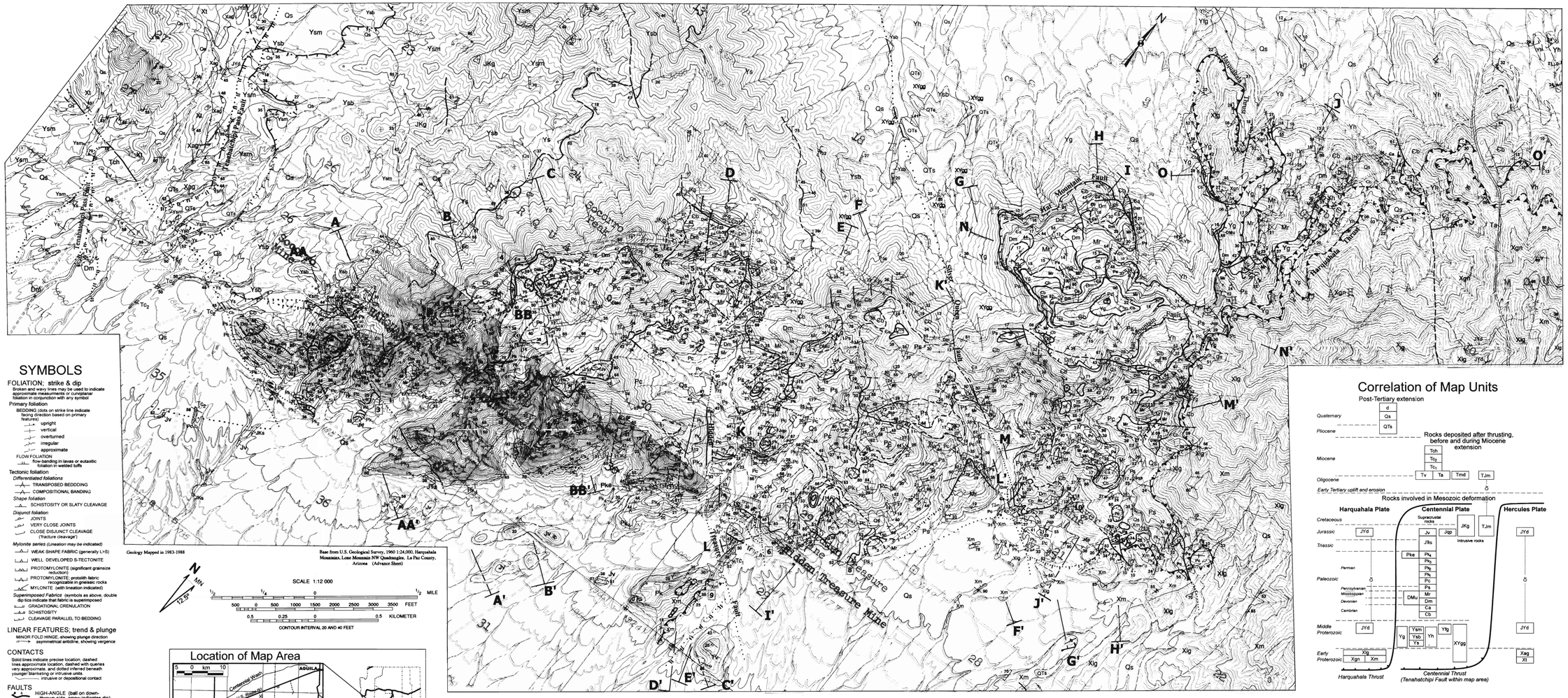

Geologic Map of the Socorro Mine-White Marble Mine area, Harquahala Mountains, La Paz County, Arizona

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1999

Arizona Geological Survey
Open-File-Report 99-9

SYMBOLS

FOLIATION: strike & dip
Broken and wavy lines may be used to indicate approximate measurements or curvilinear foliation in conjunction with any symbol

Primary foliation
BEDDING (dots on strike line indicate facing direction based on primary features)
- upright
- vertical
- overturned
- irregular
- approximate

FLOW FOLIATION
- flow-banding in lavas or eutaxitic foliation in welded tuffs

Tectonic foliation
Differentiated foliations
- TRANSPOSED BEDDING
- COMPOSITIONAL BANDING

Shape foliation
- SCHISTOSITY OR SLATY CLEAVAGE

Disjunct foliation
- JOINTS
- VERY CLOSE JOINTS
- CLOSE DISJUNCT CLEAVAGE (fracture cleavage)

Mylonite series (Lineation may be indicated)
- WEAK SHAPE FABRIC (generally L>S)
- WELL DEVELOPED S-TECTONITE
- PROTOMYLONITE (significant grainsize reduction)
- PROTOMYLONITE; protolith fabric recognizable in gneissic rocks
- MYLONITE (with lineation indicated)

Superimposed Fabrics (symbols as above, double dip tics indicate that fabric is superimposed)
- GRADATIONAL CRENULATION
- SCHISTOSITY
- CLEAVAGE PARALLEL TO BEDDING

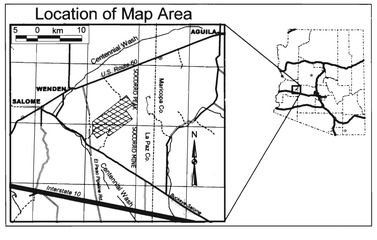
LINEAR FEATURES; trend & plunge
- MINOR FOLD HINGE; showing plunge direction
- asymmetrical anticline, showing vergence

CONTACTS
Solid lines indicate precise location, dashed lines approximate location, dashed with queries very approximate, and dotted inferred beneath younger blanketing or intrusive units
- intrusive or depositional contact

FAULTS
- HIGH-ANGLE (ball on down-thrown side, arrow indicates dip)
- LOW-ANGLE (barbs on hanging wall) thrust
- low-angle, nature uncertain
- low-angle normal fault

MISCELLANEOUS
- Tie line joining regions underlain by same map unit
- 1 Mineralized site described in text; numbered sequentially

Location of Map Area



Map Units

Tertiary or Quaternary surficial and basin-fill deposits

- **d** — **Disturbed surficial deposits** (Holocene) -- Gravel, broken rock and rearranged surficial deposits on mine dumps.
- **Qs** — **Surficial deposits** (Quaternary) -- Non-indurated to poorly indurated sand, silt, and gravel.
- **QTs** — **Old alluvium** (Quaternary or Tertiary) -- Massive, cobble to boulder conglomerate, underlies highest geomorphic surfaces preserved.

Tertiary volcanic and sedimentary rocks

- **Tch** — **Chaos** (Miocene) -- Mixed Paleozoic limestone, diorite, pegmatite, mylonitic biotite granitoid and deformed, altered porphyritic biotite granitoid.
- **Tc$_2$** — **Arkosic sandstone and conglomerate** (Miocene)-- Buff, moderately indurated arkosic sandstone and conglomeratic sandstone.
- **Tc$_1$** — **Conglomerate** (Miocene) -- Red-brown cobble conglomerate.
- **Tv** — **Felsic volcanic rocks** (Miocene) -- Interbedded welded tuff and tuffaceous sandstone.
- **Tmd** — **Mafic dikes** (Miocene or Oligocene) -- Dark gray-with aphanitic to fine grained diorite to gabbro dikes. Fresh-like rock consists of hornblende and plagioclase.

Tertiary, Mesozoic or Proterozoic intrusive rocks

- **TJm** — **Biotite porphyry** (Tertiary or Jurassic) -- Gray dikes containing distinctive 2-5 mm diameter biotite phenocrysts in a very fine-grained to aphanitic groundmass.
- **JKg** — **granodiorite** (Cretaceous or Jurassic) -- Fine-grained, dark gray equigranular to slightly porphyritic granodiorite.
- **Jqp** — **Quartz-feldspar porphyry** (Jurassic) -- Light gray quartz-feldspar porphyry dikes; typically moderately to strongly cleaved and altered.
- **JYd** — **Mafic to intermediate intrusive rocks** (Jurassic or Middle Proterozoic) -- Mostly medium-fine grained, texturally variable diorite, locally ranges from gabbro(?) to granodiorite; occurs as small pods; disseminated in biotite granitoids, augen gneiss and Tenahatchipi Pass. Dikes of fine-grained diorite in the Harquahala Plate are also included in this unit.
- **JXg** — **Granitic rocks** (Jurassic or Early Proterozoic) -- Includes several separate small bodies of generally fine- to medium-grained equigranular biotite granodiorite.

Mesozoic volcanic and sedimentary rocks

- **Jv** — **Felsic volcanic rocks** (Jurassic) -- Locally flow banded maroon and purple dacite or rhyodacite lava(?) flows, agglomerates, laminated and massive tuff and red, volcanic-lithic sandstone.
- **JRs** — **Basal Mesozoic sedimentary rocks** (Cretaceous or Late Jurassic) -- Medium- to coarse-grained feldspathic sandstone and pebble to cobble conglomerate with siltstone partings.

Paleozoic sedimentary rocks

Kaibab Limestone (Permian)
- **Pke** — Evaporite member -- Massive anhydrite or gypsum with very light purple gray and green/gray mottled, blast-rich, very fine-grained sandstone.
- **Pk4** — Unit 4 -- Thick-bedded light gray, cherty and fossiliferous limestone, with locally preserved tan silty sandstone in upper part.
- **Pk3** — Unit 3 -- Medium-bedded dark-gray limestone, contains sparse, poorly preserved fusilinids and large gastropods.
- **Pk2** — Unit 2 -- Massive, cherty, medium gray limestone. Rock is crinoid grainstone.
- **Pk1** — Unit 1 -- Basal sandy dolomite grades up into cherty, fossiliferous dolomitic limestone, with large crinoid columnals, echinoid spines and brachiopods.
- **Pc** — **Coconino Quartzite** (Permian) -- White, vitreous, fine- to medium-grained, well sorted quartzite; mostly very thin-bedded, plane laminated or in medium- to large-scale trough cross sets.
- **Ps** — **Supai Formation** (Pennsylvanian or Permian) -- Interbedded, thick-bedded, white, vitreous quartzite, calcareous sandstone, maroon mudstone, limestone and dolomite, forming prominently banded, dark brown desert varnished outcrops.
- **Mr** — **Redwall Limestone** (Mississippian) -- Lower thick-bedded light gray and orange limestone and dark gray dolomite, overlain by variably dolomitized massive, cherty, light gray limestone; non-resistant crinoid grainstone is locally preserved beneath the karst zone at the top of the unit.
- **Dm** — **Martin Formation** (Late Devonian) -- Brown, gray and tan dolomite and dolomitic limestone; chocolate brown sandy dolomite at the base; one or two coarse, poorly-sorted sandstone beds are present.
- **Ca** — **Abrigo Formation** (Late Cambrian and Middle Cambrian) -- Dark gray, maroon and gray-green sandy shale interbedded with very thin fine-grained feldspathic sandstone.
- **Cb** — **Bolsa Quartzite** (Middle Cambrian) -- Maroon-gray feldspathic sandstone; grit and pebble conglomerate at the base are overlain by medium- to fine-grained sandstone with siltstone partings up section.

Proterozoic igneous and metamorphic rocks

- **Yg** — **Granitic rocks** (Middle Proterozoic) -- Equigranular to slightly porphyritic granitoid.
- **Ys** — **Socorro suite** (Middle Proterozoic) -- The Socorro suite forms a zoned plutonic complex that underlies Paleozoic rocks of the Centennial Plate in the Western Harquahala Mountains.
  - **Socorro granite** -- Medium to coarse-grained porphyritic granitoid.
- **Ysm** — **Muscovite granite** -- Medium-grained, mostly equigranular muscovite granite.
- **Ysb** — **Biotite granite** (Middle Proterozoic) -- Medium coarse-grained, porphyritic biotite granite.
- **Yh** — **Harquahala Granite** (Middle Proterozoic) -- Megacrystic biotite granodiorite to granite with equant, blocky K-feldspar phenocrysts up to 5 cm in diameter.
- **Ylg** — **Fine-grained biotite granite** (Middle Proterozoic) -- Fine-grained, equigranular biotite to muscovite-biotite granite.
- **YXgg** — **Fine-grained granodiorite rocks** (Middle Proterozoic or Early Proterozoic) -- Fine-grained, foliated granodiorite, unfoliated granodiorite to monzogranite (resembling unit JKgd); and hypidiomorphic-granular granodiorite to monzogranite (border phase of Yh).
- **Xlg** — **Hydula leucogranite and pegmatite** (Early Proterozoic) -- Medium fine- to fine-grained, equigranular muscovite leucogranite.
- **Xag** — **Augen gneiss** (Early Proterozoic) -- Augen gneiss that contains 2-3 cm diameter, rounded K-feldspar augen in an aggregate of granular quartz and feldspar with disseminated very fine-grained biotite.
- **Xgn** — **Heterogeneous gneiss** (Early Proterozoic) -- Quartz-feldspar-biotite gneiss, with variable amounts of pelitic schist, schistose hornblende-feldspar-quartz gneiss, biot.-rich, amphibolite-rich gneiss, and rare quartz-magnetite gneisses.
- **Xm** — **Mafic gneiss** (Early Proterozoic) -- Compositionally banded hornblende-rich gneisses ranging from amphibolite to plagioclase-biotite-hornblende gneiss.
- **Xt** — **Tenahatchipi Gneiss** (Early Proterozoic) -- Heterogeneous, fine-grained migmatitic gneiss; components include amphibolite to biotite-hornblende-feldspar-quartz and quartzo-feldspathic gneiss abundant and injected by leucogranite.

Correlation of Map Units

Geologic Map of the Socorro Mine-White Marble Mine area, Harquahala Mountains, La Paz County, Arizona

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