CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
3550 N. Central Ave, 2nd floor
Phoenix, AZ, 85012
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

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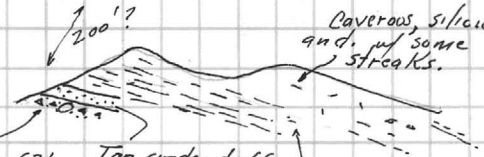
ORIGINAL OPR. 191 BY J. C. PARKER

Ajo

TR. MK. REG. U.S. PAT. OFF.

Nancy group. E-W. axis
Lewis Ettawageshik July 15, 1960
Saw No 60, just E of "Sneed Hill".



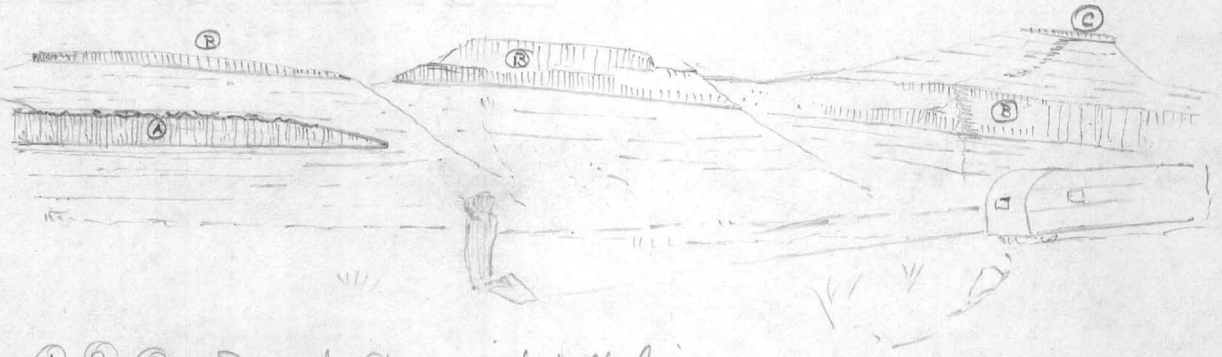
main hill type - Silicic brown and. w/ pronounced streaks w/ laminations w/ a peculiar slickensided "surface at rt angles. - Weathers out like petrified logs.

Looking west, Hill south of Sneed Ranch ("Sneed Hill")

This is Gilluly's type locality for Sneed andesite. Not typical of other parts of formation.

Ajo District.

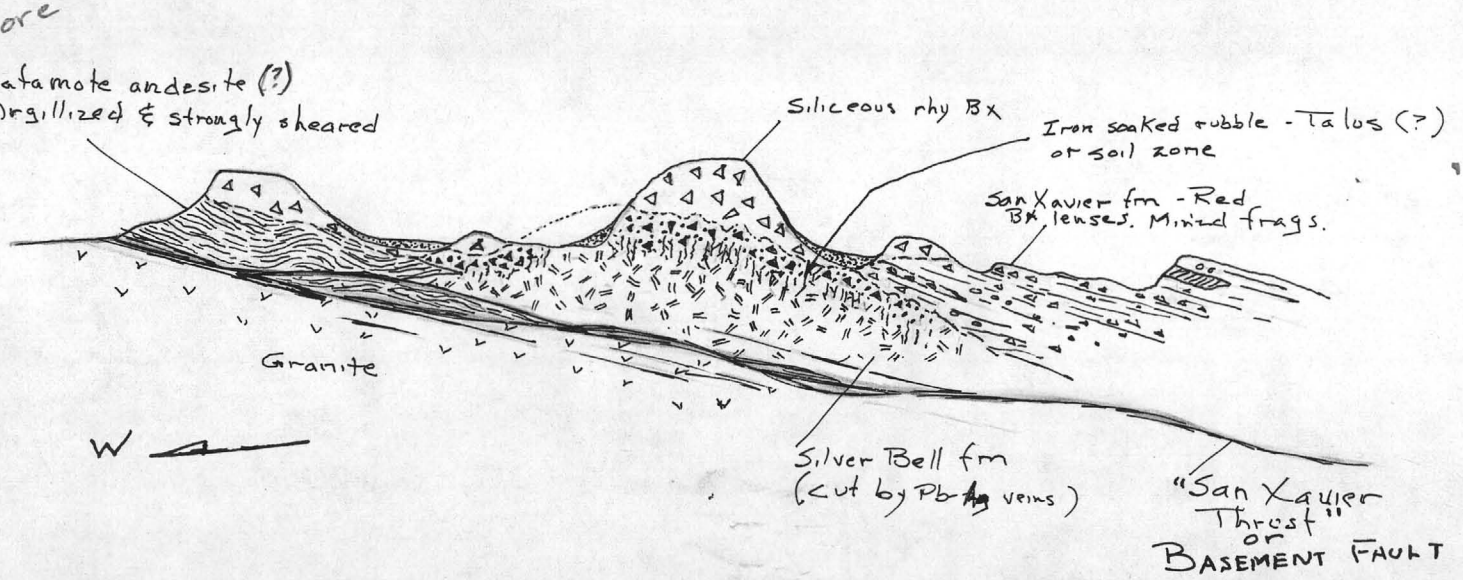
LEFAX, PHILADELPHIA 7, PA., MADE IN U.S.A.



(A) (B) (C) Basalt flows, interbedded in stratified silt and conglomerate. Many thin fine-gr. beds - playa or lake. "G. Ca-type lithology". Bottom contact of flows parallels bedding, no rubble at base or any disturbance of ~~bottom contact~~ beds beneath.

Pima Mining District

South & East of
Tucson



The Basement Fault

DIAGRAMMATIC SECTION

Looking North, SW Corner of Hanging wall Block.

Length of Section About ½ Mile

(Wilson, Chilson, Todd Claims)

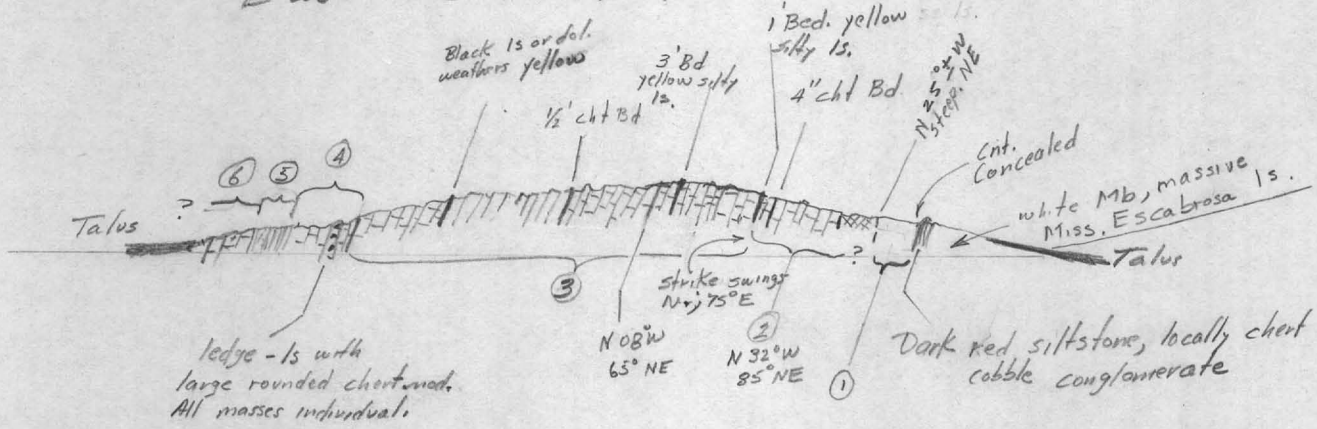
J.E.K. 1962

Traverse line on north edge of hill, nearly along S. line Sec 16.; 17S, 13E.

Paced Traverse, composite section of best exposures

Looking Southerly

East ← 1" = 100'



Note:

① is distinct -- Massive Mb

②③④ are Md bd ls & dol, forming typical horgulla ribbed slopes.

⑤⑥ are thinner bd, more clastic

1 - 20' thick

2-4 - 250'

1,6 - 50' +

Description of Major divisions

① White to yellow-white, massive medium-gr. Mb. Similar to Escabrosa -- slightly finer-gr.

② Medium-bd grey ls, some chert.

③ Medium bed. ls and dol. Forms "ribbed" slope. Beds 1 - 3' thick. Fossil ~~traces~~ "hash" throughout.

Fossil samples.

TF 15 - Find small brachs, few crinoid stems. Bry (?) scarce. abundant Fusi.?

TF 16 Replete with Fusi (?)

TF 17 Fusi (?). Abundant. Top of yellow ls. bed.

④ Similar to ③, but is highly fossiliferous. Large brachs, small brachs, bryozoa, Fusi (?).

Foss. samples.

TF 18, A - G.

⑤ Sandstone, sandy ls. Thin bedded.

6. Cherty Med. bd ls.

Emmons North Hill
Pima Mining District
Stratigraphic cross section
JE Kinnison June 1959

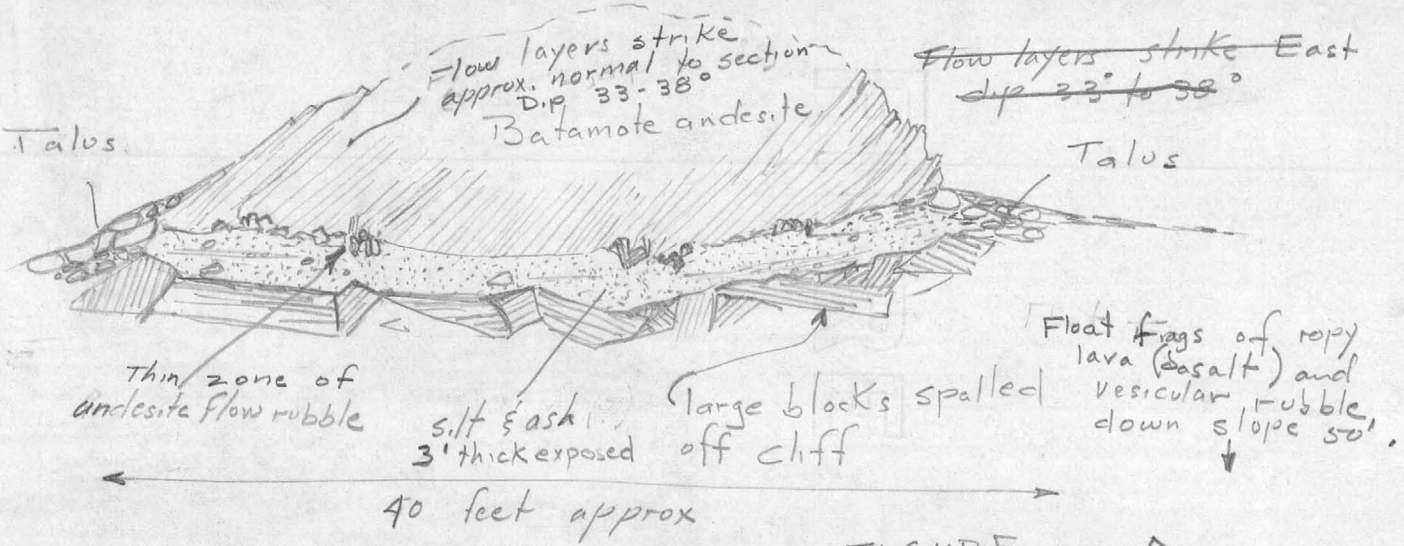
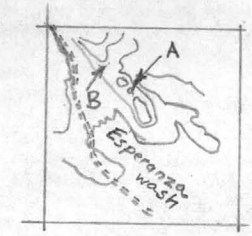


FIGURE A

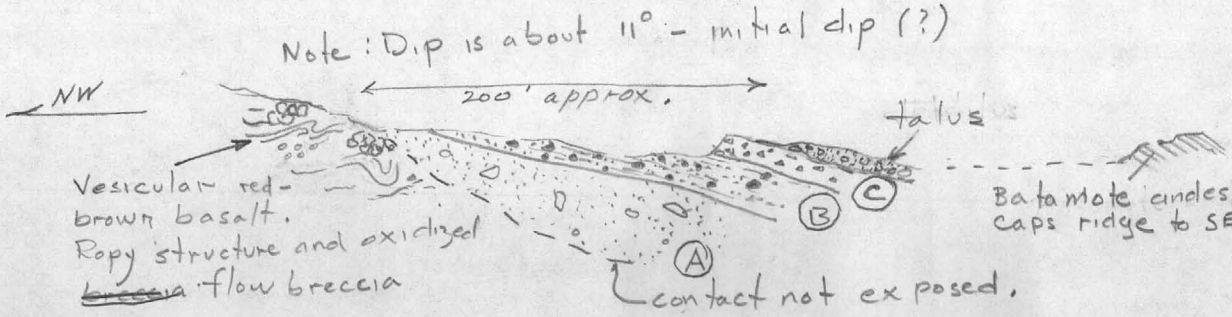
Sketch of Cliff Face.
Undercut along silt zone
Looking SW.
Not to scale

Location: 2½ Mi. E. Tinaja Peak
About 4 Mi. SE of Esperaza Pit



Sec 35
T 18S, R 12E

INDEX MAP



A - Silt, brown to dull red. Angular boulders and small frags. of underlying ropy, brecciated basalt. 15' exposed.

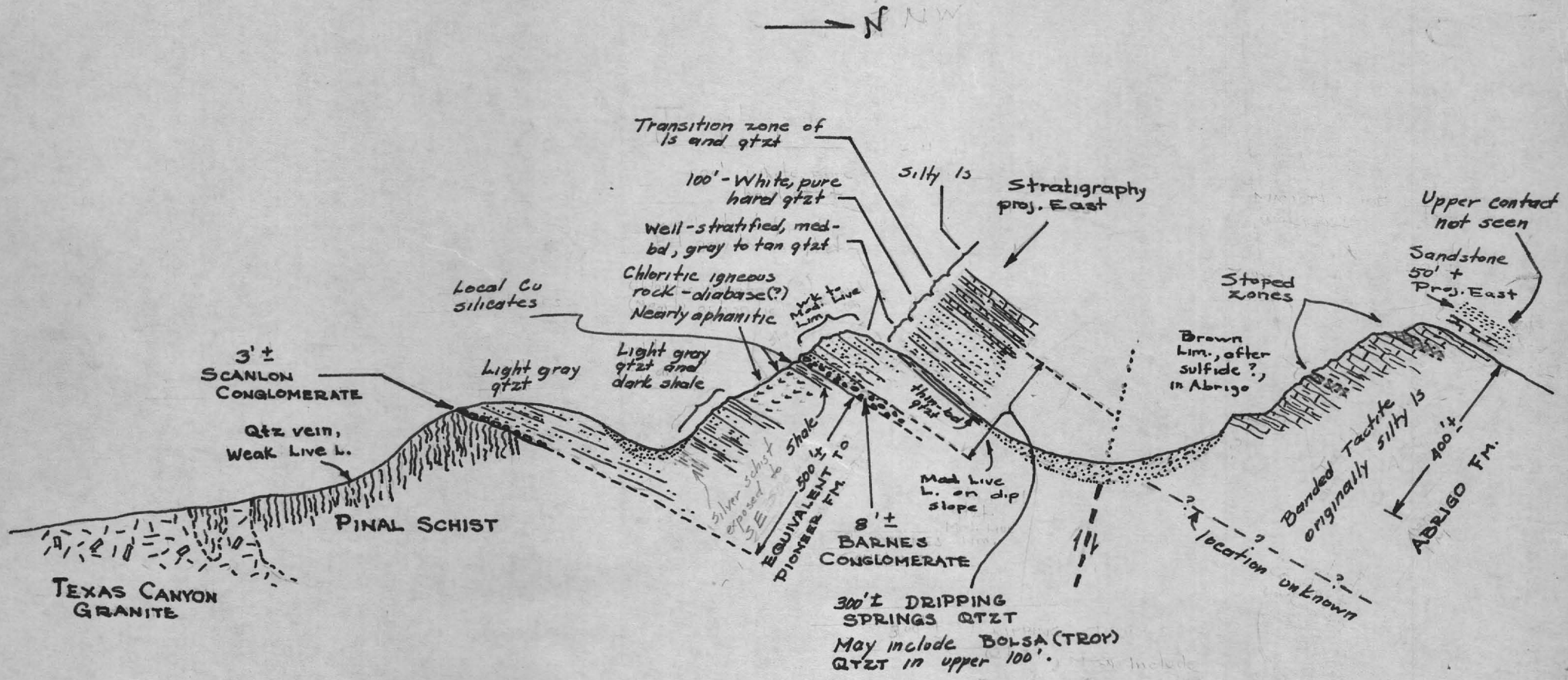
B - Orange brown cinders and silt; Frags of underlying ropy basalt. 15' ± Thick

C - White pumice-tuff. 5' thick

FIGURE B

DIAGRAMMATIC SECTION E
Based on outcrop in small gully on south side of ridge, about 1000' NW of Fig. A.
LOOKING NE
Not to scale

Feb 17, 61 JE Kinnison



DIAGRAMATIC CROSS SECTION

About 3/4 Miles West of Johnson Camp

LOOKING WEST

Length of section: About 1 Mile

Reconnaissance by K E Richard, J H Courtwright, A L Blucher, J E Kinnison; Sept. 4 1958

Length of section: About 3000'

1. Volcanic flow capping. Biotite bearing rhyolite or qtz latite. Abundant inclusions. This is similar but not identical to the igneous matrix of the "chaos" below. Also it is similar but not identical with the Biotite rhy of Tucson Mtns.

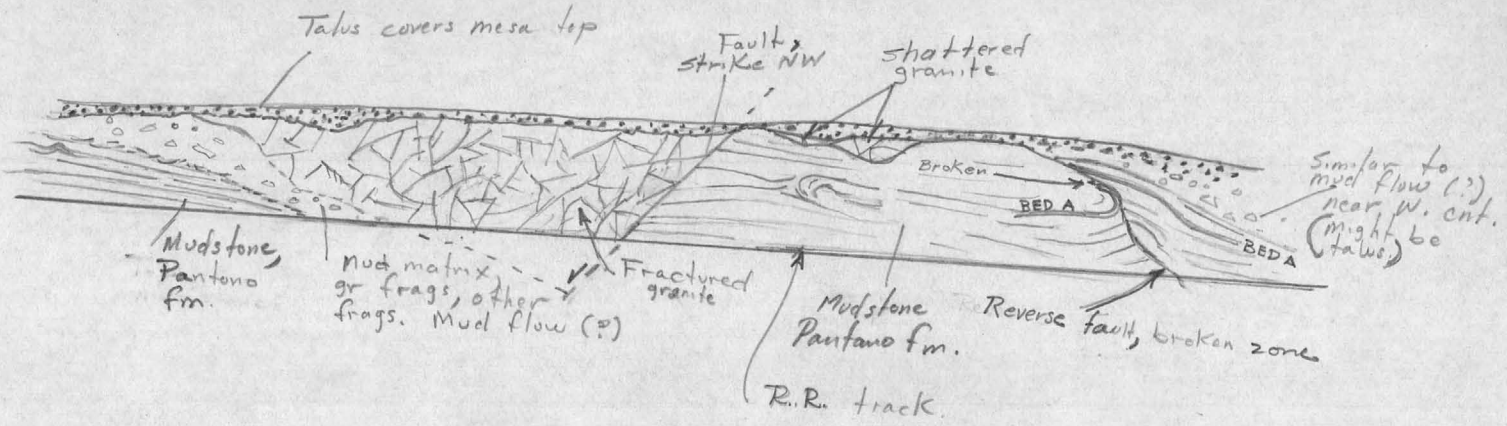
2. "Chaos". Fragments are principal K? clastic sediments, and T? Silver Bell type andesite porphyry. A few Paleozoic ls. Frags. are 1' to 25' maximum size. A biotite bearing rhyolite, light gray, intrudes between the blocks, and is packed with small inclusions.

3. Silver Bell formation. Occasional dips are about 25°.

4. Tertiary? lake beds, flat dipping. Faulted? against rhyolite capping, these beds form the flats to the north.

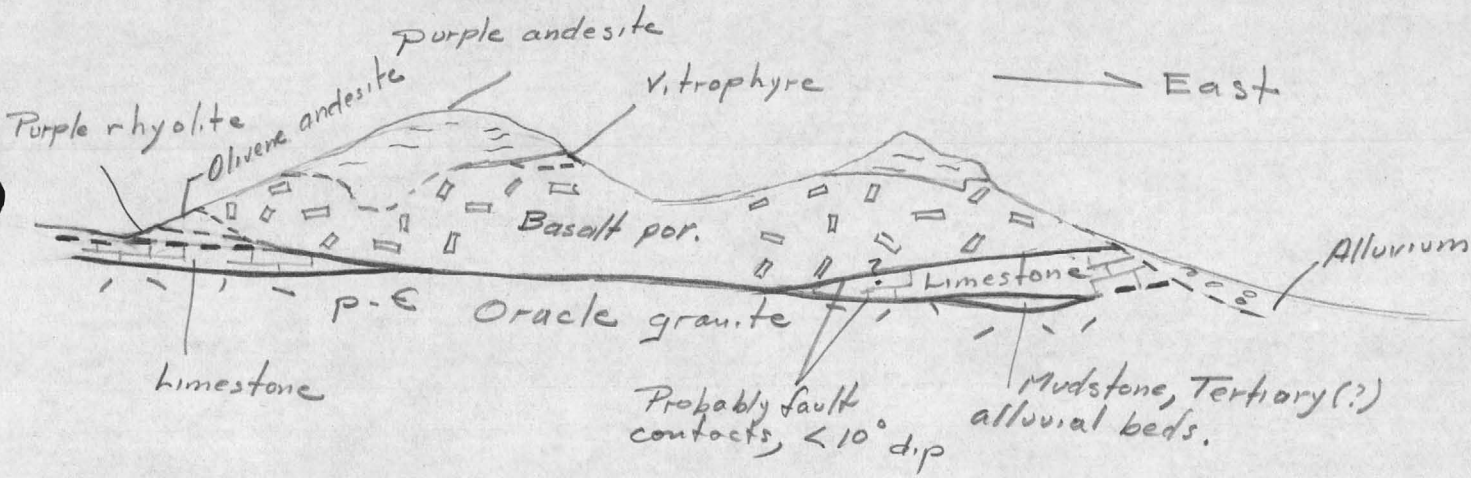
DIAGRAMMATIC CROSS SECTION
Looking Northeast
About 10 Miles West of Tombstone

Reconnaissance KR, JEK, Aug 1959



Looking North. Section of N. wall of Railroad cut, about 400' long. R.R. No. of old Benson Hwy, Rincon Mo. Foothills.
See Brenan Thesis (U.A.)

Reconnaissance
KR, JHC, JEK. 6/30/59



Purple rhyolite: Streaked rhyolite with elongated inclusions or tuff fragments. May correlate to Cat Mt. rhy.

Purple andesite: Banded blue-gray andesite porphyry. Phenocrysts of feld aligned parallel to flow bands. Abundant secondary (?) silica pervades rock.

See thesis by Cochran, U. of A., 1914.

Reconnaissance, JEK, 1959

Diagrammatic Section of

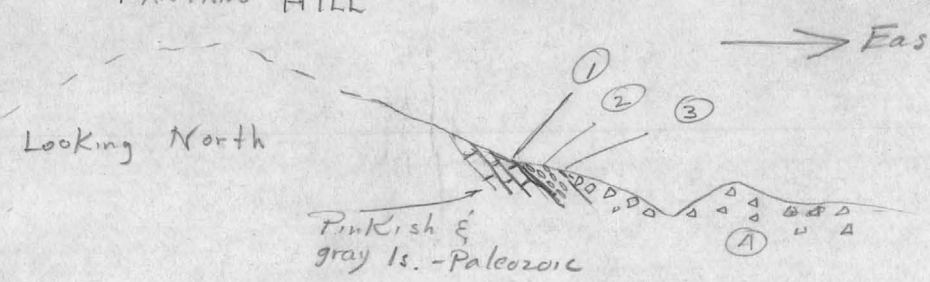
TWIN HILLS,

East of Tucson near Saguaro Nat'l Monument

Looking North

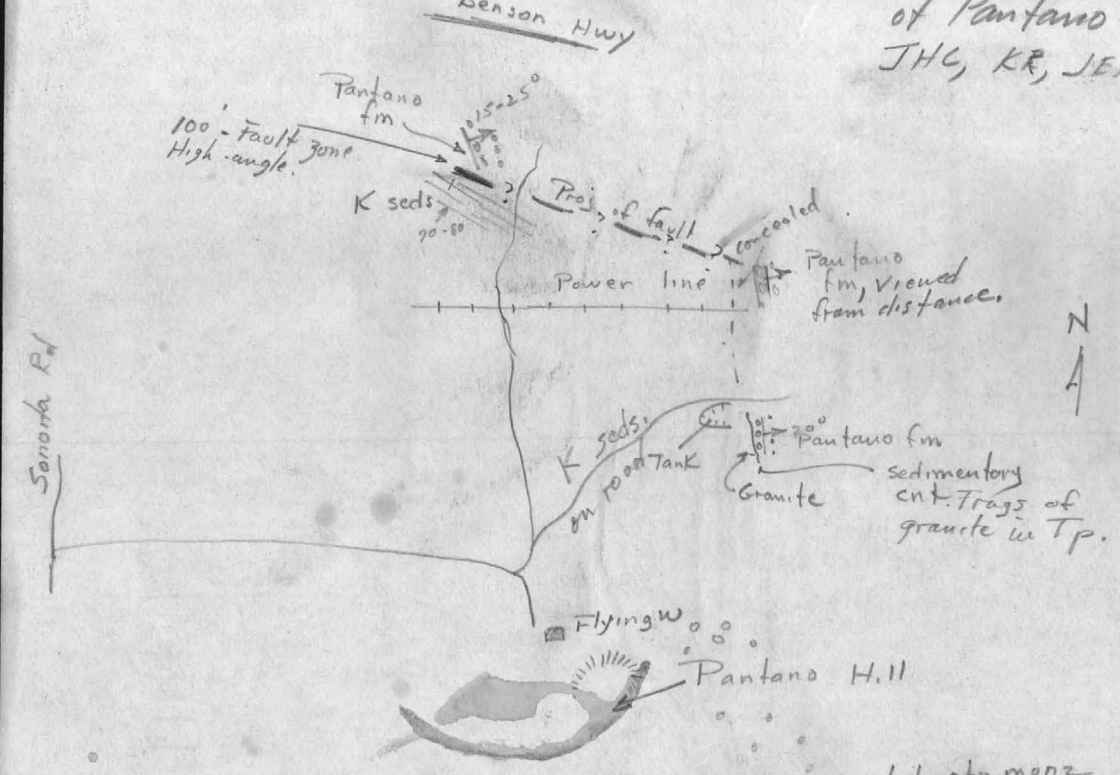
Length of section, about 2000'

PANTANO HILL

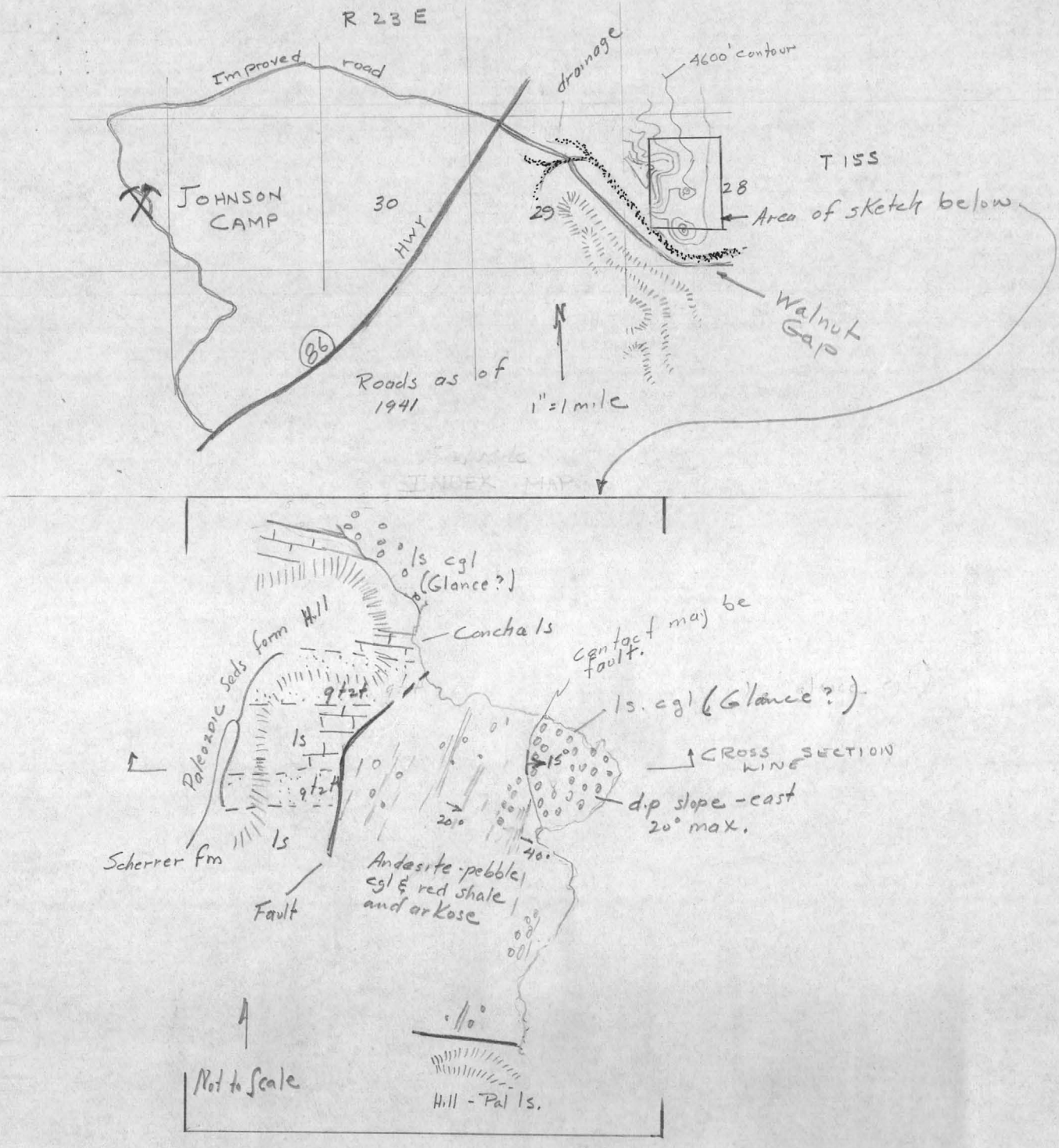


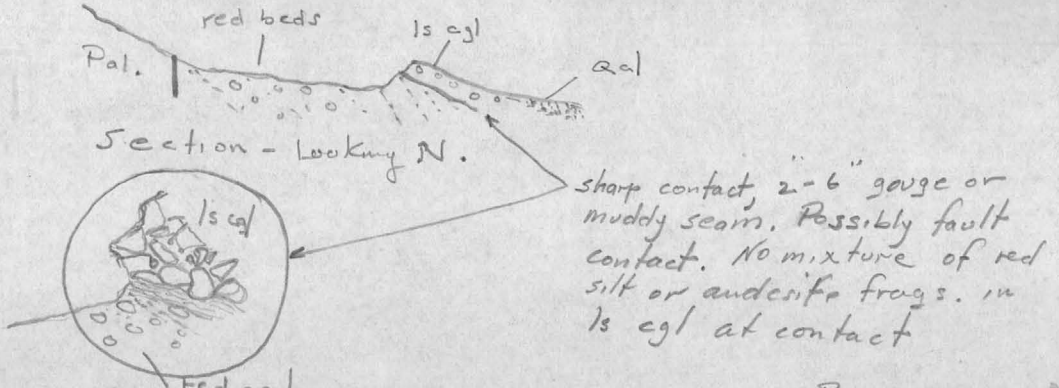
1. Contact concealed, but closely located.
2. Limestone pebble conglomerate; pebbles elongated and are aligned forming stratification. Dips about 35-40°, conforming to Paleozoic ls making up hill. 15-30'. 200' exposed further south.
3. Contact with qtzt-qtz monz. conglomerate. Sedimentary, with local mingling of ls pebbles in qtzt-qm cgl. Contact zone 3' max.
4. Angular cobble-boulder cgl, consisting entirely of Bolsa (?) qtzt and qtz monz of the type seen north & west intrusive into Pal-K sediments. Considerable chlorite, slightly gneissic. This cgl is extensive east and southeast of Pantano Hill.

Reconnaissance on East slope of Pantano Hill, Empire Mtns.
JHC, KR, JEK. 6/30/59



Sketch Plan
Not to scale





— 1/8 Natural Size —
Sketch of contact at base of ledge.

Reconnaissance sketch
Walnut Gap
J.H.C., K.R., J.E.K. May 1960

Notes from U. Ariz.
Thesis. Near Tucson.

= Vitrophyric
Augite and
2950
T5
T3
Exp in wash 10'
Rubble of T-1
T-1
T3
Hwy Tailor
T3
T5
3050
3000
3000
TP
350
3000
Pc gr

500'

500' = 1

Abstact

The Petrography of the Twin Hills, Pima County, Arizona

H. M. Cochran. M.S. Thesis, 1914

See Tucson Quad, and later Rincon Valley Quad.
Small Knolls about 14 Miles E. of Tucson, 2-3 Miles NW of Saguaro Nat'l Mon.

Geol Map, x-sections, photomicrographs.

Rock types described.

P-c "Catalina granite"

Trap - dikes few inches thick, cut granite.

P 1 Limestone - white to pink, f. gr. contains coral stems. Fragmental. assigned to Paleoz.

T 1 Rhyolite. light gray, felsitic text. w/ inconspicuous inclusions of "decayed rhyolitic material", aligned to give flow struct. Pheno. qtz & ortho. Correlates it to rhyolites in Tucson Mtns (Gould). Believes it underlies the Plag. Basalt.

T 2 Plagioclase basalt (This is the Tbp type) Contains locally amygdules w/ green stain. Phenocrysts Ab 42 An 58 (labradorite). Some augite.

T 3 Augite andesite. - Buff to bluish red, fesitic groundmass w/ numerous white pheno. of feld. Pheno set in flow pattern, as is the groundmass. Pheno. are oligoclase (Ab 65, An 35). Subordinate amount of pyroxene, some enclosed in feldspar. large fresh pyroxenes are augite. Qtz is present only as a secondary mineral.

T 4 Vitrophyric augite andesite. Forms dikes at contact between Aug. and and Plag. basalt. Perlitic groundmass, andesine pheno. and some augite pheno.

T 5 Olivene Basalt. Dense, dark bluish grey rock, with no constituent visible except numerous red specks of altered olivene material - idelingsite. Groundmass consists of andesine microlites. Apatite in small needles.

Believe to be a flow rock; "probably followed in sequence the vitrophyric augite andesite." Placed in this sequence on basis of comparable rocks at Tumamoc Hills (Tolman).

Note: Twin Hills is faulted on granite, dip of fault plane very low and slightly undulating. See my recon. sketch.

Terence

T. L. Brith M.S. Thesis Ariz 1955

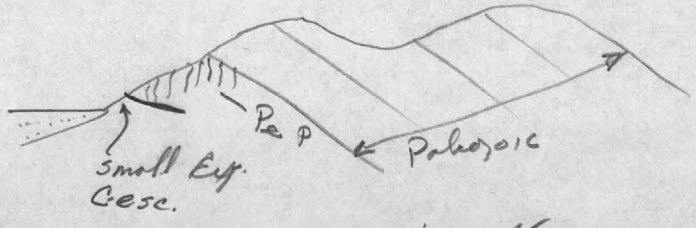
The Geology of the Twin Peaks Area, Pima County, Arizona.
(Picacho de Calero - old maps)

Detailed study of Twin Peaks (Picacho de Calero) in Tucson Mountains (Redrock Quad).

In study of Martin, ~~found no~~ made no mention of Cladapora zone.

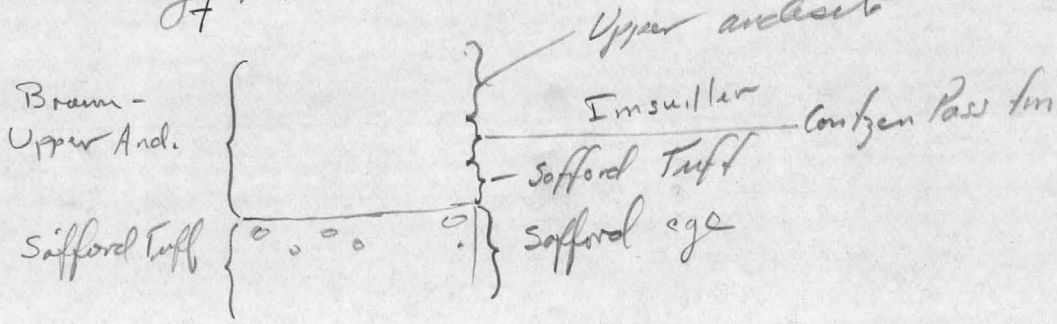
Naco fm highest Paleoz. exposed. Contact in most of the area intruded by red brown igneous rock, termed Dacite by Petrog. study. This rock intrudes as dikes and sills some (00') of the Abrigo and other fms, and as a sill on Naco-Escabrosa contact. Naco as measured is mostly limestone at this to thickness totaled 896' exposed. No mention of Dictyoclostus Brachs made.

Brith interprets the Twin Peaks as the NE flank of an anticline related to the "Tucson Mountain syncline". I interpret the contact of Paleozoic with Escabrosa as high angle fault zone, the exposed low dip due to slumping ~~or irregularity~~ or tilting.



Looking N.

Above the cgl's which Brown (1939) called Safford tuff, Imsweiler makes these subdivisions, all (mapped) correlated with upper andesite ~~by~~ of Brown.



Safford Tuff (Imsweiler -) 20-200' thick

May be seen So. side of So. hill at Contzen Pass. Traced to North of Safford Peak.

3 types:
- White Ashy tuff w/ biotite
- Pumice tuff w/ sand
- Aggl. w/ Tuff & sand matrix - hard

"Contzen Pass fm" - Overlies safford tuff - traced from Contzen Pass to No. of Safford Peak. 20-40' thick. Vitrophyre, w/ phenos of oligoclase, biotite, hornblende, diopside and apatite. Shards are "present but not abundant". Perlitic Matrix. Classified on groundmass index 1.495 as rhyolite obsidian. Color gray to black. 10' ash at top.

Abstract of part of M.S. thesis (U.A.) by Imsweiler

Some Notes on: Geol. of the Cerro Colorado Mining District, Pima Co, Ariz. A U. of A. Thesis by Richard D. Jones, 1957

General statement: Map seems to have been done with care in plotting outcrops, but structural interpretation may be weak. The text itself is very brief and geol. order of events and rocks is not well presented. Jones' interpretations as to rock sequence needs to be taken with caution. Descriptive data, accompanied by photomicrographs, is good.

Rocks: As I understand it, the sequence proposed is as follows. The possible correlations (following page) are my own.

And por. and aglom.
Black Princess Bx
thin limestone
Congl 2
Congl 1 — Felsite intrudes cgl 1
Erosion, deformation
Sandstone and arkose
qtz latite porphyry — ±Poss. below Sand. More likely intrudes it.
qtz porph.
qtz diorite
granodiorite (intrudes qtz diorite)

Rhyolite sill intrudes sandstone.

1. The sandstone and arkose sequence is thin-bedded, gray. Photos show resemblance to either K anole or to dacite sandstone of Claflin at Silver Bell.

2. The q/z latite porphyry, in description and photomicr. appears to be Cat Mtn. rhy. Jones thinks it to be intrusive, or possibly a flow below sandstone. Structure not mapped would be required to get it to Cat Mtn position over the sandstone.

3. Congl 1 is composed of q/z latite por. frags. and q/z-t frags. The matrix in places in thin section is rhyolitic textured. Ribbon rock? Claflin Ranch equivalent? Jones equates it to Davis' latite cgl

4. Congl 2 is composed of frags of q/z latite por., q/z-t, and andesite, and underlies the limestone near Black Princess mine. Claflin Ranch equiv?

5. Thin limestone is not over 40' thick, pale red to brown, massive, fine-gr., unfossiliferous, silty matrix. - Possible chaos slab (?)

occurs at Black Princess Mine

6. Black Princess breccia. Andesite agglom., stated to be different from "7" in appearance. Silver Bell?

7. Andesite por and andesite agglom. This is Silver Bell formation where I have seen it by Cerro Colorado Mine.

8. Felsite intrudes cgl. Ribbon rock?

9. Qtz diorite intruded by granodiorite.. both mafic rocks similar to one another. Intrude the qtz latite porphyry.

10. Qtz porph. dikes. May be all biotite rhy. or might be the aphanitic porphy type.

11. Rhyolite sill, intrudes sandstone at crest of hill north of Cerro Colorado. Ribbon rock?

Notes on:

"Geology of the Mary G Mine Area, Pima County, Ariz. A M.S. Thesis by Robert E. Davis, 1955, Univ. of Ariz.

Abstracted by JCK.

Field work 1948-49.

Quality of work seems O.K. Certain areal patterns of rocks termed qtz-latite porphyry and latite cgl. seem odd in view of stratigraphic relationships proposed by Paves, but may be O.K. -- needs checking.

Rocks. Described well. Several petrographic descriptions.

Columnar

Qtz latite cgl: red to tan, forms small cliffs. Small phens. qtz and feld, 20-45%. aphanitic groundmass (devitrified glass). (Might be called Rhy - but not certain. inclusions not mentioned - JCK)

Base not seen.

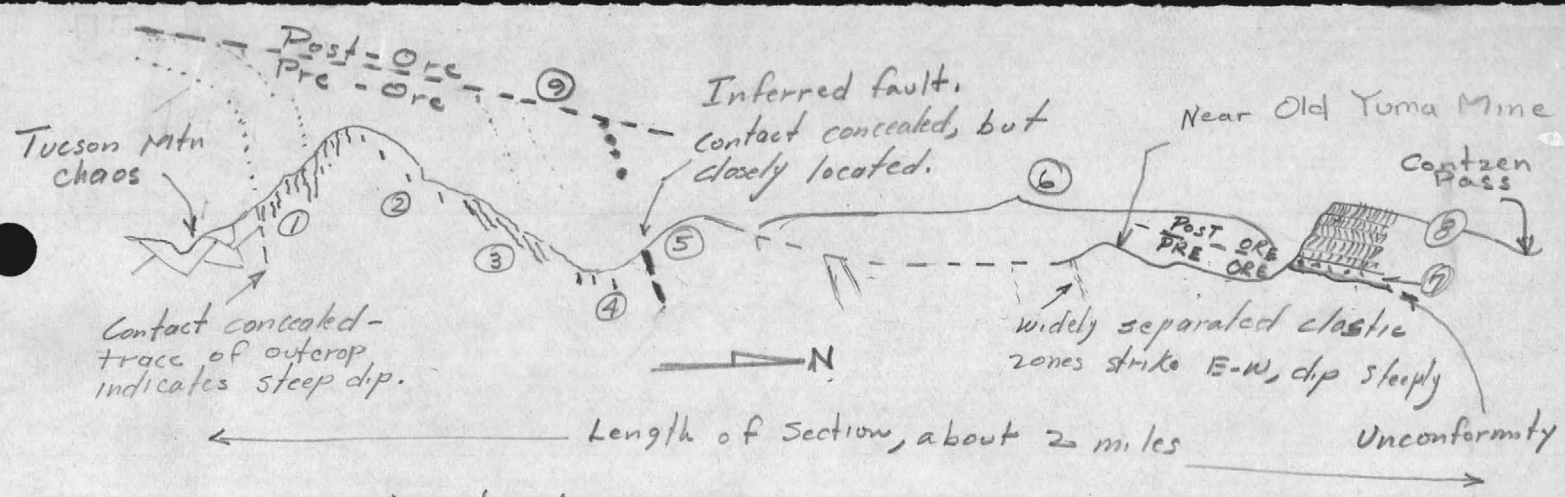
latite cgl. - Composed mainly of qtz latite frags. similar to flow beneath. 15% rounded qtz-t frag. Variable thickness interpreted as filling channels. -- only locally present. Good otherwise scarce.

Andesite porphyry. Weathers generally to low hills. Gray or green, propylytic alt. No frags. mentioned. (prob. Silver Bell - JCK).

Mary G Mine.

High silver — in galena and/or tetrahedrite. mentions cinnabar.

Tucson Mts.



Cat Mountain rhyolite 1–4.

1. Welded tuff -- weathers purple and brown. Abundant pebble-size inclusions. Streaks of purple material are aligned with flow structure. 200' thick

2. Flow or welded tuff. Massive light brown. 100' thick.

3. Welded tuff. Abundant pebble-size inclusions. Well developed flow structure. 200' thick.

4. Welded tuff. Purple, fragmental. Does not appear to be as completely "welded" as lower units. 200' thick.

Inferred fault separation between "4" and "5".

5. Massive rhyolite, light brown. Contains a few scattered, small phenocrysts. Prominent manganese oxide stain on surface.

6. Andesite, andesite porphyry, andesite pebble conglomerate and/or flow breccia. Occasional thin zones of water laid tuff and arkose. Possibly related to Silver Bell formation.

Unconformity between "6" and "7"

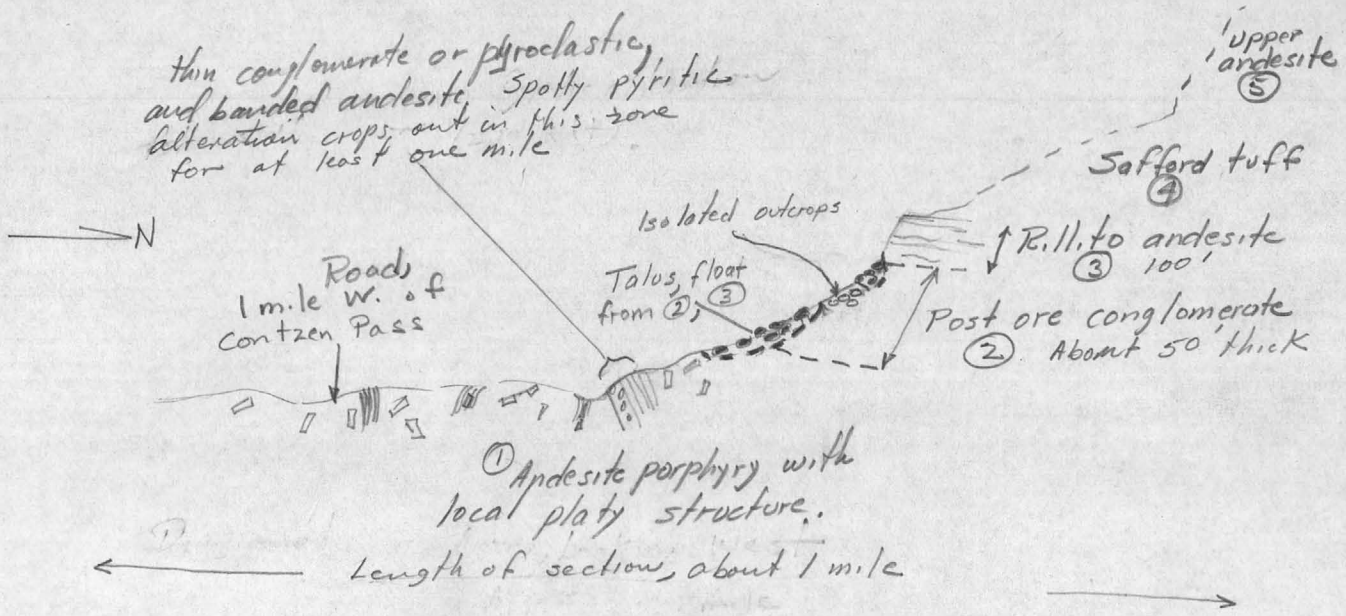
7. Thin zone containing soft chalky white tuff w/ biotite, and dark grey andesite porphyry

8. "Upper andesite" (Brown, 1939). Brown porphyritic andesite with well developed flow structure.

9. Projection of unconformity surface, based on outcrops @ 7 & 8, and on an outcrop ½ mile NE of the hill composed of Cat Mtn rhy.

DIAGRAMMATIC CROSS SECTION,
Looking West
North end of Tucson Mountains

Reconnaissance JEK, 1959
Refer: Brown map 1939



① Purple andesite porphyry. local platy flow structure. partly magnetic. Includes other andesites.

② Angular cobble conglomerate, unstratified and unsorted. frags. of ①, siltstone and of arkose, slightly altered, and light colored highly alt. porphyry with live(?) limonite.

③ R.11. to andesite (Brown, 1939). On fresh surface is red brown, with plag. phenocrysts and bright black biotite. Stringers of chalcedony prevelent. R.11. to andesite pinches out to the E. and thickens to the W.

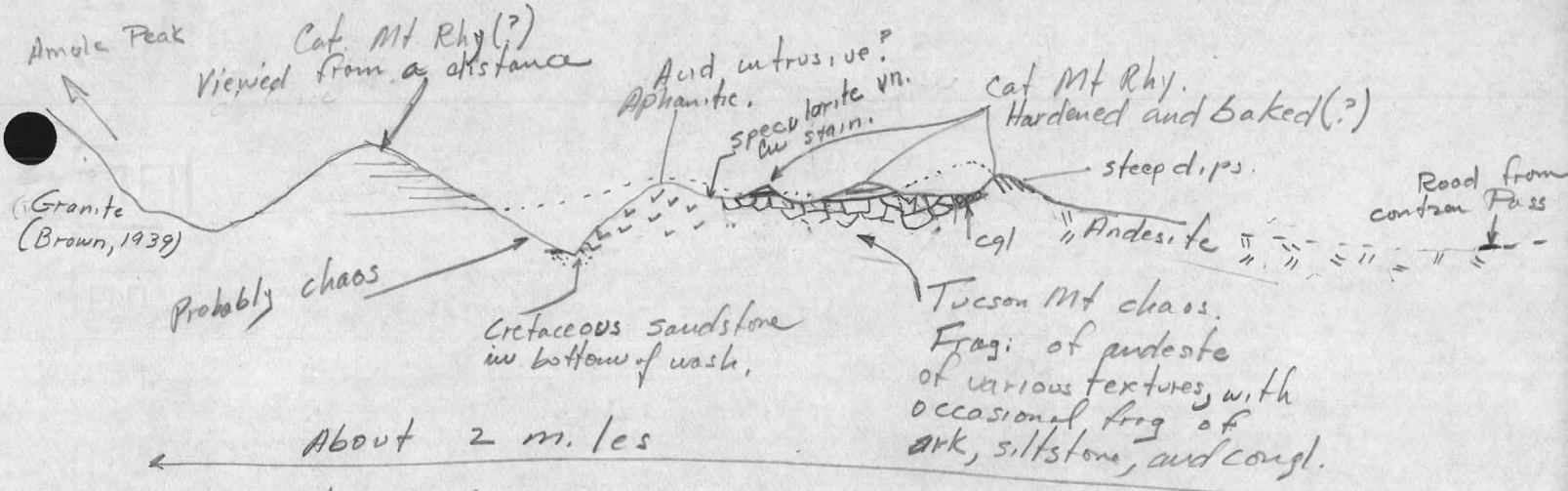
④ Safford tuff (Brown, 1939) Not examined.

⑤ Upper andesite (Brown, 1939) Light brown to purple ~~reddish~~ gray andesite. Biotite and plag. phenocrysts. Pronounced flow structure and weathered elongate pits on surface. Examined float on talus slope, ~~rock in place~~ outcrop not visited.

DIAGRAMMATIC CROSS SECTION
Looking West

North End of Tucson Mtns
1 mile west of Contzen Pass

Reconnaissance July 21, 1959.
KR, JHC, JEK

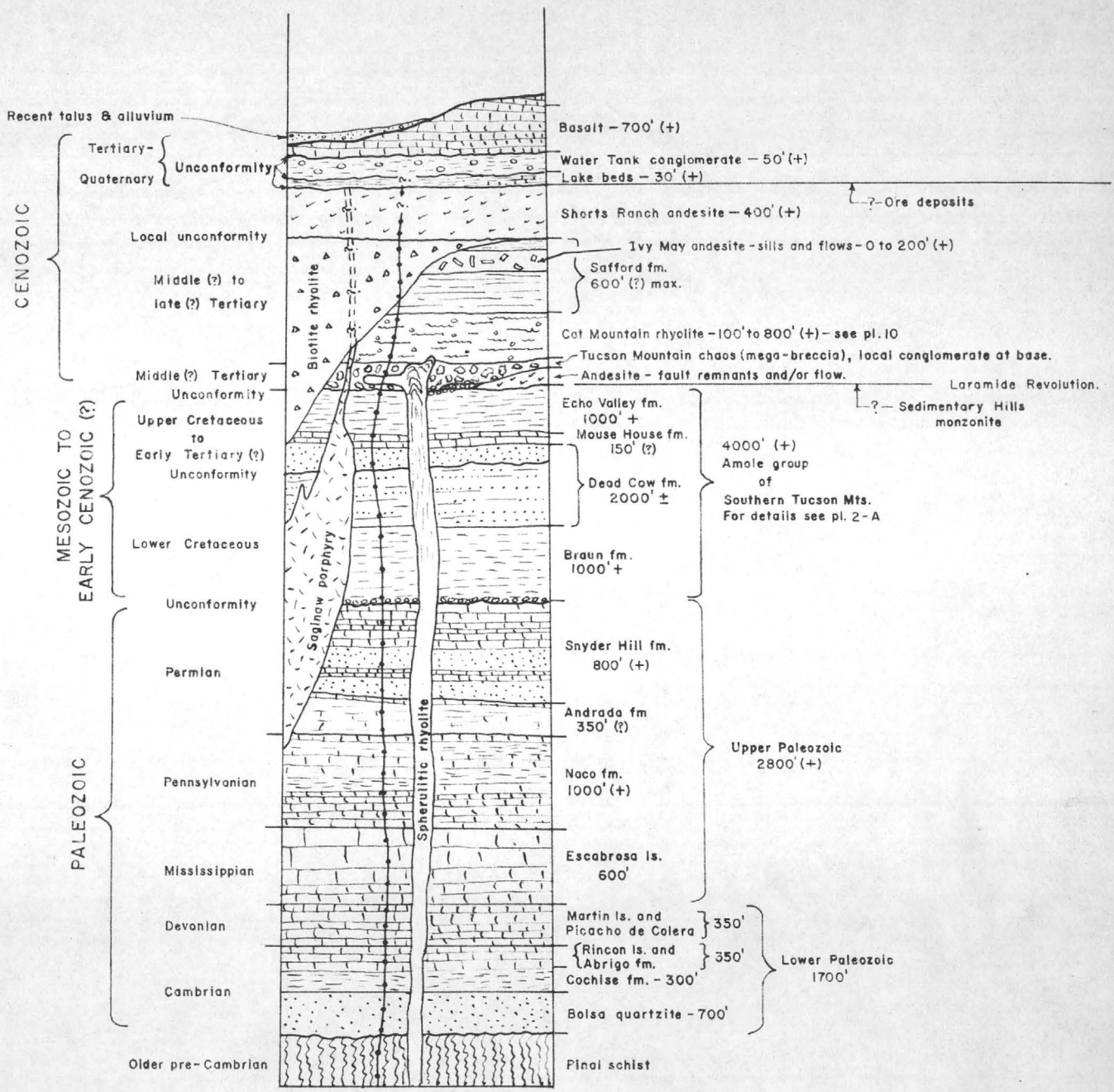


Note. Rocks tend to blend with one another in both color and texture, probably due to weak metamorphism or "baking" by the nearby granitic mass. Structural relationships are not entirely clear.

sketch section about 1½ Miles W. of Old Yuma Mine, Looking West.

Reconnaissance by KR, JHC, JEK July 21, 1959

M.S. THESIS, J.E. Kinnison (U.A.)
(Copy of thesis in library)
(Asarco Tucson)



GENERALIZED STRATIGRAPHIC COLUMN

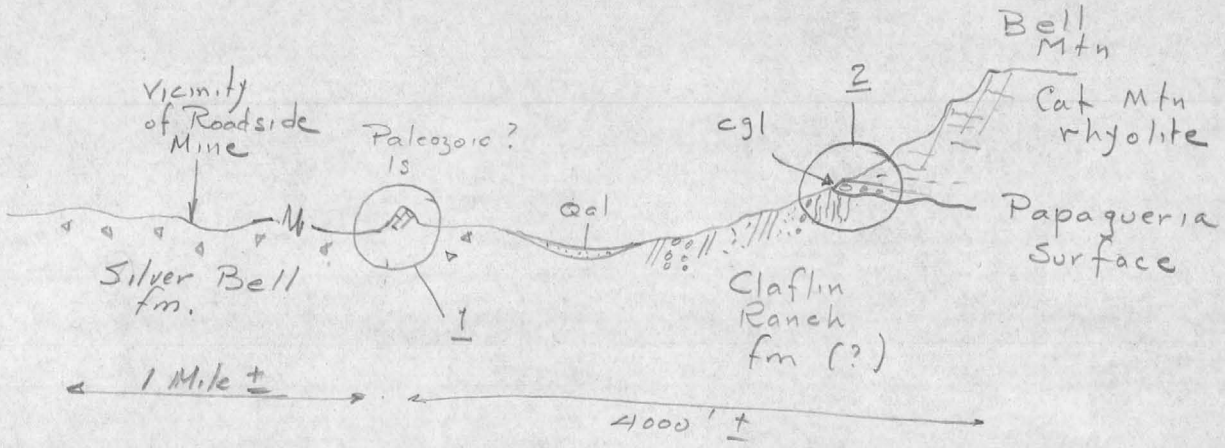
Southern Section of the Amole Mining District.

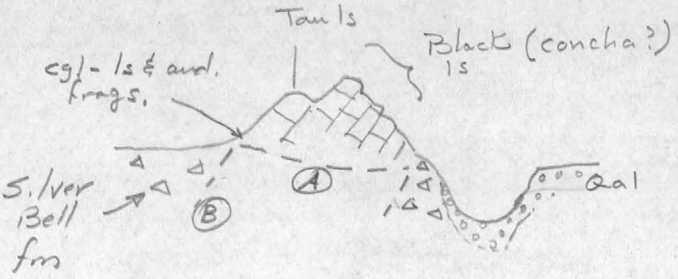
Not to Scale.

Plate 2

Baboquivari Region

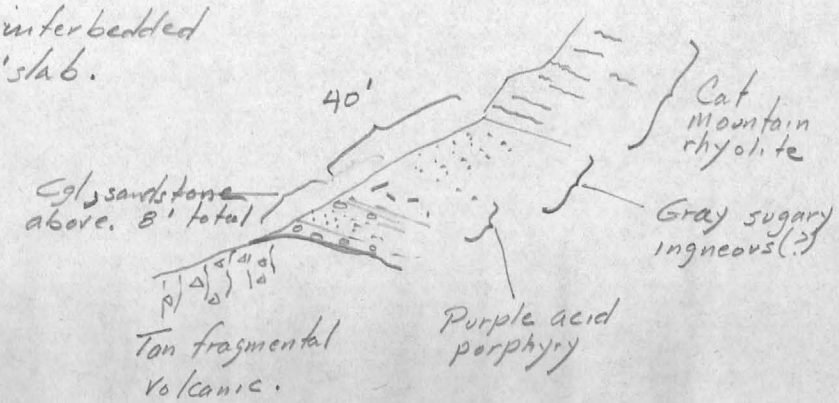
NE





Enlarged, area 1

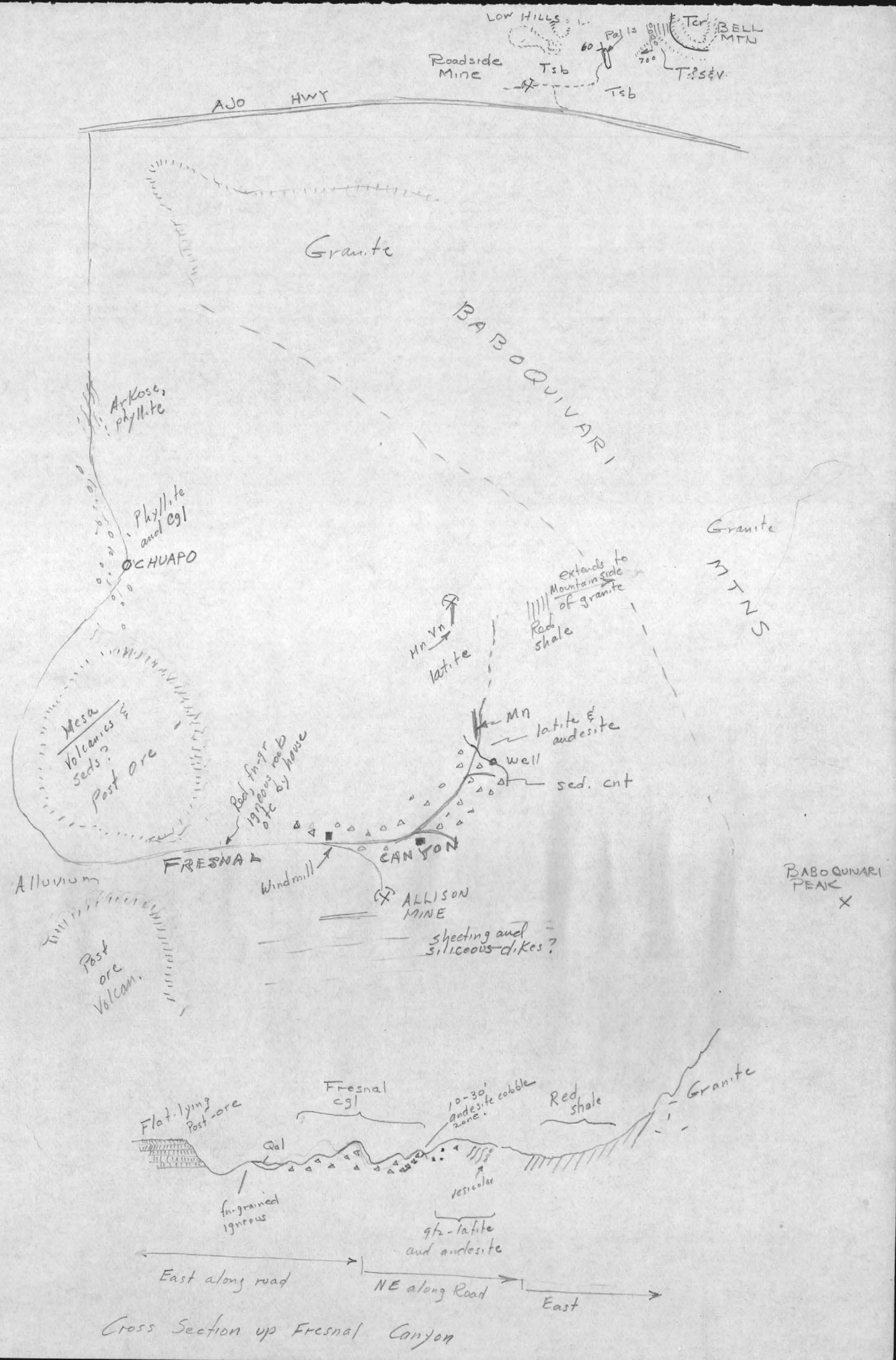
limestone may be a slab (chaos?) on Silver Bell (interpretation A) or interbedded (interpretation B) as a "chaos" slab.



Enlarged, Area 2

SKETCHES
Looking Northwest
Bell Mountain - Roskruge Mts
Ariz

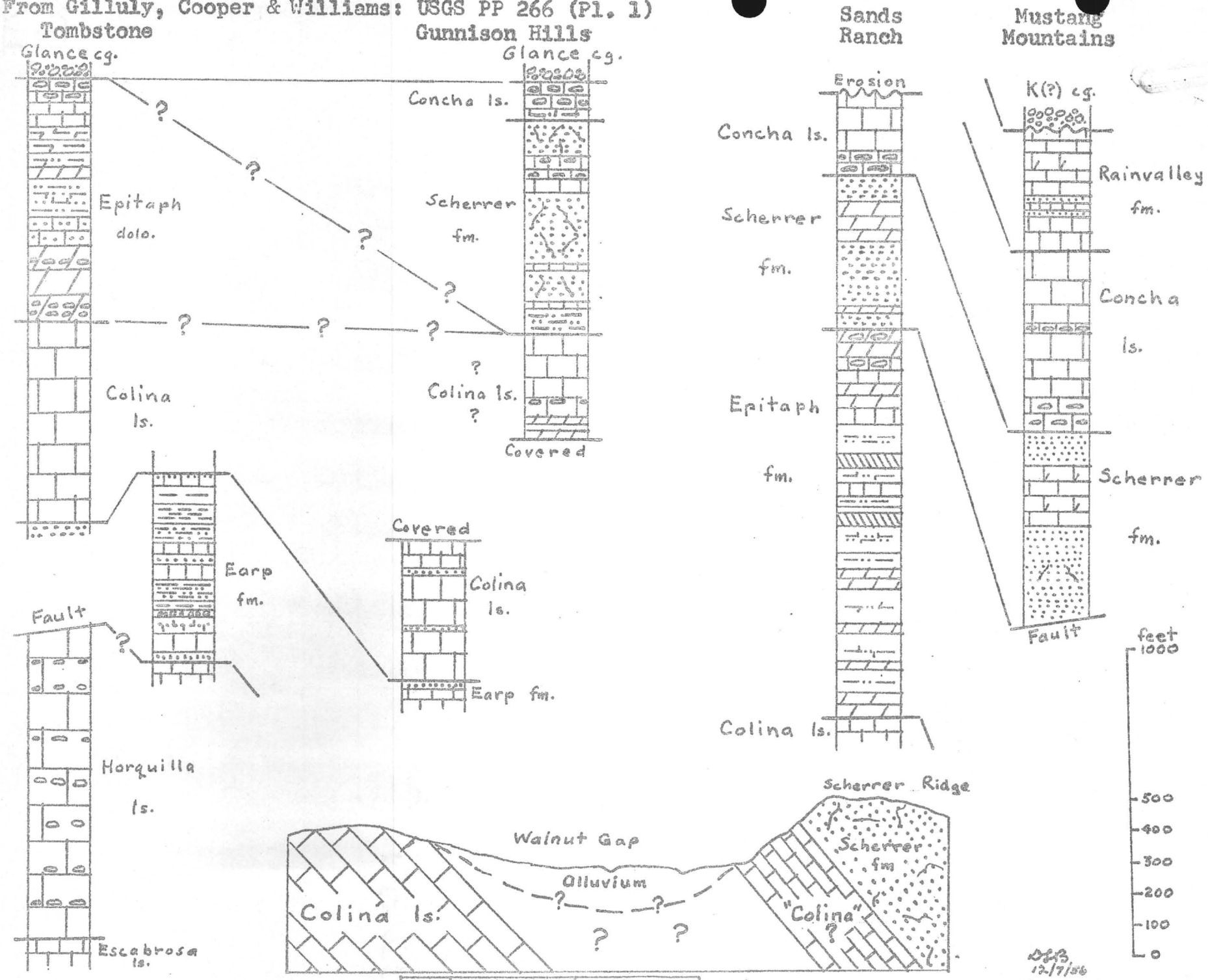
J.E.K. } Reconnaissance
J.H.C. } 1959
K.R.



Cross Section up Fresnal Canyon

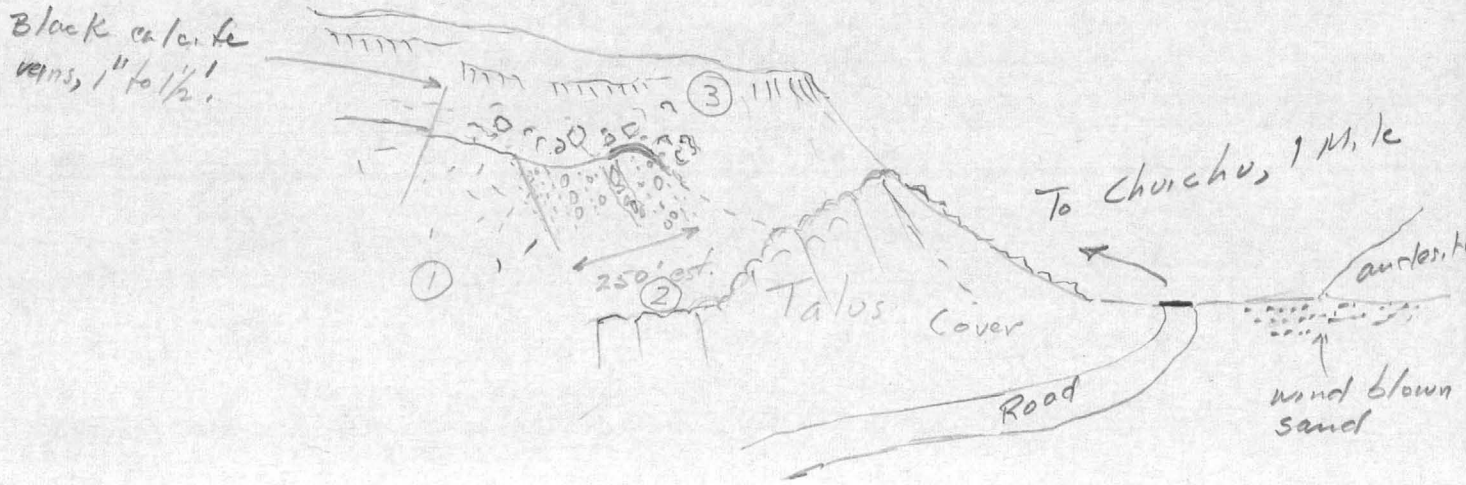
PERMO-PENNSYLVANIAN SECTIONS IN SOUTHERN ARIZONA

From Gilluly, Cooper & Williams: USGS PP 266 (Pl. 1)



Synthesized by D.L. Bryant Sr., 1956

Casa Grande Mining District.
(South of Casa Grande)



1. Pre-Cambrian granite. Coarse-grained gray to brown granite with large pink orthoclase. Irregular blebs qtz and ragged biotite. Weathers red on slopes.

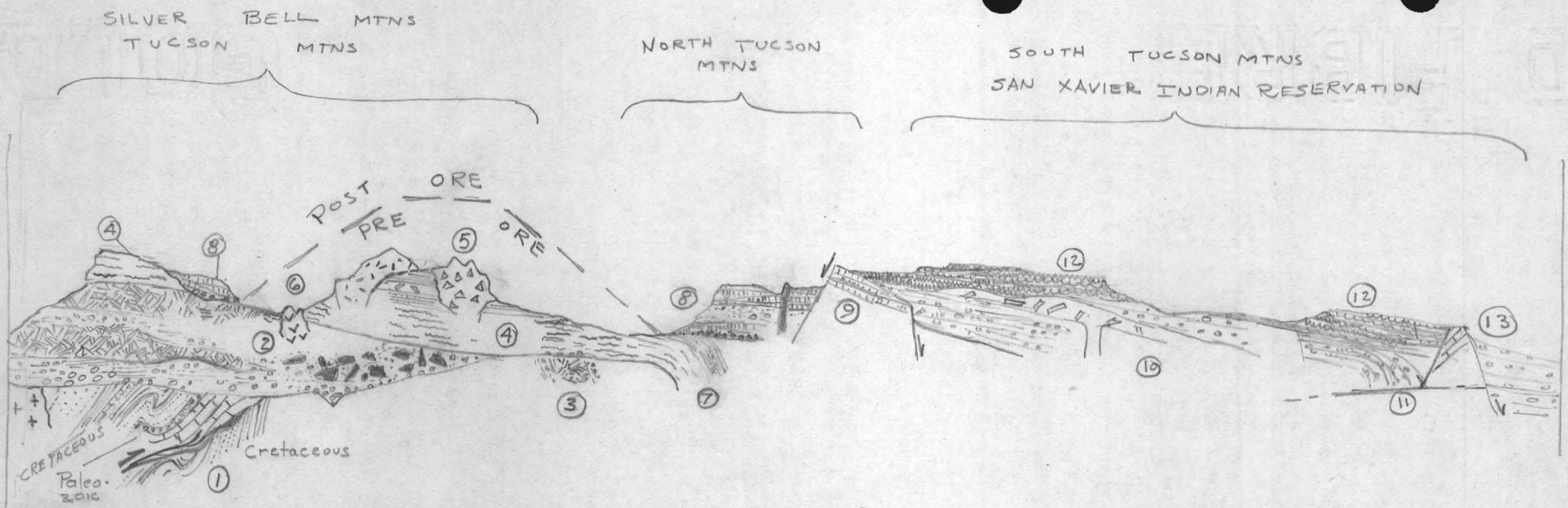
2. Tertiary post-ore conglomerate and grits. Well-bedded granitic grit with frags, partly rounded, of Apache group (Pioneer fm, Dripping Spring qtzt, Troy qtzt, Mescal (?) ls), pre-€ granite, and Pinal schist. About 5% frags. of porphyry - some altweakly, w/ traces hem after sulfide. Basal portion all granitic grit, other frags appear higher in section. Fm. appears to be lacustrine, not a fanglomerate.

3. Andesite or latite, much manganese stain. Brown on fresh surface. Tight flow contact over granite and congl. Irregular flow bx -- not related to basal contact area.

Field trip
JEK JDS

North end of Silver Reef Mts.
Pinal County, Ariz
Looking NW

JEK Dec 1963



DIAGRAMATIC CROSS SECTION

Illustrating Age Relationships and Structural History

Post-Cretaceous Rocks near Tucson, Arizona

1. Intense deformation of Paleozoic and overlying rocks of probable Lower-Upper Cretaceous Age. Laramide revolution of Upper Cretaceous or Early Tertiary. Intrusion of granitic stocks.

2. Erosion to surface of low relief; the "Tucson surface" (Kinnison, 1958, 59) Deposition of Claflin Ranch clastic beds (Richard and Courtright, 1960), Tucson Mtn. chaos (Kinnison, 1958, 59) and extrusion of Silver Bell formation (Richard and Courtright, 1960) andesite breccias.

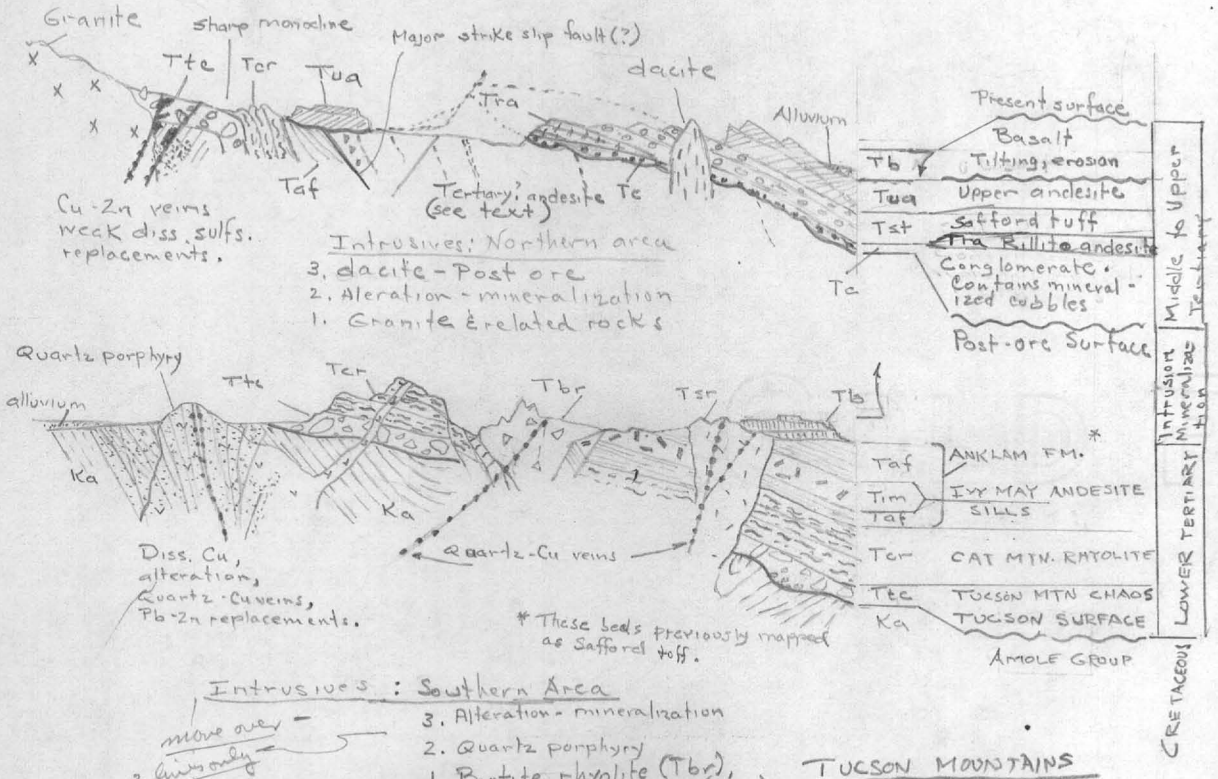
3. Tilting or monoclinal folding in some areas

4. Extrusion of Cat Mountain rhyolite (Brown, 1939). In the Tucson Mtns this is overlain in succession by the Anklam formation (new name), Ivy May andesite (Kinnison, 1958) (sills), and Shorts Ranch andesite (Brown, 1939).

5. Intrusion of Biotite rhyolite (also flows)

6. Intrusion of monzonitic plugs and stocks. Mineralization by Cu, Pb, Zn, Ag followed on extensive scale.

J.E.K. 1961



These sections do not represent any one particular cross section, but are composites of many different sections, compiled for illustration purposes only.
Not drawn to scale.

TUCSON MOUNTAINS

DIAGRAMMATIC CROSS SECTIONS WHICH ILLUSTRATE ROCK SEQUENCES.
1. Northern area - Upper section
2. Southern area - Lower section

John E. Kinnison 1961

Center in a page
5.4" high
8.8" long