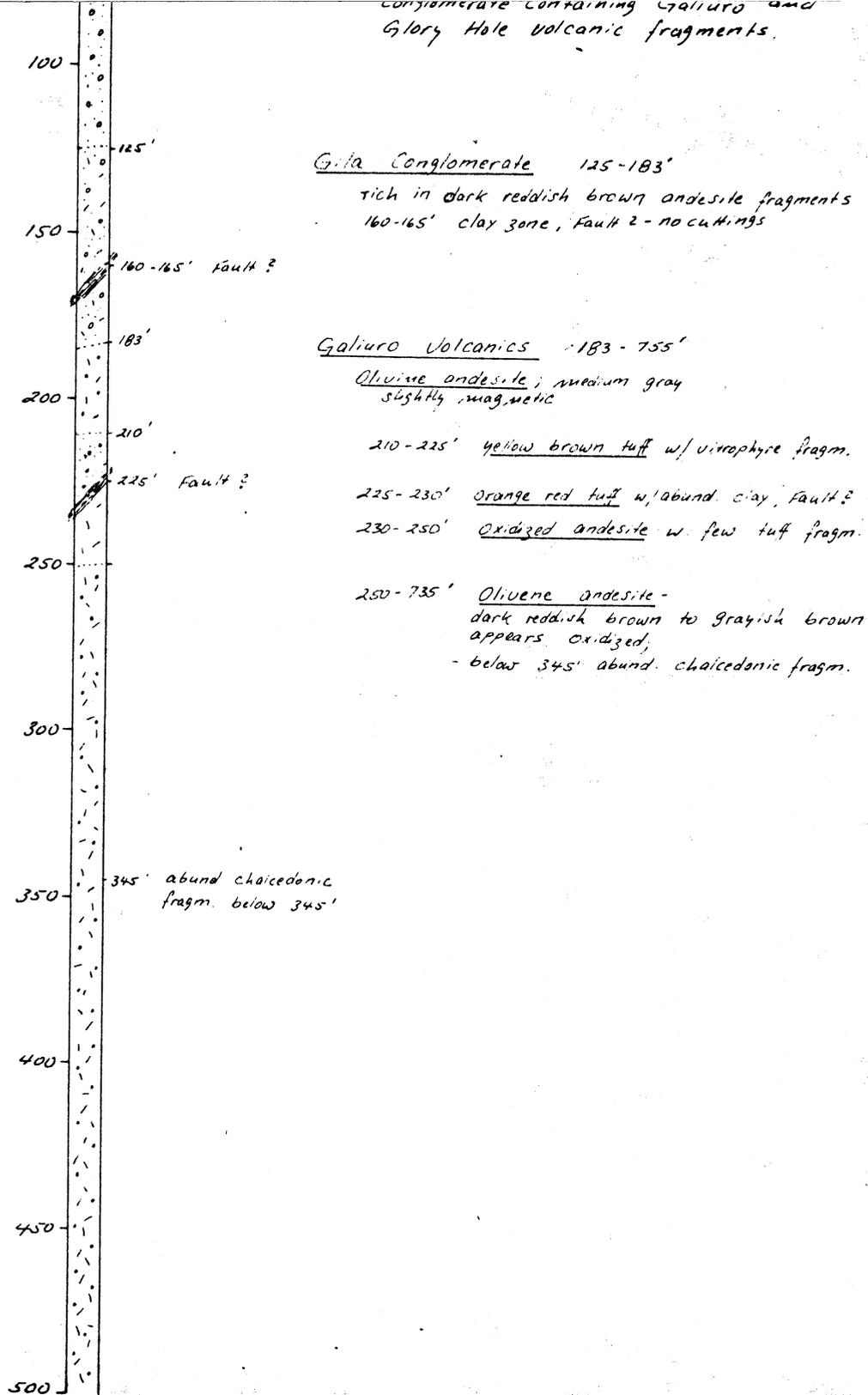
below 835' - rock becomes grayish tan latite (?) containing abundant epidote
 rock appears fragmental w/ varicolored chert (?) and vitric fragm.

No scuffs visible
 andesite is locally auto-brecciated w/ calcite in matrix
 numerous dissem. epidote specks in rock and red hematite along steep fract.
 reddish brown, fine grained andesite w/ abund. epidote spot core

below 755' Glory Hole L'volcanics
 oxidized, dense, fine grained andesite with abund. epidote

deep red oxidation of andesite
 upper part of Glory Hole volcanics?





MODERATE TO STRONG
NOT MAGNETIC-FRESH BELOW 2528 - WEAKLY MAGNETIC
ONLY TRACES OF DISSEMINATED PYRITE - NARROW
BARREN APLITE - 2519 - 2523

FRESH PRECAMBRIAN GRANITE WITH ONLY NARROW
ZONES OF MODERATE TO WEAK CLAY ALTERATION
STRONGLY MAGNETIC - PYRITE VERY RARE.

X
X
TOTAL DEPTH 2680'

2500

15-2

2600

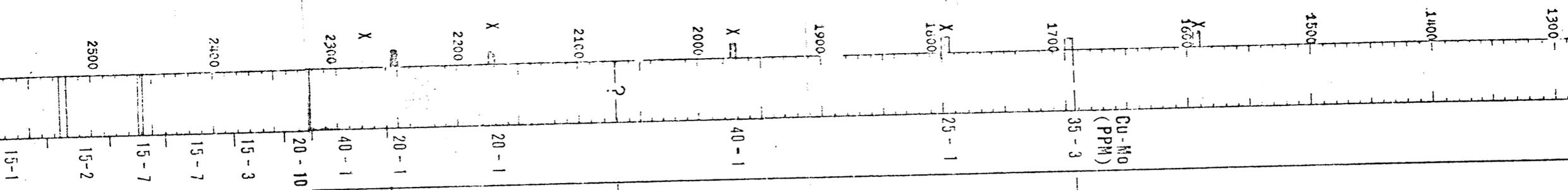
15-1

25-1

20-1

2700

2800



Cu-Mo
(PPM)

PRECAMBRIAN GRANITE AS ABOVE
SHEARED WITH SHEAR PLANES 50°-80°
TO AXIS OF CORE. SHEARING MOST
INTENSE IN CORE RUN 1797-1802'
PLAGIOCLASE AND BIOTITE ALTERED
TO GREEN CLAY AND CHLORITE.

CONTACT BETWEEN GRANITE AND ANDESITE
PORPHYRY NOT KNOWN ACCURATELY BECAUSE
DRILL CUTTINGS HEAVILY CONTAMINATED
BY MATERIAL UP THE HOLE.

ANDESITE PORPHYRY -
CONTAINS 20% PLAGIOCLASE PHENOCRYSTS
UP TO 5mm ALTERED TO CLAY AND 5-10%
BIOTITE PHENOCRYSTS UP TO 2mm ALTERED
TO CHLORITE IN A GREY APHANITIC
GROUNDMASS

END OF ROTARY DRILLING
NX WIRELINE SKILLING
ANDESITE PORPHYRY AS ABOVE
TRACE AMOUNTS OF FINE PYRITE AND
RARE BARITE DOLOMITE VEINS

PRECAMBRIAN GRANITE COARSE-GRAINED
CONTACT CORE ANGLE-21°
PLAGIOCLASE WEAKLY ALTERED TO CLAY
TO 2342 - FRESH BELOW THAT STRONGLY MAGNETIC
VERY RARE FINE PYRITE IN SERICITE-LINED
FRACTURES AND AS RARE DISSEMINATIONS
NARROW BARREN APLITE DIKE - 2454 - 2461
TWO 1/4 PYRITE STRINGERS - 2483
MODERATE TO STRONG CLAY ALTERATION 2500-2528 -
NOT MAGNETIC-FRESH BELOW 2528 - WEAKLY MAGNETIC
ONLY TRACES OF DISSEMINATED PYRITE - NARROW
BARREN APLITE - 2519 - 2523

FRESH PRECAMBRIAN GRANITE WITH ONLY NARROW
ZONES OF MODERATE TO WEAK CLAY ALTERATION

X

X

X

X

X

X

X

X

15-7

15-3

20-10

40-1

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20-1

40-1

25-1

35-3

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25-1

PROJECT CODE NO. MAHJ07H 06-01-0333
 STATE ARIZONA COUNTY PINAL
 T 0 S R 17 E S1CT 29

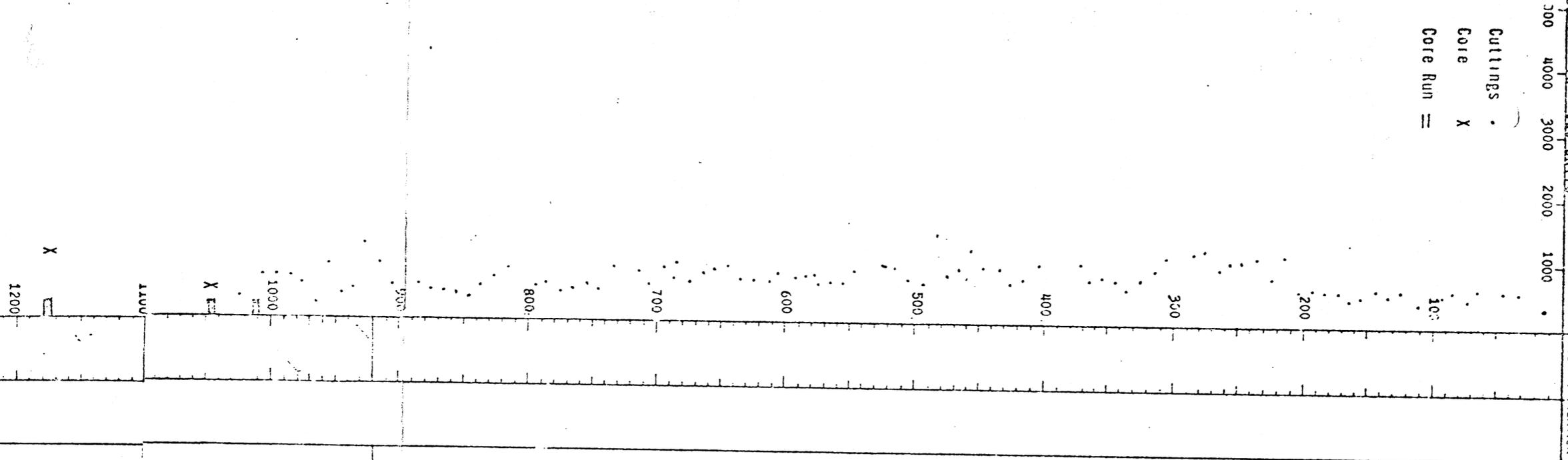
COORDINATES:

STARTED JULY 11, 1964
 COMPLETED OCTOBER 10, 1968
 COLLAR ELEV. 2440
 TYPE(S) OF DRILLING MUD ROTARY W. SPOT CORES
 TO 2255' NWL 2255' - 2680'
 TOTAL DEPTH 2680'
 LOGGED BY

MAGNETIC SUSCEPTIBILITY
 10-6 CGS UNITS

ROCK TYPE MINERAL
 SECTION 12A110N

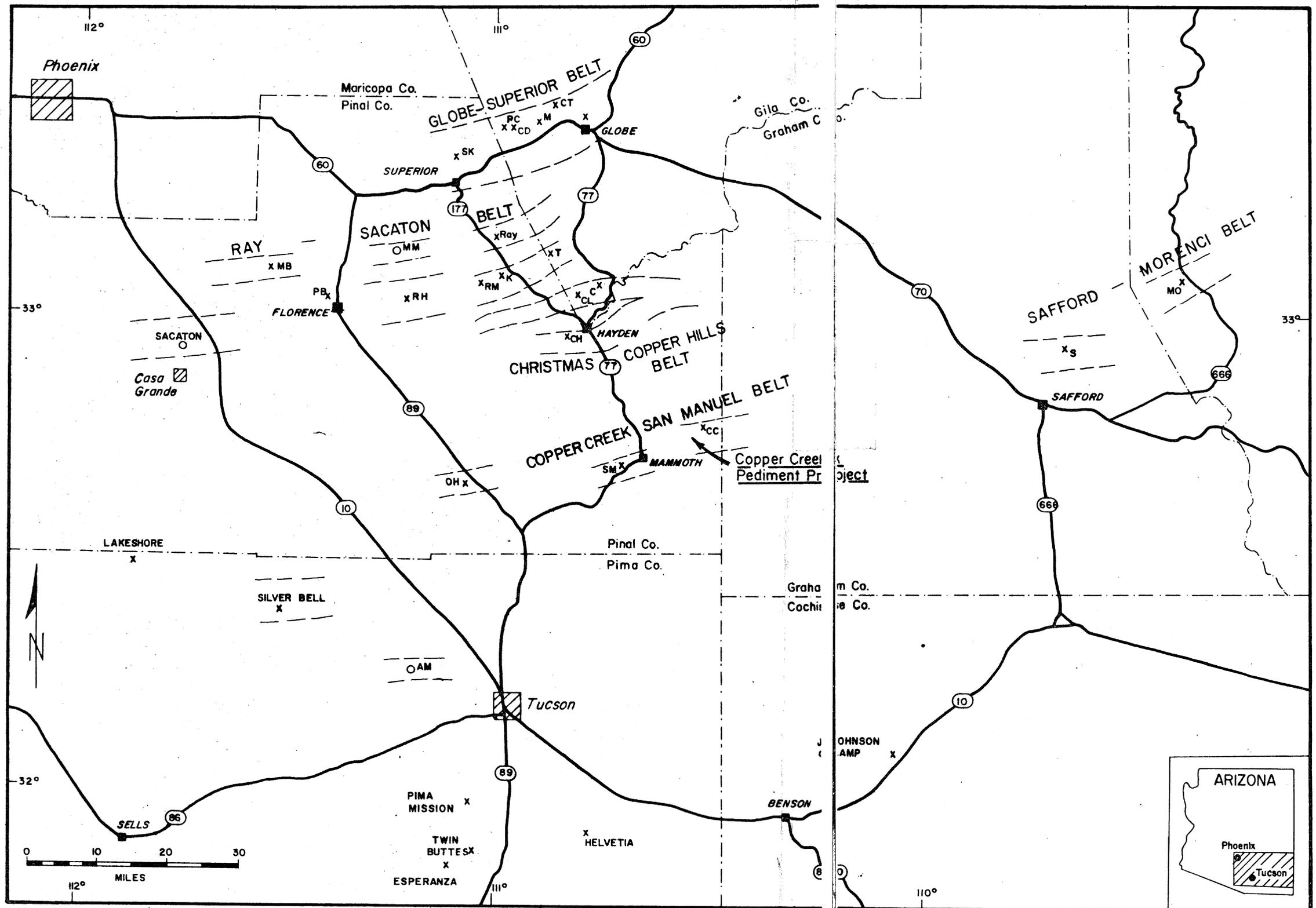
Cuttings .
 Core X
 Core Run =



UNCONSOLIDATED GRAVEL

DECOMPOSED PRECAMBRIAN GRANITE
 -OR GRANITE WASH

UNALTERED PRECAMBRIAN GRANITE
 COARSE-GRAINED WITH LARGE (2 cms)
 PINK ORTHOCLASE PHENOCRYSTS, WHITE
 PLAGIOCLASE CLEAR QUARTZ, AND BLACK
 BIOTITE



- | | | | | |
|-------------------|--------------------|-------------------------|-------------------|-----------------------------|
| AM - Amole | CH - Copper Hills | M - Miami - Inspiration | OH - Owl Head | RM - Rare Metals |
| C - Christmas | CL - Chilito | MB - Mineral Butte | PC - Pinto Creek | S - Safford |
| CC - Copper Creek | CT - Copper Cities | MM - Mineral Mountain | PB - Posten Butte | SK - Silver King |
| CD - Castle Dome | K - Kelvin | MO - Morenci | RH - Red Hills | SM - San Manuel / Kalamazoo |
| | | | | T - Troy |

EAS 1/73

Figure 1 Location of Copper Creek Pediment Project in relation to major mining districts in Southeast Arizona