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The Eagle Pass detachment, southeastern Arizona: Product of mid-Miocene listric(?) normal faulting in the southern Basin and Range

Geological Society of America Bulletin, Part I, v. 92, p. 749–762, 14 figs., 1 table, October 1981.

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MEMORANDUM

To: Clancy Wendt

From: Will Wilkinson

Date: April 28, 1986

Subject: Monthly Report - April 1986

GENERAL

I spent one day with Joe Kapler looking at AESOP Enterprises' Blue Jay prospect in Graham Co., Arizona. This prospect was presented as a stacked series of low angle, gold-bearing mylonite zones in the footwall of a regional thrust fault. Mineralization consists of copper (chalcopyrite and copper oxides) and gold (free) in shattered, locally brecciated Precambrian quartz monzonite. The mineralized zones are spotty and discontinuous along strike of the low angle fault. AESOP Enterprises has only taken 32 samples along the 4 miles of strike length they have claimed with gold values up to 9.70 ppm. The area with the highest values and most extensive alteration occurs within a contested claim group.

My visit to the property prompted a different interpretation from that originally presented. Mineralization and alteration are restricted to the immediate footwall of the low angle fault. Shattering and brecciation decrease dramatically into the footwall of the structure. The shattered zones are chloritically altered. Hanging wall rocks are rotated, Tertiary fanglomerates and volcanic rocks. The low angle structure is a classic detachment fault with some alteration and mineralization localized along it. Further literature search indicated this structure has been mapped as the Eagle Pass detachment fault.

No detailed geology or geochem have been conducted on the property but reconnaissance surveys indicate gold is present. The major drawback is the contested nature of a portion of the claim block. There is some potential on the property and, if time permits, we should look at it as a low priority target.

CALIFORNIA

Riverside County

RP Project - Two trips were made to RP this month. The first was to check the proposed drill sites and to make sure that the track-mounted drill rig would reach each site. Such a rig should have no problem reaching each of the drill sites.

While on this trip, we learned that the BLM had denied our Plan of Operation. After many phone calls and five days of trying, I finally reached Leslie Cone, Area Manager for the Indio Resource Area. The main reason the Plan was denied was because we had been in noncompliance with our previous Plans with regard to reclamation since September 1985. However, the BLM had failed to notify us and nothing was mentioned regarding our noncompliance in the BLM's reply to our Plan of Operation.

Upon talking to Ms. Cone, it was decided that if we completed the reclamation to their satisfaction, she would review the earlier decision. I met with Bob O'Brien, Wilderness Specialist; Fred Schuster, Geologist; and Rob Waywood, District Minerals Officer on 22 April at RP. Two specific areas were targeted for reclamation. Bob O'Brien will inspect these on 29 April and report to Leslie Cone. They will reach a new decision regarding our Plan of Operation on 30 April or 1 May.

The two areas specified were reclaimed during the week of 21 April. All other areas from our previous drill programs were also reclaimed with the help of Mike Dennis. No reclamation has been attempted on the main access trail to the copper prospect because we plan to utilize it again shortly.

At this point, I am not sure what is going to happen. I have talked to Lance Eklund, Eklund Drilling Co, and told him of our situation. We will still be able to get the track-mounted rig if the problem is resolved in a timely manner. If not we may have to wait awhile. Based on this latter contingency, I asked the State BLM Office for a deferrment of assessment work should we not be able to complete our drilling by 31 August 1986.

NEVADA

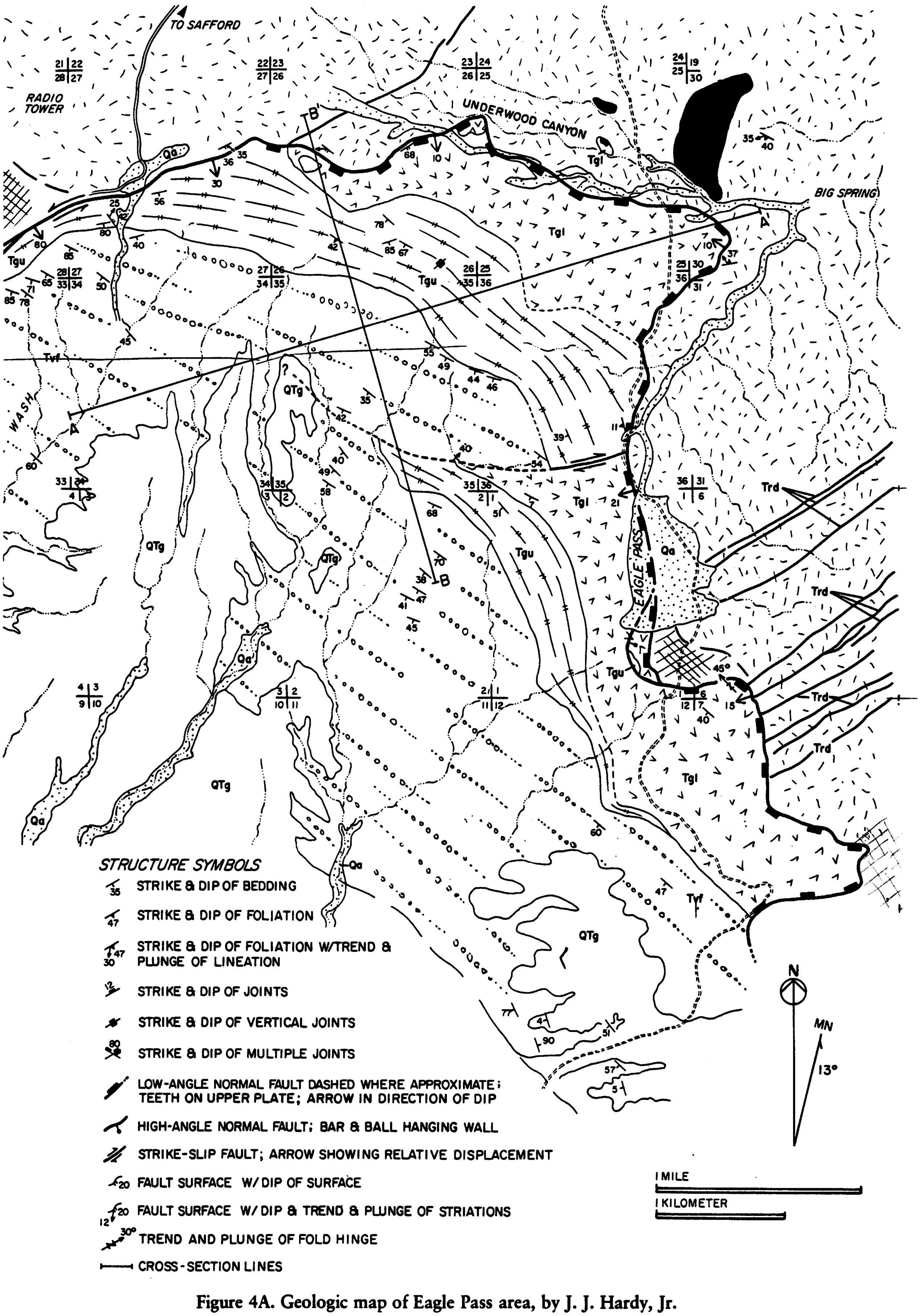
White Pine County

Mt. Hamilton Project - The Mt. Hamilton 1985 project report was completed and mailed out. Mike Dennis has been able to spend a few days mapping on Mt. Hamilton while dodging snow storms. A budget of $258,000.00 for 1986 work was prepared and submitted to Paul Taylor.

While moving out of the office on Aultman, many boxes of rotary cuttings were discovered buried under junk. In our previous program of sampling drill holes, many holes were reported as having no material to sample and assay. From these newly located boxes, Mike Dennis retrieved 625 samples from 10 holes of interest. Eight of these were from the West "Ore" zone area. Overall, the assay results are disappointing. One hole, PH-40, contained 15 feet of 0.039 opt gold from 180 to 195 feet. These results substantiated the projected limits of the West "Ore" zone area but did not diminish the limits.

FUTURE PLANS

I will continue to monitor the progress of our Plan of Operation for RP with the BLM. With some measure of luck, we may be able to begin drilling by the end of May. I plan to spend the first week in May mapping at RP.



North Anomaly

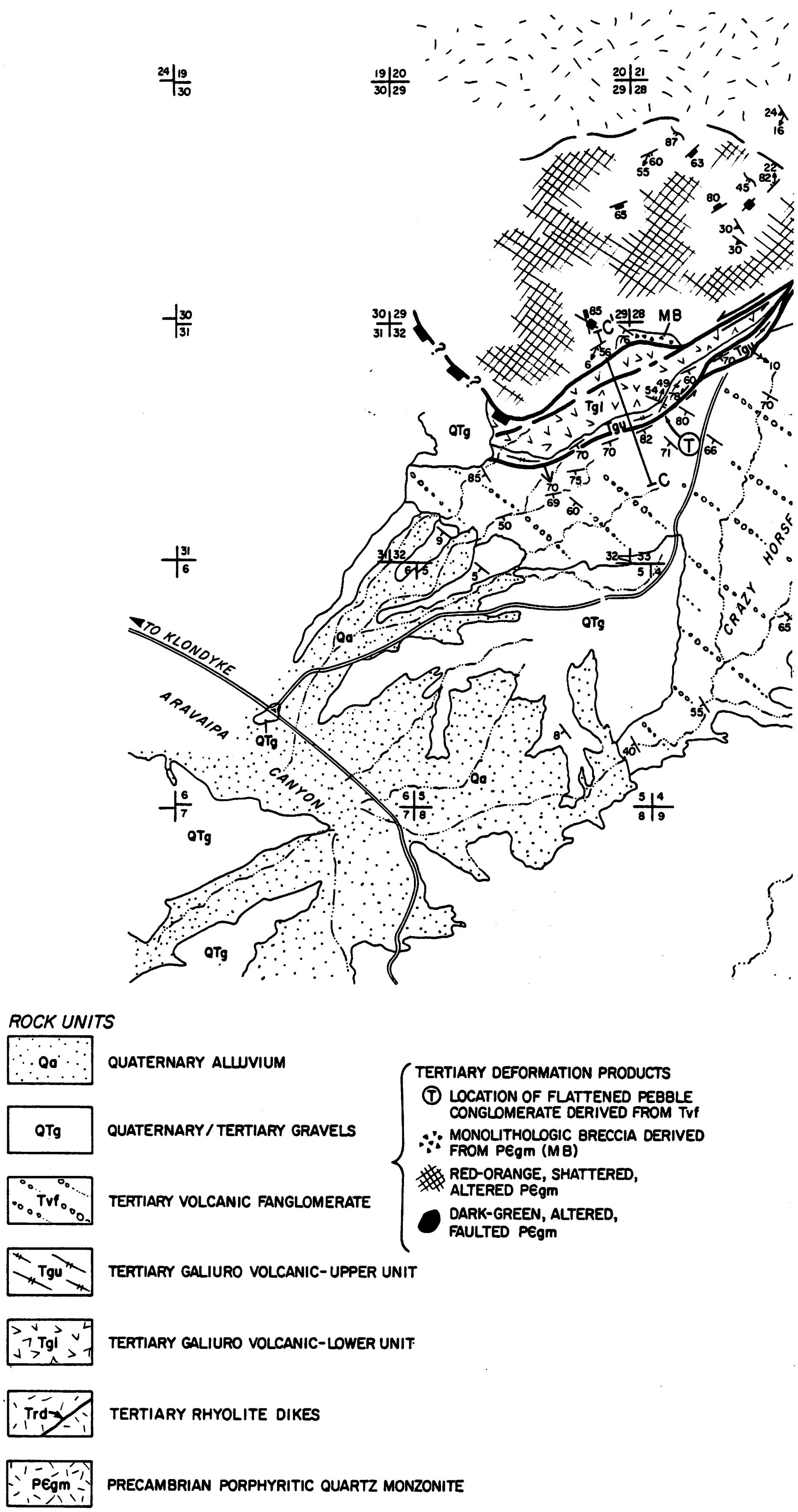
Figure 4A. Geologic map of Eagle Pass area, by J. J. Hardy, Jr.

ding surfaces in rhyolite (Fig. 10). The rhyolite forms a wall of steeply dipping strata which were dragged into parallelism with the quartz monzonite along this steeply dipping segment of the detachment fault (see Figs. 4, 5, 11). The andesite, a much weaker rock than the rhyolite, was severely attenuated within this zone and is generally absent. Where it does crop out, exposures are poor and striae are not generally evident. The more competent rhyolite is pervaded by small, conjugate, strike-slip faults which disclose flattening perpendicular to the northeast line of strike.

Nowhere along the northwest tear-fault boundary of the detachment do the volcanic units display the N50°W strike typical of the majority of the detached rocks. The volcanic rocks are dragged and smeared out against the footwall quartz monzonite along the fault. In contrast, the fanglomerate maintains a N50°W strike until within tens of metres of the tear-fault boundary. At that point, the layers are dragged abruptly westward, and/or the rock is transformed to flattened-pebble conglomerate by shear movements along very closely spaced faults, including microfaults (Fig. 12). The drag effects clearly reveal left slip of the detachment along the fault interface. The development of stretched-pebble conglomerate at the expense of ±20-m.y.-old fanglomerate containing competent rhyolite clasts is surprising. The zones of simple shear are as much as 10 m wide and are separated by intervening zones of approximately the same width where the fanglomerate is highly faulted and fractured, but not penetratively deformed. The "tectonite fabric" must have formed under dry, cool, relatively shallow conditions of deformation. The strain characteristics of the simple-shear zones are indentical to those discussed by Ramsay and Graham (1976). Movement of the fanglomerate detachment strata northeastward along the footwall of quartz monzonite must have been met by substantial frictional resistance to movement.

Another slip-line indicator is a single asymmetrical overturned fold, 2 m in amplitude, in highly deformed andesite just a metre above the Eagle Pass fault in the southeast corner of the map area. The fold trends N40°W and is clearly overturned northeastward.

One of the most peculiar structural relationships along the tear-fault boundary is the presence of a stratified monolithologic breccia which is sandwiched between the highly fractured to shattered quartz-



BLUE JAY PROSPECT

Graham County, Arizona

AESOP Enterprises, Inc.
and
Ruffin I. Rackley

February 1, 1986

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Summary Report - Blue Jay Prospect

SUMMARY REPORT, BLUE JAY PROSPECT

Location: The prospect is located in Graham County, Arizona, on the west flank of the Piñaleno Mountains. Access is via gravel roads leading north from Willcox or southwest from Safford.

General geology: The mineralization exposed is hosted by Precambrian granitic rocks and andesite dikes that cut the Precambrian. These have been mapped as younger than the more gneissose rocks that comprise the bulk of the Graham mountains to the east. The age of the andesite dikes is uncertain, but lack of fabric and of recrystallization indicate post-Precambrian age at least. There are also a few examples of andesitic dikes of probable Precambrian age within the granitic host. Still more numerous are dikes of granophyric and andesitic composition that are post-mineral and cut the host rocks in swarms of northeasterly trend. A few late dikes also course in a north-south direction.

The synmetamorphic fabric developed in Precambrian time is faint, and usally discernible only in outcrop, not under the microscope. Superimposed upon this is heavy shearing (locally mylonitization) that occurred under light load as evidenced by lack of flow recrystallization of the fabric. The plane of shearing is undulatory but is relatively flat-lying, appearing in places to dip more steeply to the east, especially in the eastern side of the area. The structure may bifurcate, both along strike and down dip, leaving crackled lenses of granitic host rocks between separated strands.

The morphology of the structure suggests exposure of the top of a major structural zone. The shear zone/mylonite that is host to ore is believed to be the uppermost in a stack of mylonites of sub-regional extent, though the evidence to this effect is slight. A sample of a post mineral dike was found to contain a xenolith of mylonitized granite hosting sulfides in a biotite-stable alteration assemblage.

To the west, the host rocks and the structure are cut off by a low angle post-mineral fault that dips gently to the west. This fault is younger than the structure that is host to mineralization. The rocks in its hanging wall are Galiuro volcanics and fanglomerates of Tertiary age. The fault follows crushed dikes in its footwall suggesting that, at least in part, it follows an older zone of weakness in the Precambrian rocks.

Mineralization/alteration: The type of metallization present is Au-Ag in association with considerable copper. Native gold of both hypogene and supergene age has been found at one prospect, and stromeyerite has been seen in other samples taken to the south. Chalcopyrite was the chief sulfide present originally, with pyrite seen in lesser amount. Relict chalcopyrite is rare.

Most has oxidized to chalcocite and covellite, further to malachite, chrysocolla, and iron oxides.

Alteration associated with primary sulfide mineralization is in the assemblage quartz-calcite-sericite-chlorite-hematite. Chlorite, developed in the rocks during retrograde metamorphism, remains stable as well, and is frequently the "lubricant" in the rocks where they have been sheared prior to alteration.

The mineralization occurs as disseminations in sheared and crushed rocks, and as extensional fracture fillings.

Geochemical analyses of samples show anomalies for Au, Ag, and Cu without any other elements present. Absent are Pb, Zn, Se, Te, As, Sb, Bi, Mo. Appreciable W was found at one prospect, but it occurrs in Mn oxides and is of uncertain significance.

Conclusions: The geochemical signature and structural setting of the prospect show similarity to other prospects and developing mines in western Arizona and southern California, though this appears to be the easternmost known example at present. In addition, there are indications that the prospect may not be unique within the general area, but rather that it represents one occurrence within a possible district of considerably greater extent.

Sample Summary

Sample Summary

Sample No.	Geochem Analysis	Thin Section Analysis	Remarks

North Anomaly

BJ-1 X X Dump sample from large shaft, taken from west flank of dump, consisting of oxidized sulfide fracture fillings. Native gold was observed. Assays 93.7 ppm gold and 22 ppm silver. BSE image photographs 004 and 005. Photomicrograph 14.

BJ-3 X Outcrop sample of andesite dike taken from north-south drainage west of shaft, andesite dike cross-cutting quartz monzonite; both appear to be sheared.

BJ-4 X Outcrop sample of upper plate andesite lava flow and flow breccias.

BJ-6 X Dump sample from large shaft. Sample consists of andesite dike? material.

BJ-7 X Outcrop sample of quartz monzonite granophyre dike. Dike cross-cuts the mineralized and mylonitized quartz monzonite. Dike shows no alteration, mineralization or structural deformation.

BJ-8 X Outcrop sample from cut north-northeast of steam shovel. Sample consists of oxidized sulfide fracture fillings in shattered quartz monzonite showing abundant chalcocite and covellite. Assays .07 ppm gold. Photomicrograph 21.

BJ-9 X Outcrop sample of fault gouge taken from east-west drainage north-northwest of steam shovel. Gouge consists of andesite (upper plate, eg. BJ-4) and rounded fragments of mineralized and mylonitized quartz monzonite. Upper plate rocks show no alteration or mineralization.

BJQ-2 X Dump sample from large shaft. Sample taken from "ore pile" beneath tree. Assays greater than 10 ppm gold.

BJQ-2a X Dump sample from large shaft. Sample consists of oxidized sulfide fracture fillings in shattered and sheared quartz monzonite. Assays 7.8 ppm gold.

BJQ-3 X Dump sample from prospect pit. Quartz vein material showing galena. Assays 2.8 ppm gold and 80 ppm silver. BSE image photograph 001.

BJQ-4 X Outcrop sample from trench located on northeastern edge of area. Sample consists of oxidized sulfide fracture fillings in shattered and sheared quartz monzonite. Assays 39 ppm silver.

BJQ-5 X Outcrop sample from trench and shaft east-northeast of cut near the steam shovel. Sample consists of oxidized sulfide fracture fillings in shattered and sheared quartz monzonite. Shows abundant chalcocite and covellite. Assays 38 ppm silver. BSE image photographs 002 and 003.

BJQ-6 X X Outcrop sample from cut north-northeast of steam shovel. Sample consists of oxidized sulfide fracture fillings in shattered sheared quartz monzonite. Shows chalcocite and covellite. Thin section of cross-cutting dacite dike. Dike shows no alteration, mineralization, or structural deformation. Assays 9 ppm silver.

B-5 X Dump sample of andesite dike? material from large shaft. Photomicrograph 5.

B-6 X Outcrop sample from east-west drainage north-northwest of steam shovel. Sample consists of mylonitized quartz monzonite.

Middle Anomaly

BJ-14 X Dump sample from shaft; taken from western flank of dump. Sample consists of andesite dike? material. Photomicrographs 15, 19 and 20.

BJ-15 X Outcrop sample from east-west cut. Sample consists of oxidized sulfide fracture fillings in shattered and sheared quartz monzonite. Photomicrographs 25 and 26.

BJ-18 X X Outcrop sample of barite vein in upper plate fanglomerates. Barite shows descloizite and relect galena

BJQ-1 X Dump sample from the vicinity of the shaft and north-south cut. Sample consists of oxidized fracture fillings in shattered and sheared quartz monzonite. Assays .08 ppm Au.

BJQ-1a X Outcrop sample from

north-south cut east of shaft. Sample consists of oxidized sulfide fracture fillings in mylonitized andesite dike. Photomicrograph 22.

BJQ-7 X Dump sample from the vicinity of the shaft and north-south cut. Sample consists of oxidized sulfide fracture fillings. Assays .03 ppm gold and 16 ppm silver.

BJQ-8 X Outcrop sample from east-west cut. Sample consits of oxidized sulfide fracture filling in shattered and sheared quartz monzonite. An oriented thin section shows the plane of shearing close to horizontal. Photomicrograph 24.

BJQ-18 X Dump sample from prospect pit; the most easterly of the three. Sample consists of oxidized sulfide fracture fillings in shattered quartz monzonite. Assays 20 ppm silver.

BJQ-19 X Dump sample from prospect pit; the middle pit of three. Sample consists of oxidized sulfide fracture fillings in shattered and sheared quartz monzonite. Assays .05 ppm gold and 123 ppm silver.

BJQ-20 X X Dump sample from prospect pit; the westerly most of three. Sample consists of oxidized sulfide fracture fillings in shattered and shseared quartz monzonite. Thin section of andesite dike cutting quartz monzonite; both showing mylonitization. Oriented thin section shows the plane of shearing near horizontal. Assays 117 ppm silver.

B-1 X Outcrop sample. Sample consists sheared quartz monzonite. Photomicrograph 1.

B-2 X Outcrop sample from east-west cut. Sample consists of andesite dike cutting quartz monzonite; both showing mylonitization. Photomicrogrph 2.

B-3 X Outcrop sample from prospect pit; the westerly most of three. Sample consists of andesite dike cuttting quartz monzonite; both showing mylonitization. Photomicrograph 4.

Southern Anomaly

BJ-20 X Outcrop sample of footwall granodiorite dike? in quartz monzonite from trench exposing low angle fault contact. Upper plate andesites lavas flows and lava flow breccias show no alteration, mineralization, or structural deformation.

BJ-22 X Outcrop from drainage below trench. Sample consists of shattered and sheared quartz monzonite showing oxidized sulfide fracture fillings and disseminations. Photomicrograph 16.

BJ-23 X Outcrop sample of andesite dike cutting quartz monzonite.

BJQ-21 X Outcrop sample from drainage below trench. Sample consists oxidized sulfide fillings and disseminations in shattered and sheared quartz monzonite.

BJQ-22 X Outcrop sample of 3 foot thick quartz-carbonate vein located at the head of the north-south drainage southeast of the trench. Vein observed cutting upper plate andesite lava flow and lava flow breccias.

B-7a X Outcrop sample from trench exposing low angle fault contact. Footwall rocks and or gouge. Photomicrograph 9.

B-7b X Outcrop sample of footwall quartz monzonite, showing strong deformation and oxidized sulfide. Sample shows covellite and chalcocite. Photomicrograph 10.

Miscellaneous Samples

BJQ-15 X Dump sample from pospect pit developed in quartz monzonite, just east of exposure of contact of low angle fault. Sample consists of oxidized sulfide fracture fillings in shattered and sheared quartz monzonite.

B-4 Outcrop sample of andesite dike in quartz monzonite; both showing mylonitization. Sample from drainage, just east of exposure of contact of low angle fault. Photomicrograph 5.

Please note, BJ - 25, BJ - 26, and BJ - 29 are reference samples.

Petrographic Descriptions

BJ-1

Crushed, sheared quartz plus lenses of deformed feldspar (sericitized after shearing) and foliated lenses of pennine. Also post-shearing are sulfides and gold, the sulfides since replaced by hematite and goethite. Crushed quartz is recrystallized only near sulfides; calcite gangue joins sulfides in filling rubble areas.

BJ-3

Andesite showing flow alignment (could be a dike or flow) and originally composed of plagioclase, hornblende, and accessory magnetite. Plagioclase is lightly altered to sericite + calcite; hornblende is wholly altered to pennine + calcite. The rock is cut by crush zones, then cut by thin sinuous calcite veinlets. Where the veinlets intersect one another there has been a little silicification and often a pyrite grain (now oxidized) is present.

BJ-4

Andesite flow breccia composed of flow-aligned plagioclase laths plus a few hornblende prisms. Flow lines are interrupted by younger flowage of residual matrix melt and by syndepositional crush zones. Sometimes plagioclase is replaced by orthoclase within a limited area; sericitization is negligible. Accessory magnetite and all hornblende have been replaced by hematite. A little kaolinization of matrix rubble has occurred.

BJ-6

Meta-andesite hosting perlitic xenoliths. Originally the andesite carried plagioclase, hypersthene, augite, and hornblende. Following thermal metamorphism it consisted of plagioclase, hornblende, and biotite. Subsequent epizonal alteration produced quartz, calcite, and sericite plus tiny disseminated pyrite grains. Vesicles are filled with quartz and calcite.

BJ-7

Quartz monzonite granophyre with small phenocrysts of beta quartz, plagioclase, and graphic quartz-orthoclase in a granophyric matrix of quartz/both feldspars/muscovite. Biotite is rare. Traces of (oxidized) pyrite are disseminated but alteration has been virtually nil.

BJ-14

Andesite originally composed of plagioclase + hornblende. Penninization of hornblende was probably deuteric. Later the rock was sliced up by mylonite zones. Some of the zones are followed by quartz-calcite veins. Plagioclase is partly sericitized , particularly in the vein selvages. Pyrite is rare.

BJO-6

A dacite dike composed of plagioclase, augite, hornblende, and biotite. Primary quartz occurs sparingly in the matrix with a trace of orthoclase. Only deuteric alteration has occurred. Augite is replaced by granular calcite, hornblende by pennine. Some biotite is fresh, some penninized. Plagioclase is clouded with a little sericite and calcite.

BJQ-8A

Quartz monzonite composed of quartz, microcline, plagioclase, and hornblende. The rock is now a mylonite in which strained, crackled islands of quartz and feldspars lie in trains of foliated to disoriented sericite and rubble. The sericite is of post-deformation age. Pennine is squeezed into fractures. Sulfides are post-deformation and lie in the sericitized rubble. An oriented section showing the plane of shearing is close to horizontal.

BJQ-10

Partially mylonitized granodiorite; crushing occurred under heavy load. Both orthoclase and plagioclase remain fresh. Quartz is recrystallized a little, particularly near the disseminated pyrite cubes present. They are oxidized to jarosite.

BJQ-13

A microbreccia cemented lavishly by specular hematite and a little chalcopyrite. The latter mineral is oxidized to hematite and chrysocolla. The angular clasts in the breccia are quartz, microcline, and plagioclase representing a quartz monzonite.

BJQ-13A

A quartz monzonite mylonite in which all components remain fresh. Thin seams following the youngest fractures carry hematite, rutile, samarskite, etc.

BJQ-14

A partly mylonitized andesite breccia in which the plagioclase is fresh and all mafites have been sericitized. Hematite fills fractures with a little rutile, samarskite, and zircon.

BJ-15

Coarse grained quartz monzonite composed of quartz-microcline-plagioclase-hornblende. The rock has been partly mylonitized. Subsequently sericite replaced hornblende (or the pennine derived from it) and both feldspars only where they have been reduced to rubble. Associated with the post-crushing sericite are numerous oxidized chalcopyrite grains (hematite-chrysocolla-malachite).

BJ-18

Vein of very coarse barite tablets with a little granular quartz in the interstices. Traces of descloizite occur in the remaining voids (some show outlines of relic galena). The wallrock is coarse andesite pebbles (similar to BJ-4) plus clasts of microcline, quartz monzonite, etc. set in fine, oxidized feldspathic debris.

BJ-20

Granodiorite composed principally of coarse plagioclase rectangles with equally coarse quartz and orthoclase in the interstices. Hornblende, biotite, and abundant accessory magnetite fill the remaining spaces. Mafites are totally altered to pennine, calcite, and leucoxene. Plagioclase cores are heavily sericitized.

BJ-22

Crushed, coarse grained quartz monzonite like BJ-15. Post-crushing alteration includes sericitization of feldspars where they are crushed or crackled. Pennine derived from hornblende is badly deformed but remains stable. Quartz is recrystallized only where near chalcopyrite which is dispersed in the breccia matrix. The latter mineral is fully oxidized to malachite, chrysocolla, and hematite.

BJ-23

An andesite, probably a porphyritic dike, composed of very fine grained plagioclase matrix hosting aligned phenocrysts of hornblende and plagioclase. The rock shows deuteric alteration only. Hornblende is altered to pennine and epidote. The outer portions of plagioclase grains may be dusted with sericite.

BJQ-1

An andesite flow or dike composed of plagioclase and hornblende. The rock is cut by crush zones carrying sulfides (now hematite and chrysocolla). Areas between such zones are undisturbed but within them plagioclase is partly sericitized and all hornblende is chloritized. Crush zone rubble is now a dense sericite paste which is gangue to the former sulfides.

BJQ-16

Breccia of andesite fragments altered to albite and Fe-rich pennine, pervaded and partly replaced by massive fluorite. Chalcopyrite (oxidized) occurs in fluorite clevages or fractures.

BJQ-17

Angular (open) quartz monzonite breccia. Plagioclase and microcline clasts remain fresh and angular, quartz show overgrowths that host rings of specularite crystals.

BJQ-20

Sheared andesite breccia. Plagioclase have remained mostly fresh; mafites are altered to sericite. Abundant (oxidized) pyrite in the oxidized shears.

"B" Series

#1

The original rock was a coarse grained quartz monzonite composed chiefly of quartz, microcline, and plagioclase. Biotite was a mafite; hornblende may have been present as well. Textures have been nearly obliterated by deformation and subsequent alteration.

In some thin zones, all constituents are reduced to cherty rubble. Such zones anastamose in the fabric and bound domains in which quartz and feldspars are crackled or shattered. Mafites were doubtless penninized prior to deformation, for the pennine is squeezed into shears and extensional microfractures. Epizonal alteration has affected only the fine rubble; coarser feldspar fragments remain quite fresh. A scaly paste of sericite hosting cloudy calcite blotches replaces rubble, and much of the pennine formerly present.

Mineral percentages are estimated as follows: quartz 23%, microcline 25%, plagioclase 13%, sericite 22%, calcite 7%, pennine 4%, hematite 3%, leucoxene 2%, apatite 1%.

#2

The rock is an andesite showing crude flow alignment of the plagioclase laths that comprise its matrix. Textures suggest either a flow or hypabyssal unit. Hornblende is the sole mafite, usually interstitial to plagioclase but occasionally as phenocrysts. Epizonal alteration has been moderate.

Much of the plagioclase remains fresh but it is now albite. Hornblende is replaced by clusters of thick books of ripidolite. The rock is laced with fractures carrying clusters of tiny oxidized pyrite cubes. These are filled with cloudy calcite and a scaly paste of sericite. Both minerals attack albite and ripidolite on grain boundaries throughout the rock but especially in the vicinity of the fractures.

Estimated mineral percentages are as follows: plagioclase 38%, sericite 19%, ripidolite 20%, hematite 6%, calcite 16%, quartz ½%.

#3

The rock is an andesite differing in texture from 2 but compositionally the same. It could be from a thick effusive unit or hypabyssal. It consists chiefly of plagioclase and hornblende. Both species are as phenocrysts set in a matrix of stubby laths that seem randomly oriented but show a crude overall alignment. Epizonal alteration has been modest.

Plagioclase is clouded with dust-like sericite and calcite. Hornblende is wholly altered to pennine plus accessory hematite and leucoxene. Alteration is a bit stronger in thin subparallel shears cutting the fabric. Some of these curve as much as 90% and become thick veins of coarse columnar calcite. The few pyrite grains seen in the rock occur in or near the shears.

#3 con't.

Percentages of minerals present are estimated as follows: plagioclase 33%, pennine 35%, sericite 8%, calcite 16%, hematite 5%, leucoxene 2%, pyrite ¼%.

#4

The rock is an andesite texturally similar to #3. It could be either effusive or hypabyssal. Plagioclase is the chief constituent and it occurs as crudely aligned stubby laths of uniform size together with interstitial hornblende prisms. Moderate epizonal alteration has been accompanied by weak shearing.

Plagioclase is dusted with calcite and sericite, its alteration nearly half complete. Hornblende is entirely altered to pennine. Pennine and accessory hematite and leucoxene tend to smear into incipient shears developing on plagioclase grain boundaries.

The rock mode is estimated as follows: plagioclase 34%, pennine 31%, sericite 13%, calcite 16%, hematite 4%, leucoxene 2%.

#5

The rock is a basalt, likely a severely chilled hypabyssal rock. It hosts innumerable small, euhedral augite phenocrysts and a few of plagioclase. The matrix, originally glass, is devitrified to fibrous plagioclase clouded with Fe-rich trichytes. The basalt hosts a xenolith of quartz monzonite (much like #1) which exhibits a moderate degree of shearing followed by foliae of biotite that host pyrite octahedra.

Subsequent alteration has been modest. Glass and mafites in the basalt are replaced by clouds of tiny biotite scales and calcite. The biotite has begun to retrograde to pennine and sericite. Sericite, calcite, and quartz replace the plagioclase and vein the basalt. Within the xenolith sericite and calcite cloud the plagioclase. Microcline is corroded by irregular calcite seams.

#6

The rock is a microbreccia of quartz monzonite fragments in the process of mylonitization. Some show heavy shearing, others are simply crackled, or have disaggregated into small angular fragments. They are all entrained in a crudely banded matrix of fine rubble.

Alteration post-dates deformation and has been moderate, epizonal. All mafites (except biotite in one or two large fragments) are replaced by sericite and accessories such as hematite and sphene. Sericite replaces the fine feldspar rubble,

#6 con't.

but larger clasts remain fresh. Calcite was noted in a few late fractures.

The rock mode is estimated as: quartz 28%, plagioclase 10%, microcline 19%, sericite 36%, sphene 2%, hematite 2%, biotite ½%, apatite ½%, calcite 2%.

#7A

The rock is a microbreccia, believed to represent fault breccia derived from quartz monzonite (much like #1 etc). The larger clasts are angular chips of plagioclase and microcline. Some are fresh, others heavily sericitized, suggesting that alteration had occurred earlier. Other clasts include magnetite apatite, quartz, and bits of chalcopyrite (now hematite and chrysocolla).

The matrix is a fine paste of feldspar flour, sericite, and pennine. Alteration subsequent to brecciation has been negligible. Even the finest plagioclase dust may be quite fresh.

#7B

The rock is a microbreccia similar to 7A but not so severely sheared or pulverized. Fragments in it include quartz monzonite which is frequently in undisturbed condition and shows only light alteration (chiefly sericitization of plagioclase and mafites). Other fragments are andesite texturally much like #2. However, these fragments are just a component of an earlier sheared breccia which also includes mylonitized quartz monzonite. These earlier breccia fragments host relic sulfides, now replaced by covellite, chalcocite, then hematite and malachite. Malachite leaks into other parts of the rock freely. Tiny sulfide relics were also seen in the breccia matrix.

Key to BSE Photographs

KEY TO BSE PHOTOGRAPHS

001

Sample BJQ-3. Black is quartz gangue; irregular grey patches are galena. The duller grey oval spot (center) in the largest galena grain is a hessite inclusion about 50 microns across. Magnification 51X.

002

Sample BJQ-5. Black is gangue. The large dull grey area filling the picture is covellite hosting slightly lighter grey patches of chalcocite. The two tiny patches just to the right of center (light grey) are stromeyerite. They are about 5 microns across. Magnification 360X.

003

Sample BJQ-5. Dark grey is gangue; ragged lighter grey areas to the left are covellite. The bright white areas (center) are miersite, a supergene mineral filling open spaces in the gangue. The two larger grains are about 4 microns in diameter. Magnification 760X.

004

Sample BJ-1. Dark grey is gangue, lighter grey to right is goethite (mostly) with a little duller grey hisingerite in it. The bright white grains are supergene gold, the largest grain about 80 microns across. This gold is 782 fine. Magnification 370X.

005

Sample BJ-1. Black is gangue (right) and the irregular spongy grey areas to left are hisingerite which replaced pyrite. The bright white is gold of hypogene origin, still showing its crystalloblastic shape against the former pyrite. The grain is 10 microns across. This grain is 901 fine. Magnification 1050X.

XES Geochemical Analysis

GLOBO DE PLOMO

XES GEOCHEMICAL ANALYSIS

pulp	sample #	Fe	Cu	Zn	Pb	U	Mo	Ag	Ba	Te	As	Au			
	BJ 1	5.80%	6.05%	656	761	17	23	22	.09%	<2	<5	93.4			
	BJ 8	6.08%	3.38%	<50	<5	<2	<1	<2	.15%	<2	<5	.07			
	BJ 9	4.18%	.33%	110	<5	<2	<1	<2	.02%	<2	<5	<.02			
	BJ 18	.21%	<50	62	275	<2	<1	<2	16.6%	<2	<5	<.02			
	BJ 22	3.96%	1.71%	<50	<5	<2	<1	35	.10%	<2	<5	<.02			
	BJQ 2a	9.66%	2.09%	308	118	<2	10	<2	.03%	<2	<5	7.80			
	BJQ 3	5.45%	183	<50	.53%	<2	91	80	.02%	77	<5	2.80			
	BSQ 4	5.64%	2.56%	128	29	<2	<1	39	.08%	<2	34	<.02			
	BSQ 5	8.87%	17.2%	<50	31	<2	<1	38	.08%	<2	<5	<.02			
	BSQ 6	6.53%	7.11%	<50	<5	<2	<1	9	.14%	<2	<5	<.02			
	BSQ 7	4.89%	4.00%	<50	47	<2	<1	16	.20%	<2	<5	.03			

values in ppm unless % is specified

GLOBO DE PLOMO

XES GEOCHEMICAL ANALYSIS

pulp	sample #	Mn	Fe	Cu	W	Pb	Bi	Y	Zr	Nb	Mo	Ag	Ba	Au
	BJQ-9		5.08%	285		580	169				21			9.70
	BJQ-10		5.12%	116										.03
	BJQ-11		7.23%	1.93%										<.02
	BJQ-12		3.57%	56										<.02
	BJQ-12A	29.5%		920	.15%	144					335		3.08%	.09
	BJQ-13		20.3%	.75%										<.02
	BJQ-14		11.8%	105				118	.21%	459				<.02
	BJQ-15		4.02%	1.31%								9		<.02

values in ppm unless % is specified

GLOBO DE PLOMO

XES GEOCHEMICAL ANALYSIS

pulp	sample #	Mn	Fe	Cu	Zn	Pb	As	Se	Ag	Sb	Ba				
N49	BSQ 16	.05%	6.46%	1.99%	89		12	4	3	7	15				
N50	BSQ 17A	.05%	6.16%	109		23					72				
N51	BSQ 17B	.01%	1.25%	89							9				
N52	BSQ 17C	.05%	15.9%	.40%							93				
N53	BSQ 18	.04%	4.37%	1.12%	46	113			20		.30%				
N54	BSQ 19	.04%	7.05%	5.31%	163				123		.30%				
N55	BSQ 20	.06%	4.04%	2.75%	98				117		.13%				
N56	BSQ 21	.09%	6.82%	1.97%	181						138				
N57	BSQ 22	.44%	.36%	45	.11%	390					237				

16 fluorite
17A bx w/Pb
17B " " fluorite
17C " " [illegible]

values in ppm unless % is specified

Skyline Labs, Inc. - Gold Assays

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. UGM 039
September 6, 1985
KQ1 TO BJQ2

GLOBO DE PLOMO ENTERPRISES
Attn: Dr. S.A. Williams
P.O. Box 872
Douglas, Arizona 85607

Analysis of 4 Pulp Samples

ITEM	SAMPLE NO.	Au (ppm)
1	KQ1	.05
2	KQ2	.37
3	BJQ1	.08
4	BJQ2	>10.00*

*NOTE: Greater than normal geochemical range.
Please advise if fire assay is needed.

* Jack Allen says it was about 16 ppm (verbal)

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. UGM 044
November 14, 1985

GLOBO DE PLOMO ENTERPRISES
Attn: Dr. S.A. Williams
P.O. Box 872
Douglas, Arizona 85607

Analysis of 5 Pulp Samples

		FIRE ASSAY	
ITEM	SAMPLE NO.	Au (oz/t)	Au (ppm)
1	BJ 1	2.725	
2	BJ 8		.07
3	BJ 9		<.02
4	BJ 18		<.02
5	BJ 22		<.02

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. UGM 042
November 11, 1985
BJQ 2A TO BJQ 7

GLOBO DE PLOMO ENTERPRISES
Attn: Dr. S.A. Williams
P.O. Box 872
Douglas, Arizona 85607

Analysis of 6 Pulp Samples

ITEM	SAMPLE NO.	Au (ppm)
1	BJQ 2A	7.80
2	BJQ 3	2.80
3	BJQ 4	<.02
4	BJQ 5	<.02
5	BJQ 6	<.02
6	BJQ 7	.03

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Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

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Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. UGM 043
November 15, 1985
BJQ-9 TO BJQ-15

GLOBO DE PLOMO ENTERPRISES
Attn: Dr. S.A. Williams
P.O. Box 872
Douglas, Arizona 85607

Analysis of 8 Pulp Samples

ITEM	SAMPLE NUMBER	Au (ppm)
1	BJQ-9	9.70
2	BJQ-10	.03
3	BJQ-11	<.02
4	BJQ-12	<.02
5	BJQ-12A	.09
6	BJQ-13	<.02
7	BJQ-14	<.02
8	BJQ-15	<.02

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Arizona Registered Assayer No. 11122

SKYLINE LABS, INC.
1775 W. Sahuaro Dr. • P.O. Box 50106
Tucson, Arizona 85703
(602) 622-4836

REPORT OF ANALYSIS

JOB NO. UGM 047
December 12, 1985
BJQ-16 TO LUZ-3B

GLOBO DE PLOMO ENTERPRISES
Attn: Dr. S.A. Williams
P.O. Box 872
Douglas, Arizona 85607

Analysis of 14 Pulp Samples

ITEM	SAMPLE NUMBER	Au (ppm)
1	BJQ-16	<.02
2	BJQ-17A	<.02
3	BJQ-17B	<.02
4	BJQ-17C	<.02
5	BJQ-18	<.02
6	BJQ-19	.05
7	BJQ-20	<.02
8	BJQ-21	<.02
9	BJQ-22	<.02
10	LUZ-1	<.02
11	LUZ-2	.28
12	LUZ-2D	<.02
13	LUZ-3A	.10
14	LUZ-3B	.04

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

James A. Martin
Arizona Registered Assayer No. 11122

Summary of Picacho Type Ore Systems

SUMMARY OF PICACHO TYPE ORE SYSTEMS

	#1	#2	#3	#4	#5	#6	#7	#8	#9	Blue Jay Project
QUARTZ	minor	major	minor	minor	minor	minor	major	minor	minor	minor
SIDERITE	major	no	no	no	minor	no	no	minor	no	no
CALCITE	no	minor	major	major	minor	minor	major	uncommon	no	minor
HEMATITE	major	minor	moderate	major	major	major	minor	major	major +magnetite	?
FE-CHLORITE	minor	minor	major	major	major	major	minor	major	major	stable
SERICITE	no	major	major	no	major	minor	minor	erratic	minor	moderate
BARITE	minor	major	major	rare	minor	uncommon	rare	minor	no	rare
FLUORITE	no	minor	major	erratic	Al-F	erratic	no	no	erratic	erratic
CU	major	rare	minor	major	major	minor	rare	minor	rare	major
PB	no	major	major	no	rare	no	no	no	v. rare	no
ZN	no	minor	major	no	no	no	no	no	no	no
HOST	andesite	andesite	pC	pC/ andesite	pC/ andesite	latite	andesite	pC	pC? qte	pC
FLAT FAULT; in/above	above	above	in	in	in/below	in	above	in/between	in	in/above
OTHER ELEMENTS	no	no	no	no	no	no	As	no	W	no
MT/oz/T Au	50+,<.1	<1,.3	?	10/.2-.3	5/.15	8/.32 much bigger	1.5/.4	?	?	?
NUMBER OF "ORE" HORIZONS	pipe-like	one	?	several	one	4	3	1	?	?
AGE OF MINERALIZATION	?	Tertiary	?	?	Tertiary	Tertiary	Tertiary	Tertiary	?	?

Miscellaneous

SOUTHERN GREAT BASIN GOLD DEPOSITS

Summary Chart

Lithologic Associations

1. Miocene felsite dikes, sills, high level plugs, and volcanics
2. Mesozoic intrusions
3. Precambrian gneiss

Structural Setting

1. Flat faults at first order
2. High angle second order faults

Age of Mineralization

1. Consensus centers on Miocene for major deposits
2. Subset of Laramide age
3. Precambrian

Alteration Mineralogy

1. Quartz-pyrite-sericite
2. Epidote-chlorite
3. Carbonate
4. Hematite

Nature of Mineralization

1. Stockwork veining in shattered host rock
2. Oxide mineralization dominant ore type
3. Sericite-pyrite assemblage likely to host ore grade

TABLE 1: Gold Deposits of the Southern Great Basin

District or Deposit	Production (Res.) Millions of oz. Gold	Age of Mineralization	Major Structural Association	Host Rocks	Au:Ag
Bagdad Chase	.260	Miocene	Low Angle Fault	Brecciated Tertiary Rhyolite Dacite	1.5:1
Big Horn	(.150)	Miocene	Low Angle Fault	Precambrian Gneiss/Cataclastite	>1:1
Blackhawk	.300	Miocene	Low Angle Fault	Brecciated Dolomitized Limestone above Precambrian Gneiss	1:15
Cargo Muchacho	.195	?	Low Angle Fault	Fractured Mesozoic Gneiss	3:1
American Girl	(.300)			Fractured Mesozoic Gneiss	
Colosseum	(.800)	100 m.y.	Breccia Pipe	Breccia and Fractured Rhyolite	>1:1
Congress	.700	Precambrian	High Angle Fault	Precambrian Granite	1:1.3
Copperstone	(.400)	Miocene	Low Angle Fault	Fractured Mesozoic Gneiss	>1:1
Mesquite		?	Low Angle Fault	Fractured Mesozoic Gneiss	>1:1
Mohave District	.250?	ca. 17 m.y.	Low Angle Fault	Brecciated Rhyolite	1:30
Middle Buttes	(.125)		Low Angle Fault	Rhyolite above Mesozoic Intrusive	
Morningstar	(.200)	Miocene	Low Angle Fault	Fractured Precambrian Granite	1:6
Oatman	2.2	14-18 m.y.	High Angle Fault	Latite	2.75:1
Picacho	(.350)	Miocene?	Low Angle Fault	Fractured Precambrian Gneiss	>1:1
Portland-Roadside	(?)	Miocene	Low Angle Fault	Fractured Precambrian Gneiss	>1:1
Rand District	.850	Miocene	Low Angle Fault	Precambrian Rand Schist and Mesozoic Intrusive cut by Tertiary Rhyolite	1:15
Yellow Aster	(.400)				
Vulture	.350	?	High Angle Fault	Tertiary Rhyolite Dikes and Precambrian Schist	1:1

GEOLOGY AND MINERALIZATION OF THE COPPERSTONE GOLD DEPOSIT, LA PAZ COUNTY, ARIZONA

Ronald E. Graichen and William D. Burton, Cyprus Minerals Company

Cyprus' new Copperstone gold deposit was discovered beneath alluvial cover at the north end of the Dome Rock Mountains in Western Arizona. A 30° dipping tabular breccia zone occurs in weakly metamorphosed Jurassic welded tuff. Specular hematite-quartz-amethyst veining is spatially associated with hydrothermal breccia containing specular hematite, quartz, amethyst, magnetite, barite, calcite and chrysocolla. Gold is associated with both breccia mineralization and veining. The 20- to 100-foot thick gold zone is 2,500 feet in strike length. Open pit reserves to 300 feet are 4.0 million tons of 0.08 ounce per ton gold with a 6:1 strip ratio.

MYLONITIC GNEISSES AND LOW-ANGLE DETACHMENT FAULTS-- AN EVOLVING UNDERSTANDING OF CONTINENTAL EXTENSION

Dr. Gregory A. Davis
Professor of Geology, University of Southern California

ABSTRACT

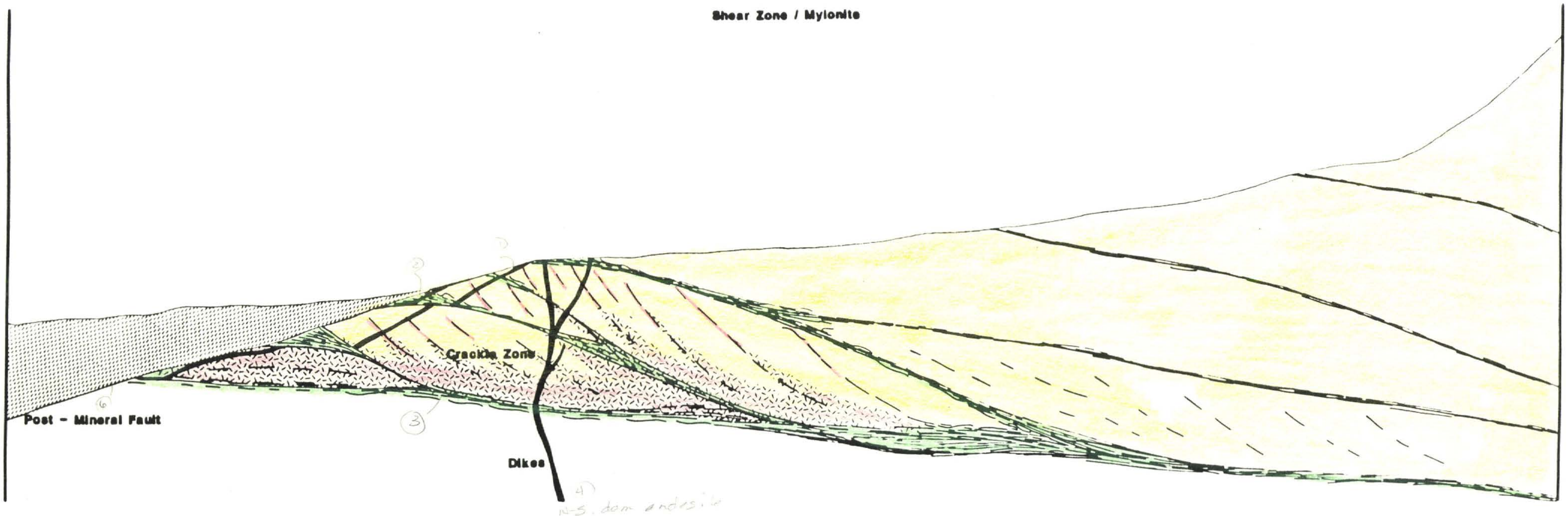
Detachment faults as here defined are extensional faults of probable low initial dip (less than 25-30°), subregional to regional areal development, and large translational displacements, certainly tens of kilometers in some instances. First recognized in the eastern Great Basin by Armstrong in 1972, they are now known to be very widespread through those Cordilleran regions that have undergone greatest Cenozoic extension. They are commonly, but not necessarily, associated with lower-plate mylonitic gneisses that comprise the so-called "metamorphic core complexes". Probably nowhere in the U.S. Cordillera are detachment faults more widely and spectacularly developed than in the region which borders the lower Colorado River between Las Vegas, Nevada and Yuma, Arizona, and a wide contiguous terrane that extends eastward from the river across the southern third of Arizona and into Sonora, Mexico. We believe that our studies and those of numerous other workers in the lower Colorado River region provide a number of new perspectives on the origin and evolution of Cordilleran detachment faults.

Cordilleran detachment faults are best explained as evolving extensional shear zones that are produced by lithospheric delamination, probably at depths between approximately 8 and 15 km. These zones propagate upwards across the overlying crust and either reach the surface directly or terminate at shallow depths into pull-apart complexes of closely-spaced normal faults. Along these evolving shear zones, lower plate rocks are drawn upwards and out from beneath upper-plate rocks, a necessary kinematic phenomenon if mylonitic gneisses formed at depths in excess of 8 km are to be tectonically juxtaposed beneath unmetamorphosed supracrustal rocks. Mylonitic detachment complexes form only when relative displacements along the inclined shear zones are sufficiently large to expose lower-plate assemblages that once lay in the brittle-ductile transition zone.

Diagramatic Cross Section - Blue Jay Prospect

DIAGRAMATIC W–E CROSS SECTION

Shear Zone / Mylonite



5) NE dikes - felsic + andesite

no dikes cutting Tfg

fault gouge contains [illegible] frags, gouge itself not min'd
No alt'n in [illegible]

ser may grow at expense of chl

Au - spec - cpy - ser
good Au values w/ SiO_2
not much SiO_2 overall

General Geologic Map/Sample Location Map

Legend

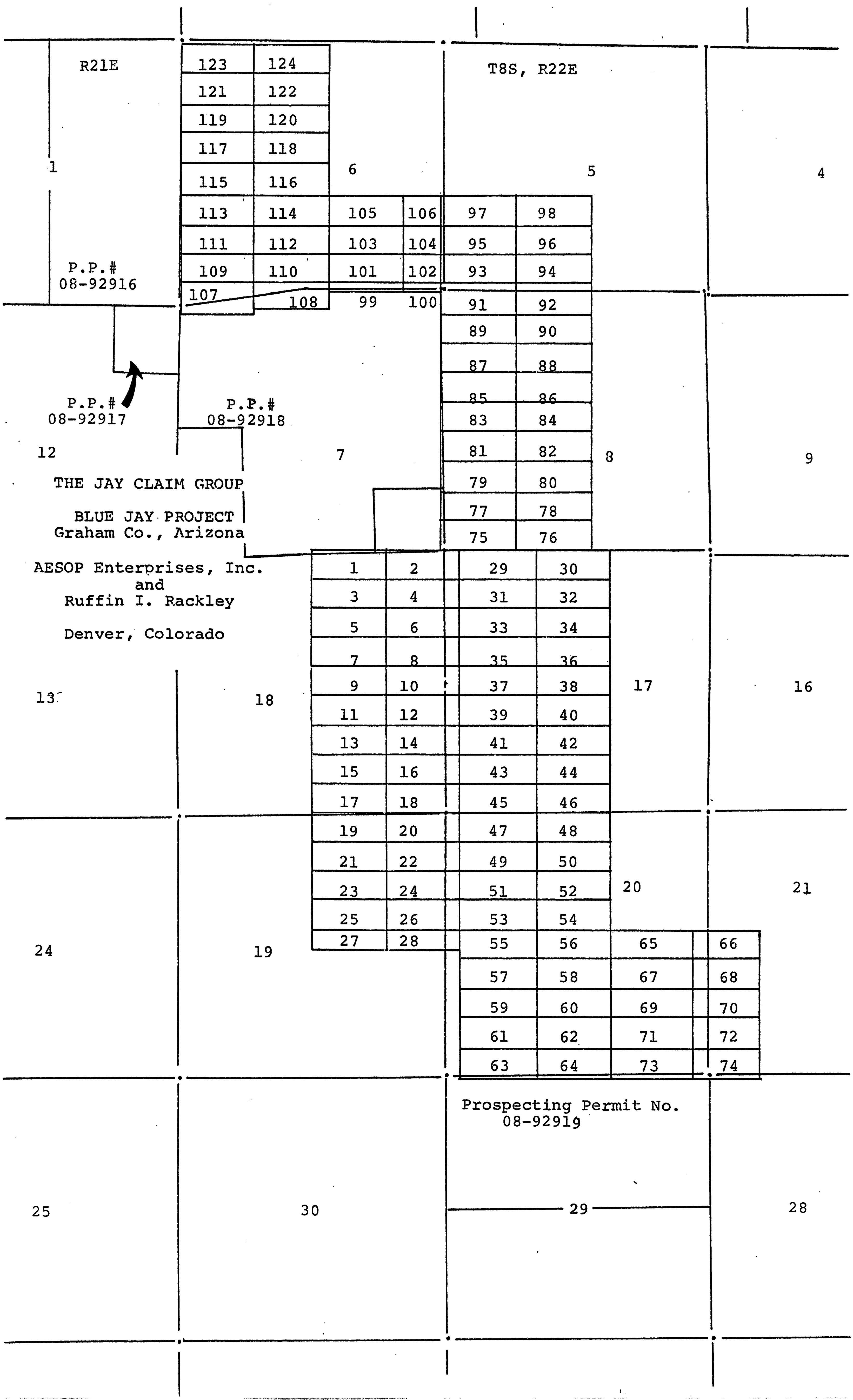
- Tg Galluro Volcanics and Fanglomerates
- pCy Quartz Monzonite
- pCx Pinal Schist
- Mylonite
- Thrust Fault
- B-1 Sample Location
- DIKES

AESOP Enterprises, Inc.

Blue Jay Project
Graham County, Arizona

Geologic/Sample Location Map

Land Map


R21E
T8S, R22E
1
6
5
4
123 124
121 122
119 120
117 118
115 116
113 114 105 106 97 98
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109 110 101 102 93 94
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9
THE JAY CLAIM GROUP
BLUE JAY PROJECT
Graham Co., Arizona
AESOP Enterprises, Inc.
and
Ruffin I. Rackley
Denver, Colorado
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