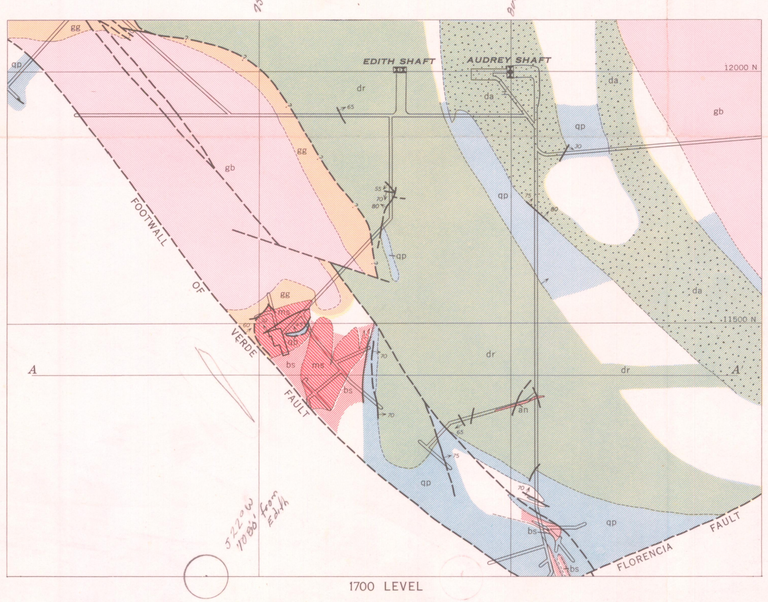
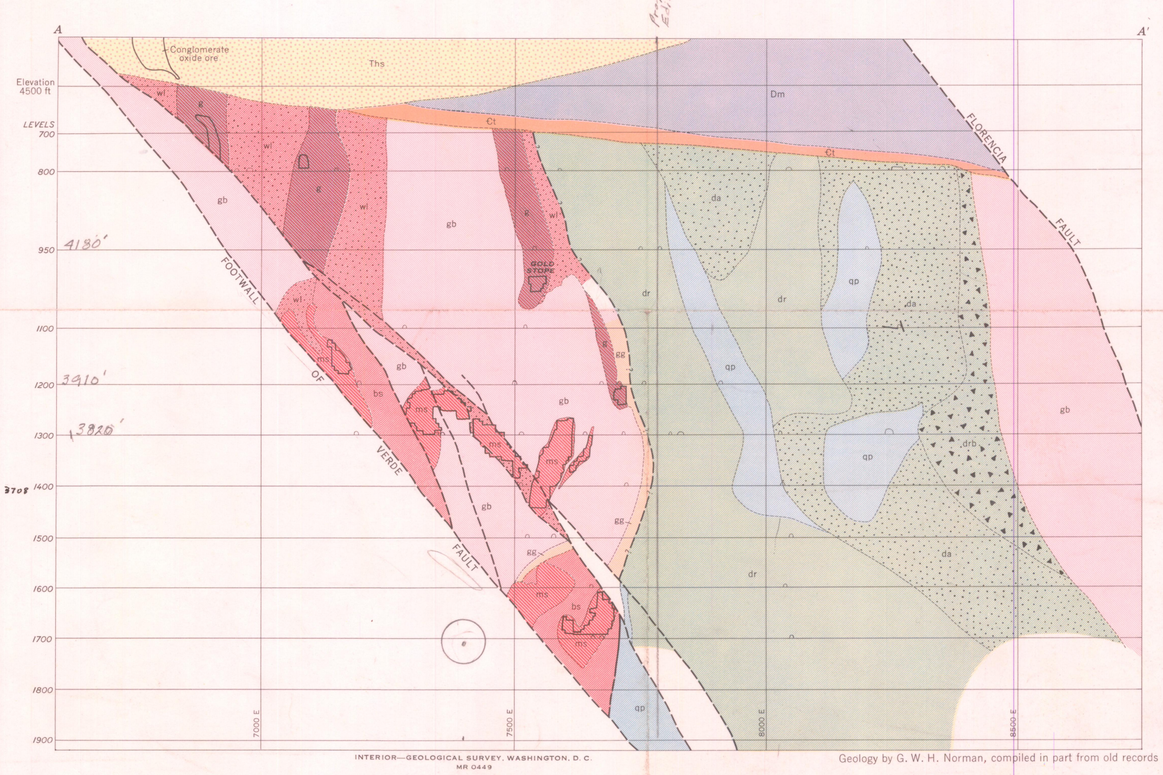
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

800 LEVEL

1300 LEVEL



1700 LEVEL



INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.
MR 0449

Geology by G. W. H. Norman, compiled in part from old records

EXPLANATION

- Pliocene(?) — TERTIARY
  - Ths — Hickey formation — *Gravel*
- UNCONFORMITY
- Middle(?) and Upper Devonian — DEVONIAN
  - Dm — Martin limestone
- UNCONFORMITY(?)
- CAMBRIAN
  - Ct — Tapeats sandstone(?)
- UNCONFORMITY
- OLDER PRECAMBRIAN
  - an — Andesite dikes
  - gb — Gabbro
  - qp — Quartz porphyry
  - gg — Grapevine Gulch formation
  - Ash Creek group
    - drb, dr, da, ds — Deception rhyolite — *Rhyolitic flows*, dr; *rhyolitic breccia*, drb; *intercalated andesitic flows*, da; *intercalated tuffaceous sedimentary rocks*, ds
  - il — Gossan
  - wl — White leached rock
  - bs — Black schist
  - ms — Massive sulfide

Contact, showing dip — *Dashed where approximately located*

Fault, showing dip — *Dashed where approximately located*

Probable fault

Strike and dip of beds

Strike and dip of foliation

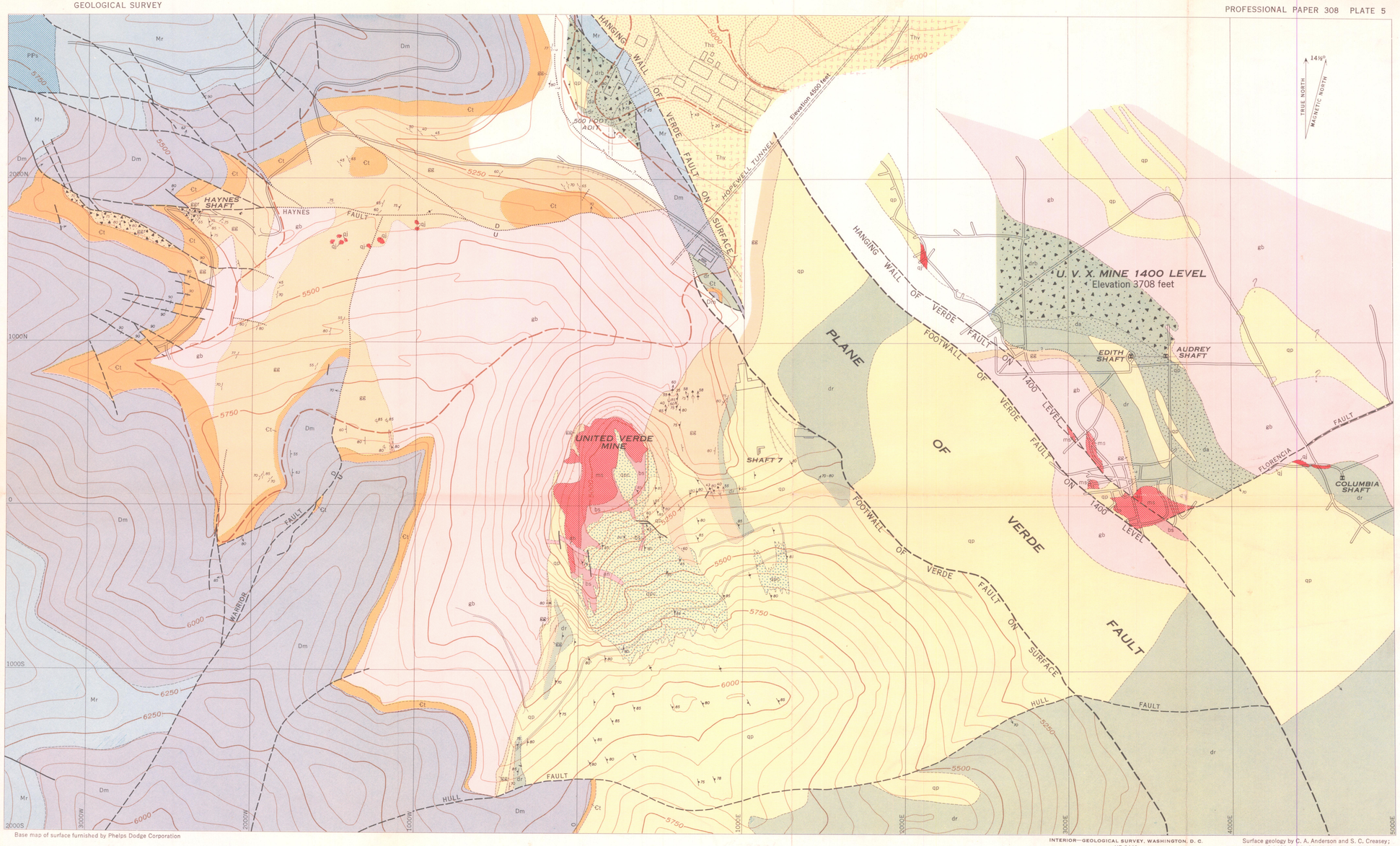
Strike of vertical foliation

Shaft, above and below levels

Stope

GEOLOGIC MAP AND UNDERGROUND WORKINGS OF THE UNITED VERDE EXTENSION MINE, YAVAPAI COUNTY, ARIZONA

200 0 1000 Feet



Base map of surface furnished by Phelps Dodge Corporation

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.
MR 0449

Surface geology by C. A. Anderson and S. C. Creasey; geology of 1400 level of U. V. X. mine and plane of Verde fault by G. W. H. Norman

SURFACE MAP OF UNITED VERDE MINE, PLANE OF VERDE FAULT, AND 1400 LEVEL, UNITED VERDE EXTENSION MINE, YAVAPAI COUNTY, ARIZONA

~~400'~~ ~~200~~ 0 ~~1000~~ 2000' Feet

Contour interval 20 feet
Datum is mean sea level

1" = 400'

EXPLANATION

TERTIARY

Pliocene(?)

Ths / Thv — **Hickey formation**
Lava, Thv; *gravel*, Ths

UNCONFORMITY

PENNSYLVANIAN AND PERMIAN

PPs — **Supai formation**

UNCONFORMITY

MISSISSIPPIAN

Mr — **Redwall limestone**

UNCONFORMITY

DEVONIAN

Middle(?) and Upper Devonian

Dm — **Martin limestone**

UNCONFORMITY(?)

CAMBRIAN

Ct — **Tapeats sandstone(?)**

UNCONFORMITY

OLDER PRECAMBRIAN

an — **Andesite dikes**

gb — **Gabbro**

qp / qpc — **Quartz porphyry**
Chloritized quartz porphyry, qpc

Ash Creek group

ggr / gg — **Grapevine Gulch formation**
Tuffaceous sedimentary rocks, gg; *intercalated rhyolite breccia*, ggr

drb / dr / da — **Deception rhyolite**
Rhyolitic flows, dr; *rhyolitic breccia*, drb; *intercalated andesitic flows*, da

PRODUCTS OF ALTERATION AND METALLIZATION

bs — **Black schist**

ms — **Massive sulfide**

qj — **Quartz and jasper**

Contact, showing dip
Dashed where approximately located, dotted where concealed

U / D — **Fault, showing dip**
Dashed where approximately located; U, *upthrown side*; D, *downthrown side*

Vertical fault

Probable fault
Dotted where concealed

Plunge of minor anticline

Plunge of minor syncline

Strike and dip of beds

Strike and dip of beds
Direction that top of bed faces is unknown

Strike and dip of overturned bed

Strike of vertical beds

Strike and dip of foliation

Strike of vertical foliation

Bearing and plunge of lineation

Strike and dip of foliation and plunge of lineation

Strike of vertical foliation and plunge of lineation

Shaft, above and below levels

Outline of area covered by dump

Note: Prior to the Tertiary displacement on the Verde fault, the 1400 level of the United Verde Extension mine was contiguous with the approximate present surface (300-foot level) of the United Verde mine. To help present the Precambrian structural relations, both are shown on this map

PROFESSIONAL PAPER 308 PLATE 1

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

QUATERNARY

Pleistocene (?) and Recent

- **Alluvium, Qa**; terrace deposits, Qt; talus and alluvial fan deposits, Qta
- **Younger gravels** — Qg
- **Older gravels** — Qtvg
- **Verde formation** — Flow-grooved lake deposits, Qtvl; gravels, Qtvg

TERTIARY

- **Hickey formation** — Thh
- **Volcanic rocks, Tvr, sedimentary rocks, Tsr; Hopkins Gulch, Tvr**

UNCONFORMITY

PALEOZOIC AND MESOZOIC

Mississippian, Pennsylvanian, and Permian

- **Supai formation** — PPs
- **Redwall limestone** — Mr

Devonian

- **Martin limestone** — Dm

Cambrian

- **Tapeats sandstone(?)** — Ct

UNCONFORMITY

- **Aplite** — Ap
- **Age of aplite along Copperopol fault uncertain** — Apa
- **Granodiorite-porphyry dikes** — gdp
- **Quartz diorite** — qd
- **Gabbro, diorite, diorite porphyry, diabase** — gb
- **Quartz porphyry** — qp
- **Quartz porphyry, qp; quartz porphyry breccia, qpb** — qpb
- **Intrusive rhyolite** — r

WEST OF SHYLOCK FAULT

- **Iron King rhyolite** — Tkr
- **Agua Fria rhyolite** — Taf
- **Acidic to basic volcanic breccia and interbedded sedimentary rocks, Tab** — Tab
- **Acidic to basic volcanic breccia and interbedded Oligocene sedimentary rocks, Tbs; Eocene(?) sedimentary rocks, Es** — Tbs / Es
- **Andesitic breccia and interbedded Oligocene sedimentary rocks, Tbs; Eocene(?) sedimentary rocks, Es** — Tbs / Es
- **Rhyolitic flow, breccia, and interbedded tuff, Tbs** — Tbs
- **Intrusive rhyolite** — ri
- **Intrusive andesite** — ai
- **Intrusive basalt** — bi

EAST OF SHYLOCK FAULT

- **Basalt flow** — Tbf
- **Basalt of Burro Creek** — Tbbc
- **Intrusive rhyolite** — ri
- **Intrusive andesite** — ai
- **Intrusive basalt** — bi
- **Flow-banded rhyolite, rhyolite breccia, and interbedded sedimentary rocks, Tbs; Eocene(?) sedimentary rocks, Es** — Tbs / Es
- **Rhyolitic flows, breccia, and interbedded beds, rf; tuff, tuf** — rf / tuf
- **Andesitic flows, breccia, and interbedded beds, af; tuff, tuf** — af / tuf
- **Basalt flows, bf; intrusive basalt, bi; intrusive andesite, ai** — bf / bi / ai
- **Flow-banded rhyolite, rhyolite breccia, and interbedded sedimentary rocks, Tbs; Eocene(?) sedimentary rocks, Es** — Tbs / Es
- **Rhyolitic flows, breccia, and interbedded sedimentary rocks, Tbs; Eocene(?) sedimentary rocks, Es** — Tbs / Es
- **Basalt flows, bf; intrusive basalt, bi; intrusive andesite, ai** — bf / bi / ai
- **Eocene(?) rhyolite** — Tbs
- **Eocene(?) andesite** — Tbs
- **Eocene(?) basalt** — Tbs
- **Eocene(?) sedimentary rocks, Es** — Es
- **Eocene(?) rhyolite** — Tbs
- **Eocene(?) andesite** — Tbs
- **Eocene(?) basalt** — Tbs

Acid to basic group

- **Intrusive rhyolite** — ri
- **Intrusive andesite** — ai
- **Intrusive basalt** — bi
- **Basalt flow** — Tbf
- **Basalt of Burro Creek** — Tbbc
- **Porphyritic dacite** — Tpd
- **Porphyritic andesite flows** — Tpa
- **Rhyolite flow** — Tbr
- **Rhyolite tuff** — Tbrt
- **Intrusive rhyolite** — ri
- **Intrusive andesite** — ai
- **Intrusive basalt** — bi
- **Interbedded rhyolite flows, breccia, and sedimentary rocks, Tbs; Eocene(?) sedimentary rocks, Es** — Tbs / Es
- **Rhyolitic flows, breccia, and interbedded sedimentary rocks, Tbs; Eocene(?) sedimentary rocks, Es** — Tbs / Es
- **Basalt flows, bf; intrusive basalt, bi; intrusive andesite, ai** — bf / bi / ai
- **Flow-banded rhyolite, rhyolite breccia, and interbedded sedimentary rocks, Tbs; Eocene(?) sedimentary rocks, Es** — Tbs / Es
- **Rhyolitic flows, breccia, and interbedded sedimentary rocks, Tbs; Eocene(?) sedimentary rocks, Es** — Tbs / Es
- **Basalt flows, bf; intrusive basalt, bi; intrusive andesite, ai** — bf / bi / ai
- **Eocene(?) rhyolite** — Tbs
- **Eocene(?) andesite** — Tbs
- **Eocene(?) basalt** — Tbs
- **Eocene(?) sedimentary rocks, Es** — Es
- **Eocene(?) rhyolite** — Tbs
- **Eocene(?) andesite** — Tbs
- **Eocene(?) basalt** — Tbs

OLDER PRECAMBRIAN

- **Metamorphosed rhyolite flows, rhyolite tuff, tuf; intercalated basaltic andesite flows, ba** — tuf / ba
- **Basaltic flow** — Tbbf
- **Basaltic flows, bs; intercalated sedimentary rocks, s** — bs / s
- **Intercalated rhyolite flows** — Tbr
- **Metamorphosed rhyolite flows, rhyolite tuff, tuf; intercalated basaltic andesite flows, ba** — tuf / ba
- **Quartz Gulch volcanics** — Qgv
- **Acidic to basic volcanic breccia and interbedded sedimentary rocks, Tab; Agua Fria rhyolite, Taf** — Tab / Taf
- **Basaltic flow and interbedded conglomerate, Tbbf; Verde formation, Tvf** — Tbbf / Tvf
- **Basaltic flows, bs; interbedded sedimentary rocks, s** — bs / s
- **Interbedded rhyolite flows, breccia, and sedimentary rocks, Tbr; Eocene(?) sedimentary rocks, Es** — Tbr / Es
- **Rhyolitic flow and interbedded conglomerate, Tbr; Verde formation, Tvf** — Tbr / Tvf
- **Basaltic flows, bs; interbedded sedimentary rocks, s** — bs / s
- **Interbedded rhyolite flows, breccia, and sedimentary rocks, Tbr; Eocene(?) sedimentary rocks, Es** — Tbr / Es
- **Rhyolitic flow and interbedded conglomerate, Tbr; Verde formation, Tvf** — Tbr / Tvf
- **Basaltic flows, bs; interbedded sedimentary rocks, s** — bs / s
- **Interbedded rhyolite flows, breccia, and sedimentary rocks, Tbr; Eocene(?) sedimentary rocks, Es** — Tbr / Es
- **Rhyolitic flow and interbedded conglomerate, Tbr; Verde formation, Tvf** — Tbr / Tvf
- **Basaltic flows, bs; interbedded sedimentary rocks, s** — bs / s
- **Interbedded rhyolite flows, breccia, and sedimentary rocks, Tbr; Eocene(?) sedimentary rocks, Es** — Tbr / Es
- **Rhyolitic flow and interbedded conglomerate, Tbr; Verde formation, Tvf** — Tbr / Tvf
- **Basaltic flows, bs; interbedded sedimentary rocks, s** — bs / s
- **Interbedded rhyolite flows, breccia, and sedimentary rocks, Tbr; Eocene(?) sedimentary rocks, Es** — Tbr / Es
- **Rhyolitic flow and interbedded conglomerate, Tbr; Verde formation, Tvf** — Tbr / Tvf
- **Basaltic flows, bs; interbedded sedimentary rocks, s** — bs / s

Structurally position not known

- **Basaltic flow and interbedded conglomerate, Tbbf; Verde formation, Tvf** — Tbbf / Tvf
- **Basaltic flows, bs; interbedded sedimentary rocks, s** — bs / s
- **Interbedded rhyolite flows, breccia, and sedimentary rocks, Tbr; Eocene(?) sedimentary rocks, Es** — Tbr / Es
- **Rhyolitic flow and interbedded conglomerate, Tbr; Verde formation, Tvf** — Tbr / Tvf
- **Basaltic flows, bs; interbedded sedimentary rocks, s** — bs / s
- **Interbedded rhyolite flows, breccia, and sedimentary rocks, Tbr; Eocene(?) sedimentary rocks, Es** — Tbr / Es
- **Rhyolitic flow and interbedded conglomerate, Tbr; Verde formation, Tvf** — Tbr / Tvf
- **Basaltic flows, bs; interbedded sedimentary rocks, s** — bs / s
- **Interbedded rhyolite flows, breccia, and sedimentary rocks, Tbr; Eocene(?) sedimentary rocks, Es** — Tbr / Es
- **Rhyolitic flow and interbedded conglomerate, Tbr; Verde formation, Tvf** — Tbr / Tvf
- **Basaltic flows, bs; interbedded sedimentary rocks, s** — bs / s
- **Interbedded rhyolite flows, breccia, and sedimentary rocks, Tbr; Eocene(?) sedimentary rocks, Es** — Tbr / Es
- **Rhyolitic flow and interbedded conglomerate, Tbr; Verde formation, Tvf** — Tbr / Tvf
- **Basaltic flows, bs; interbedded sedimentary rocks, s** — bs / s

Probable stratigraphic succession

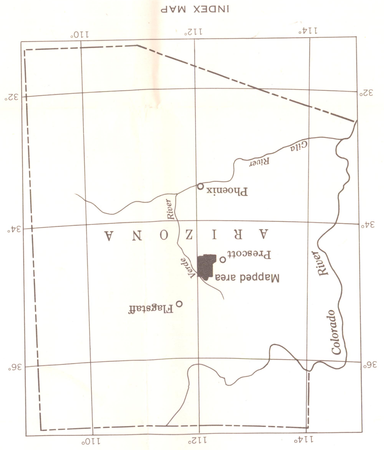
Triangle series

Alder group

PRODUCTS OF ALTERATION AND METALLIZATION

- **Quartz or jasper lenses, dots, and veins**
- **Includes silicification zone at Iron King mine, and Ed Corson and Silver Dick–Bradley vein**

INDEX MAP



Massive sulfide
Exposed in pit of United Verde mine

Contact, showing dip
Dashed where approximately located; dotted where concealed

Indefinite contact

Fault, showing dip
Dashed where approximately located; dotted where concealed; U, upthrown side; D, downthrown side

Vertical fault

Fault, showing relative movement

Thrust or low angle reverse fault
T, upper plate

Anticline
Showing bearing of plunge of crestline. Dashed where approximately located

Syncline
Showing position and bearing of plunge of trough. Dashed where approximately located, dotted where concealed

Overturned anticline
Showing trace of axial plane and bearing of plunge of axis, and direction of dip of limbs

Plunge of minor anticline

Plunge of minor syncline

Plunge of minor folds and plunge of axis

Strike and dip of beds

Strike and dip of overturned beds

Strike of vertical beds

Horizontal beds

Strike and dip of foliation

Strike of vertical foliation

Bearing and plunge of lineation

Strike and dip of foliation and plunge of lineation

Strike of vertical bed and bearing and plunge of lineation

Strike of vertical foliation and bearing and plunge of lineation

Strike and dip of planar flow structure

Strike of vertical planar flow structure

Approximate strike and dip of top of pillow structure

Approximate strike of pillow structure

Shaft

Prospect shaft or adit

Mine

Dump

APPROXIMATE MEAN DECLINATION 1944

TRUE NORTH

MAGNETIC NORTH

GEOLOGIC MAP OF THE JEROME AREA, YAVAPAI COUNTY, ARIZONA

Scale 1:24,000

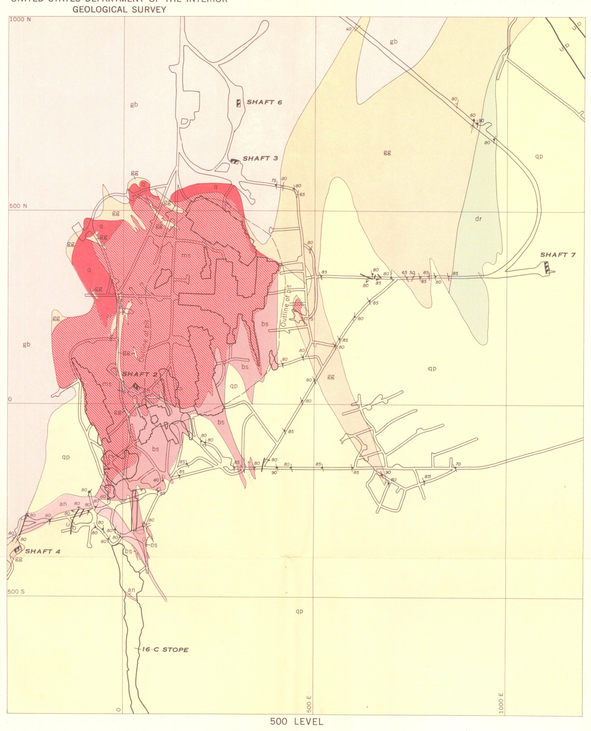
1 0 3 Miles

Contour interval 50 feet
Datum is mean sea level

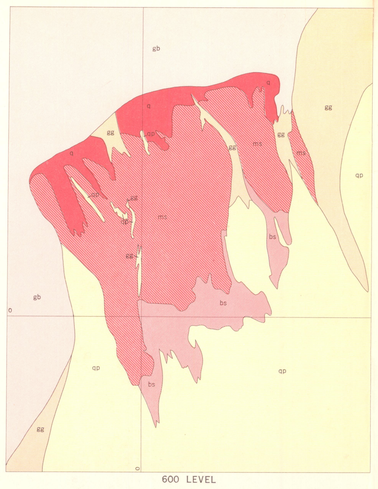
INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.

Geology by C. A. Anderson, S. C. Creasey, R. E. Lehner, M. H. Krieger, and W. E. Bergquist

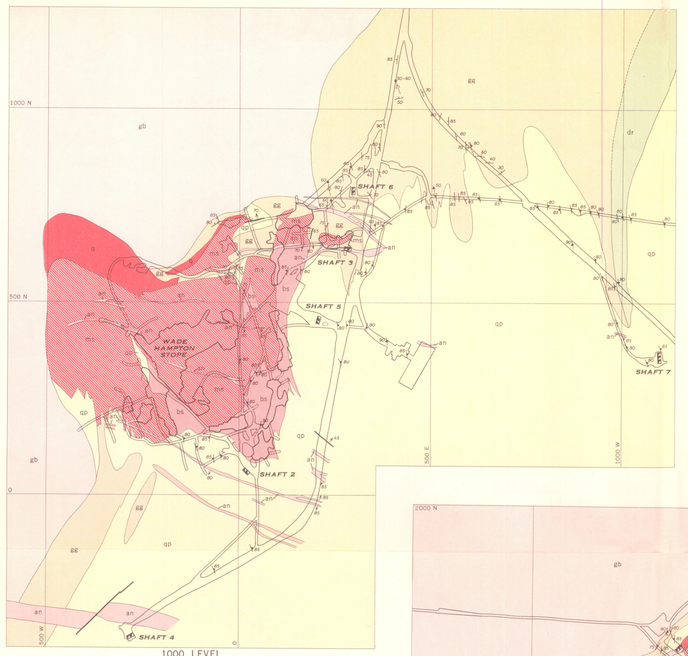
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



500 LEVEL



600 LEVEL



1000 LEVEL

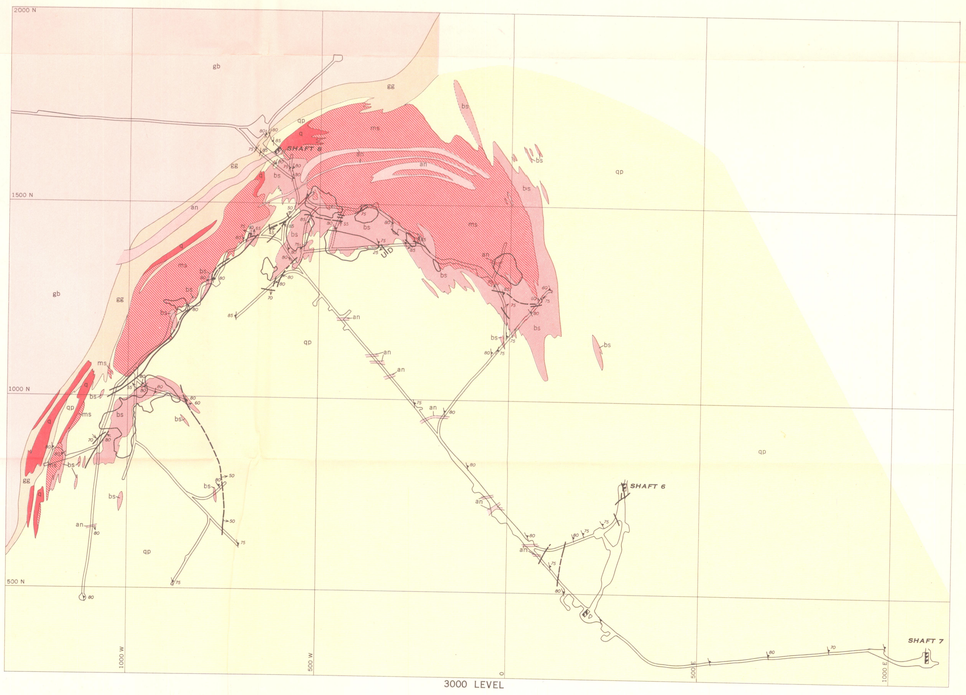
EXPLANATION

PRODUCTS OF ALTERATION AND METALLIZATION

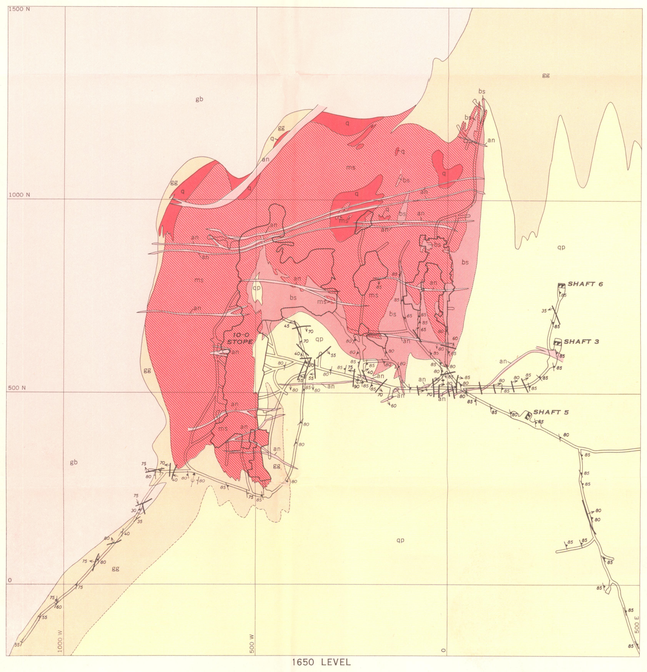
- an — Andesite dikes
- gb — Gabbro
- qpc, qp — Quartz porphyry *Chloritized quartz porphyry, qpc*
- ge — Grapevine Gulch formation (Ash Creek group)
- dr — Deception rhyolite
- bs — Black schist
- ms — Massive sulfide
- q — Quartz
- Contact, showing dip *Dashed where approximately located*
- Fault, showing dip *Dashed where approximately located. U, upthrown side; D, downthrown side*

OLDER PRECAMBRIAN

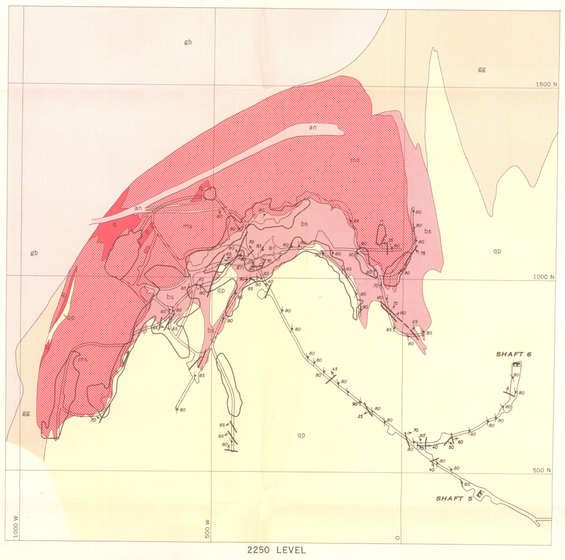
- Strike and dip of beds
- Strike of vertical beds
- Strike and dip of foliation
- Strike of vertical foliation
- Plunge of minor anticline
- Plunge of minor syncline
- Shaft
- Stope



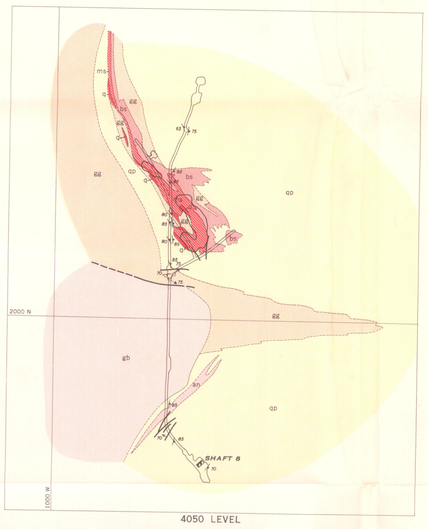
3000 LEVEL



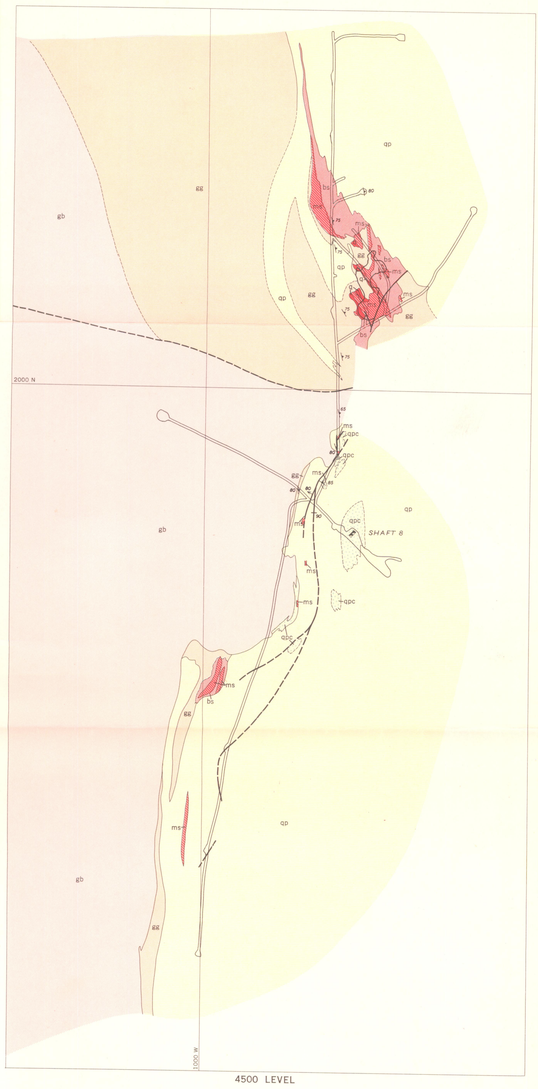
1650 LEVEL



2250 LEVEL

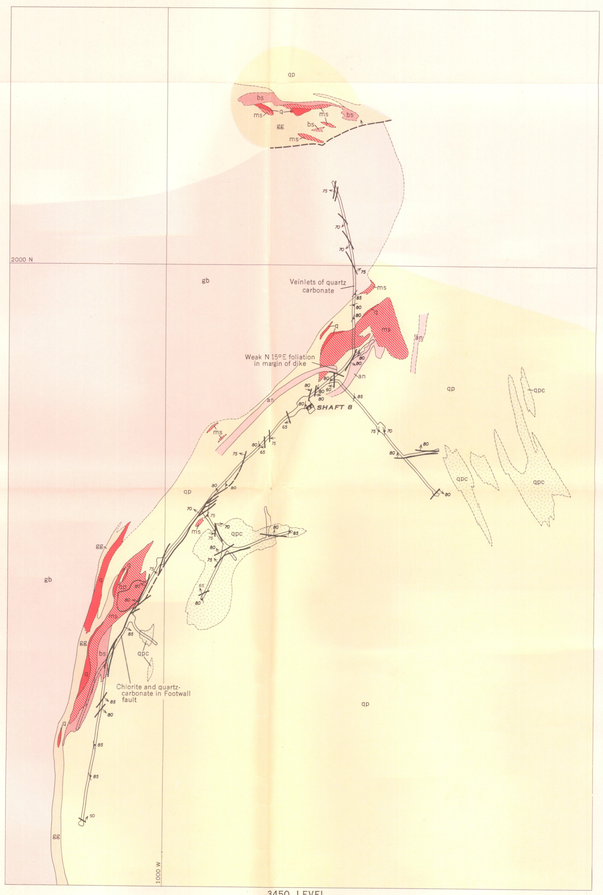


4050 LEVEL

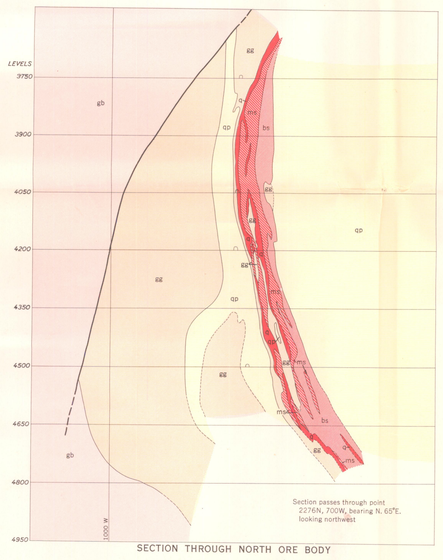


4500 LEVEL

3300 LEVEL



3450 LEVEL



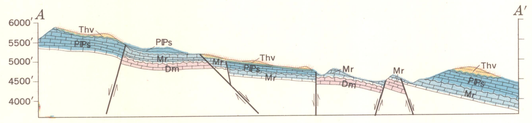
SECTION THROUGH NORTH ORE BODY

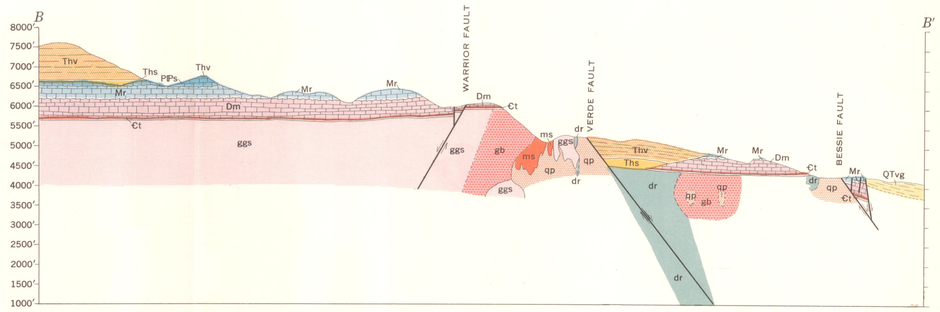
GEOLOGIC MAP AND UNDERGROUND WORKINGS OF THE UNITED VERDE MINE, YAVAPAI COUNTY, ARIZONA

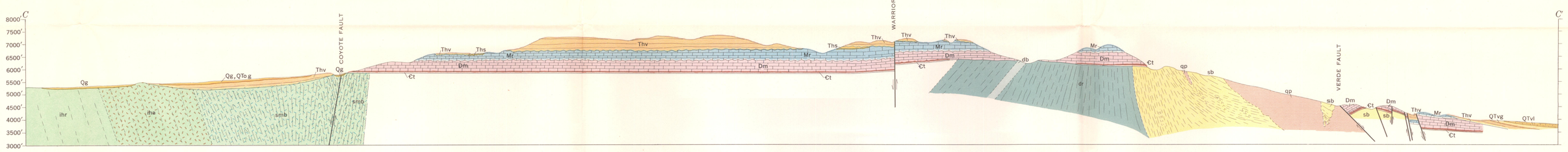
200 0 1000 Feet

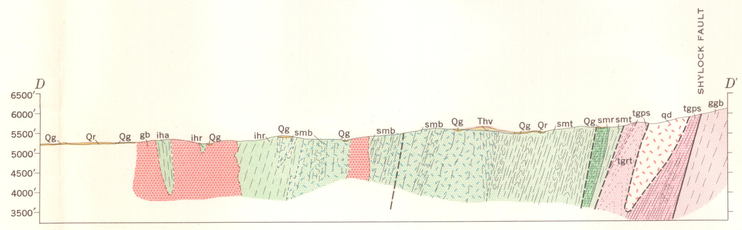
INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.
MR 0449

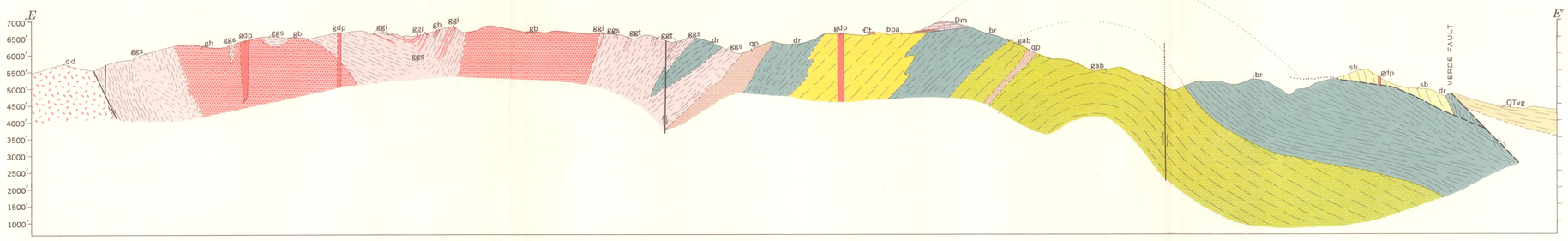
Geology by L. E. Reber, Jr. and staff of United Verde mine, modified by C. A. Anderson and S. C. Creasey

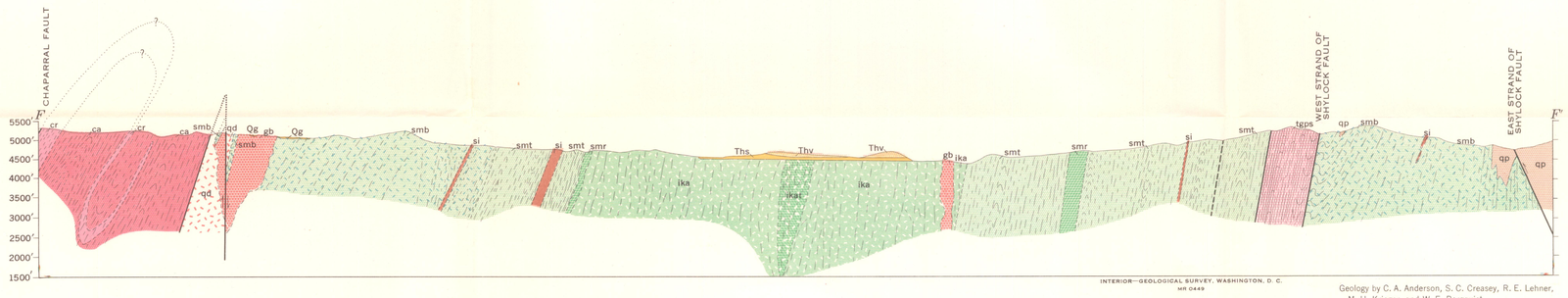












INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.
MR 0448

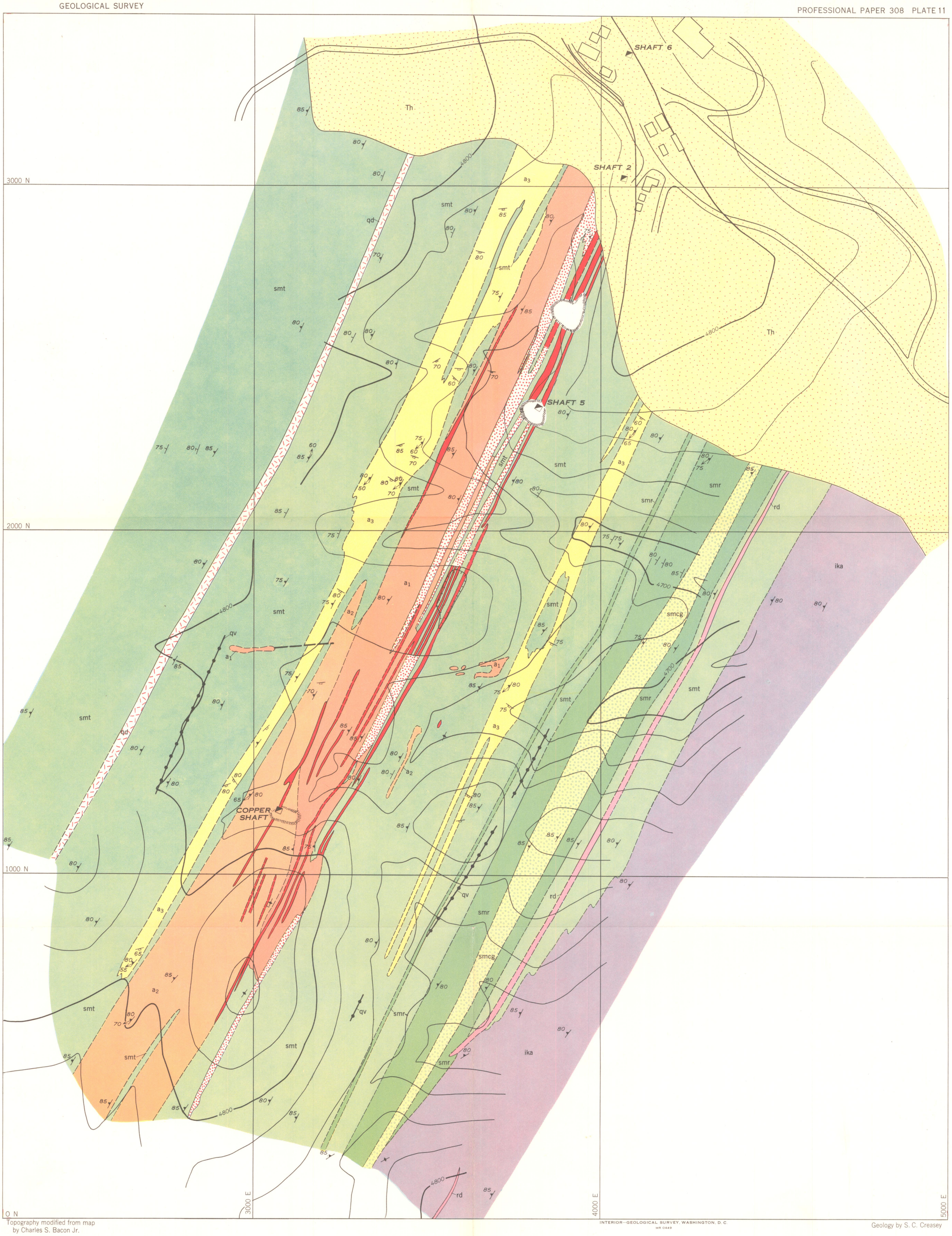
Geology by C. A. Anderson, S. C. Creasey, R. E. Lehner,
M. H. Krieger, and W. E. Bergquist.

For geologic explanation see plate 1

GEOLOGIC SECTIONS OF THE JEROME AREA, YAVAPAI COUNTY, ARIZONA

Scale 1:24,000

1 0 2 Miles



EXPLANATION

- Th — Hickey formation — TERTIARY
- rd — Rhyolite dike — AGE UNKNOWN
- qd — Foliated quartz diorite — OLDER PRECAMBRIAN
- ika — Iron King volcanics, *Amygdaloidal basaltic flows*
- smr / smcg / smt — Spud Mountain volcanics, *Rhyolitic tuffaceous unit*, smr ; *conglomeratic unit*, smcg ; *andesitic tuffaceous unit*, smt
- qv — Quartz or jasper vein
- Vein, *Contains gossan after sulfide minerals*
- Zone of veins, *Consists of two or more veins separated by altered andesite tuff. Veins contain gossan after sulfide minerals*
- a_1 — Most intense hydrothermal alteration; introduced quartz, pyrite, ankerite, and sericite
- a_2 — Moderately intense hydrothermal alteration; introduced quartz, pyrite, ankerite, and sericite
- a_3 — Least intense hydrothermal alteration; introduced sericite most pronounced; some introduced quartz and ankerite
- Contact, dashed where approximately located
- Fault, approximately located
- 75 — Strike and dip of beds
- 80 / 70 — Strike and dip of foliation and plunge of lineation
- Strike of vertical foliation
- 65 — Strike and dip of fracture cleavage
- Shaft
- Opencut
- Dump

Topography modified from map by Charles S. Bacon Jr.

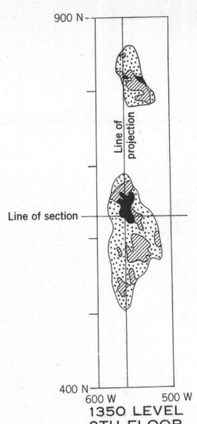
INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.
MR 0449

Geology by S. C. Creasey

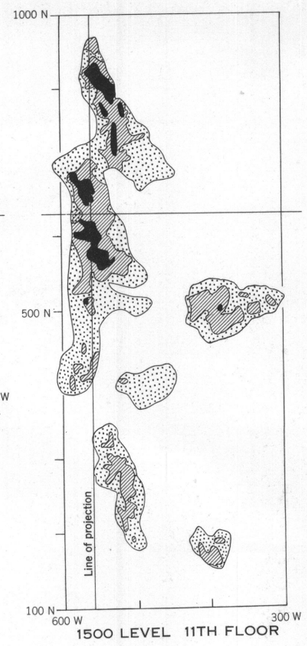
GEOLOGIC MAP OF SURFACE OF IRON KING MINE, YAVAPAI COUNTY, ARIZONA

200 0 800 Feet

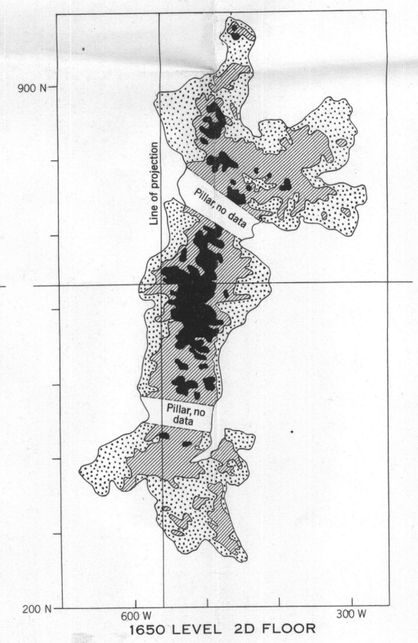
Contour interval 20 feet
Datum is mean sea level



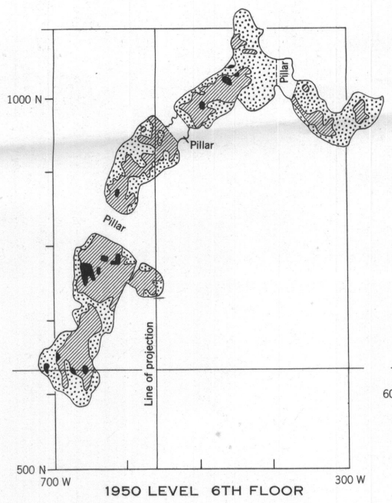
1350 LEVEL
9TH FLOOR



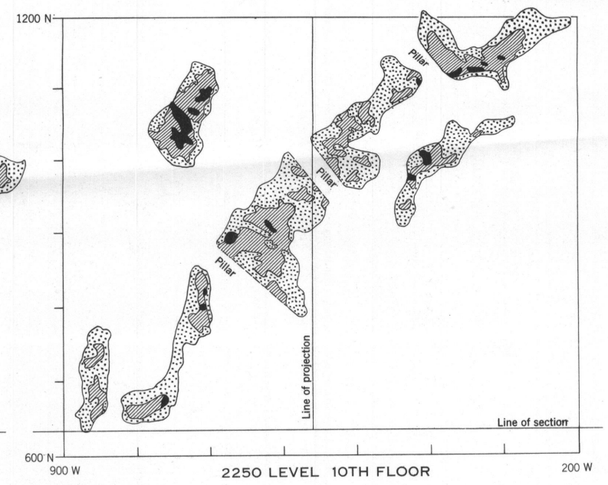
1500 LEVEL 11TH FLOOR



1650 LEVEL 2D FLOOR



1950 LEVEL 6TH FLOOR

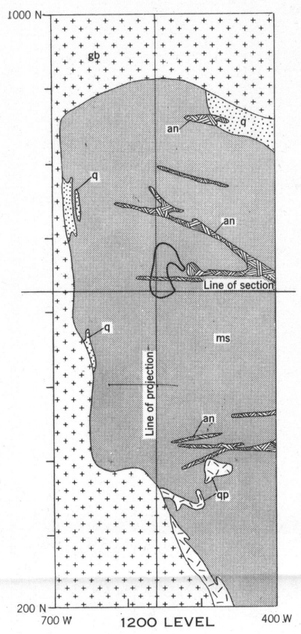


2250 LEVEL 10TH FLOOR

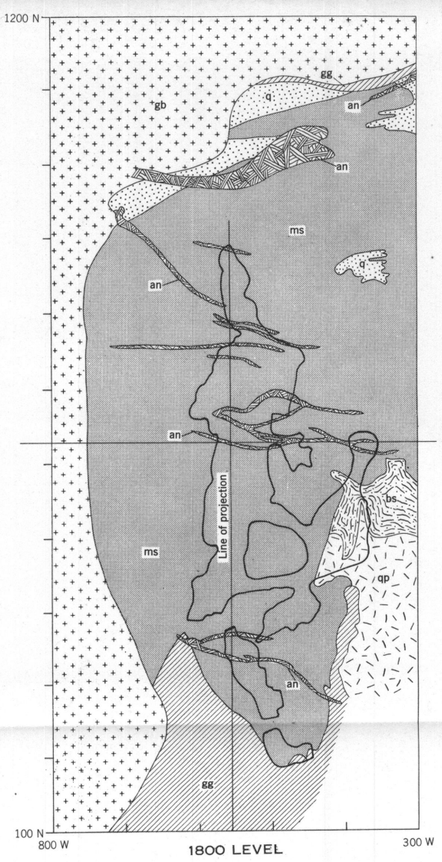
EXPLANATION

High-grade copper | Medium-grade copper | Low-grade copper

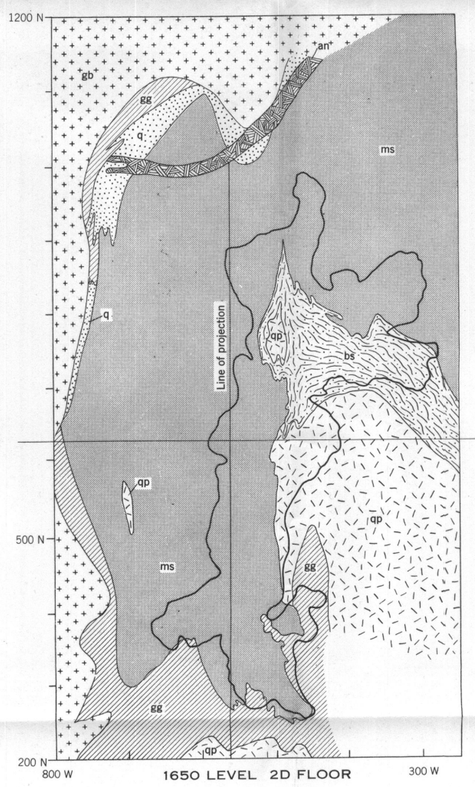
100 0 500 Feet



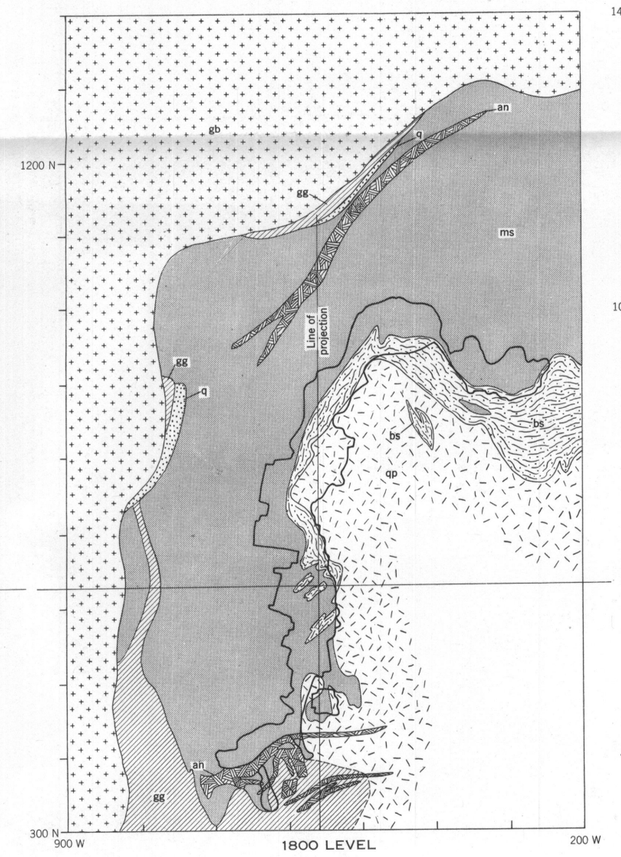
1200 LEVEL



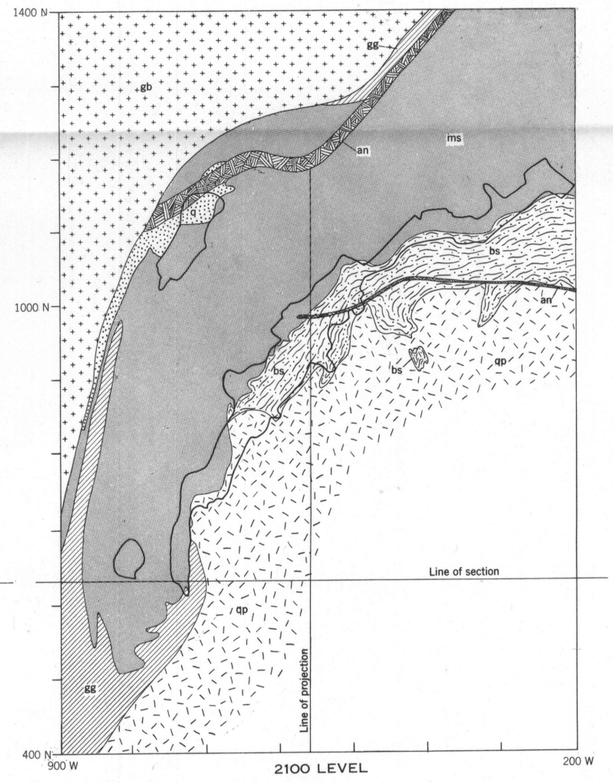
1800 LEVEL



1650 LEVEL 2D FLOOR



1800 LEVEL



2100 LEVEL

EXPLANATION

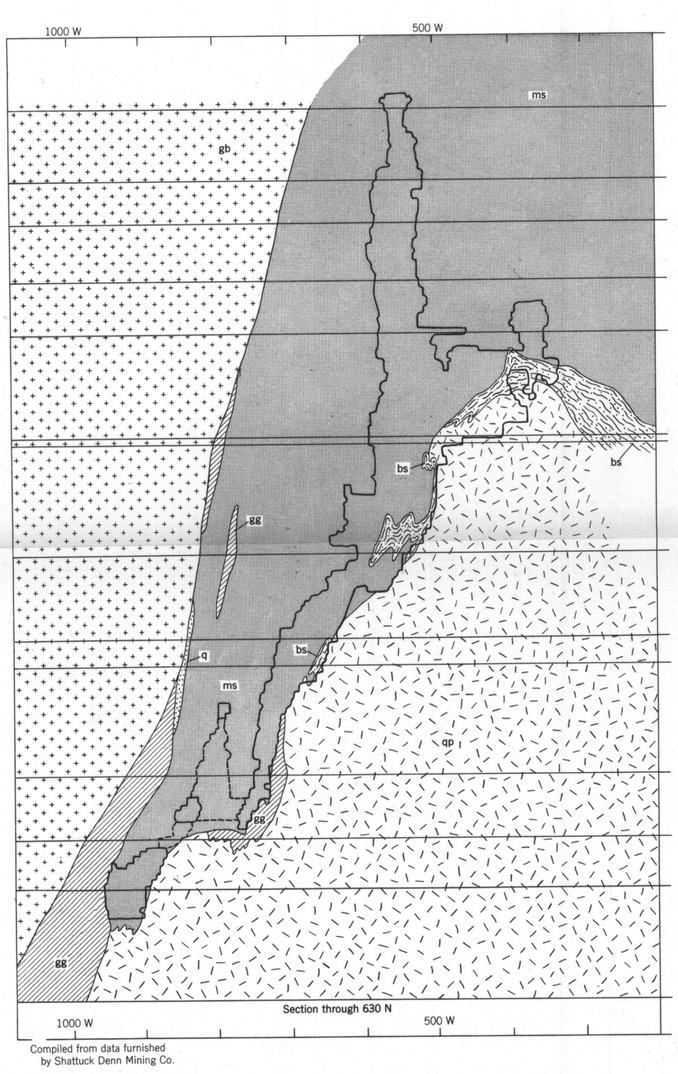
Andesite dikes
Gabbro
Quartz porphyry
Grapevine Gulch formation

PRODUCTS OF ALTERATION AND METALLIZATION

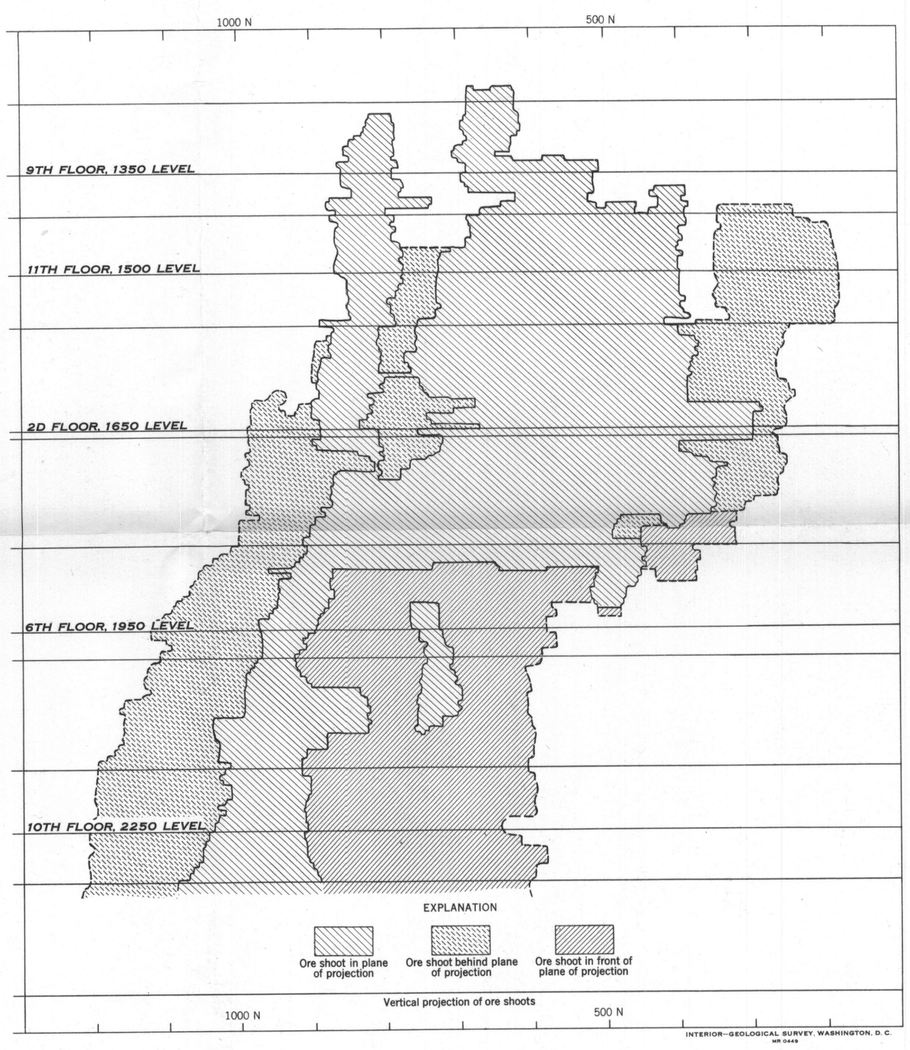
Black schist
Massive sulfide
Quartz
Outline of stope

N

100 0 500 Feet

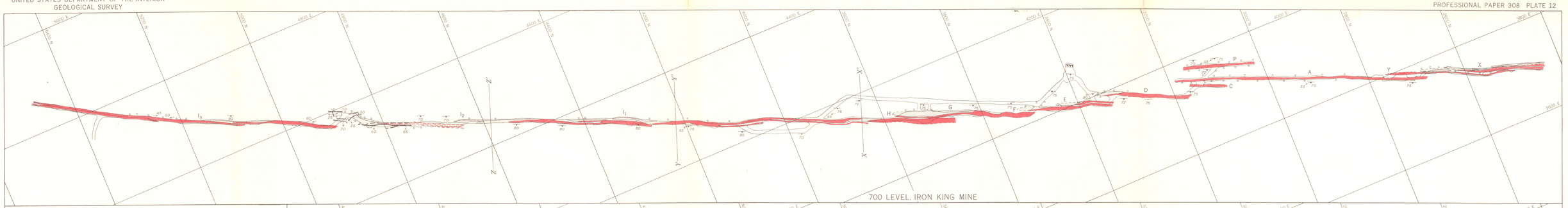


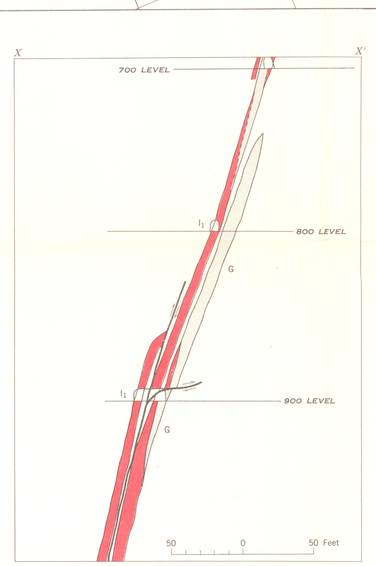
Compiled from data furnished by Shattuck Denn Mining Co.

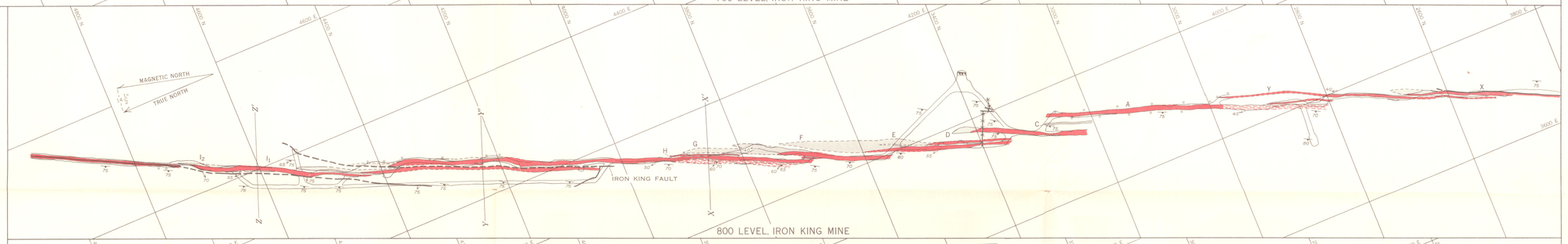


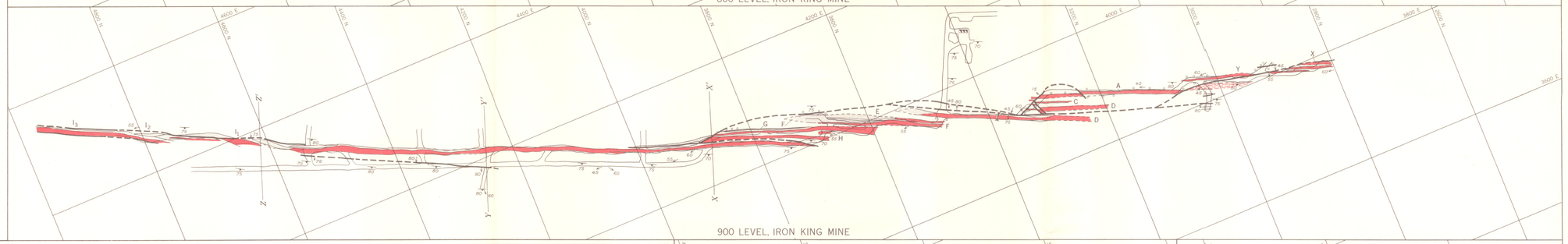
INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.
MR 0449

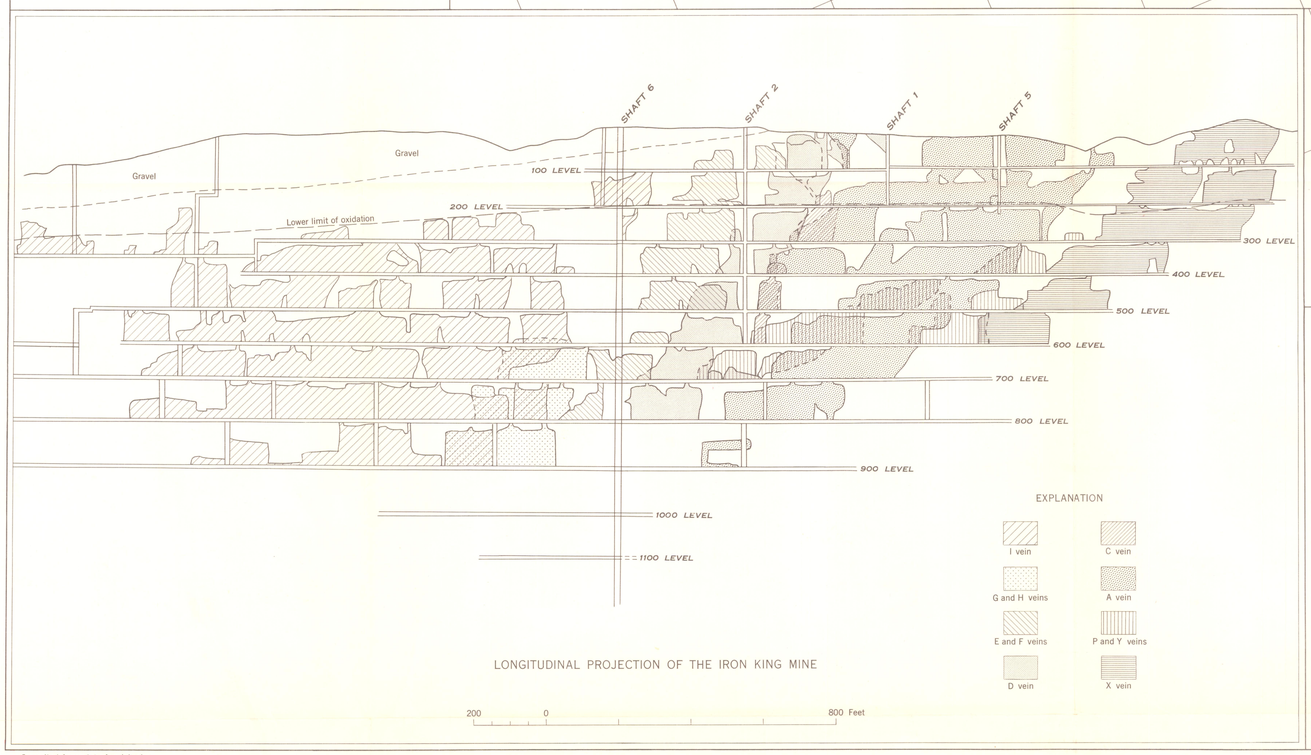
MAPS AND SECTIONS OF 10–O ORE SHOOT SHOWING VARIATIONS IN GRADE OF COPPER AND RELATION OF ORE SHOOT TO GEOLOGY, YAVAPAI COUNTY, ARIZONA

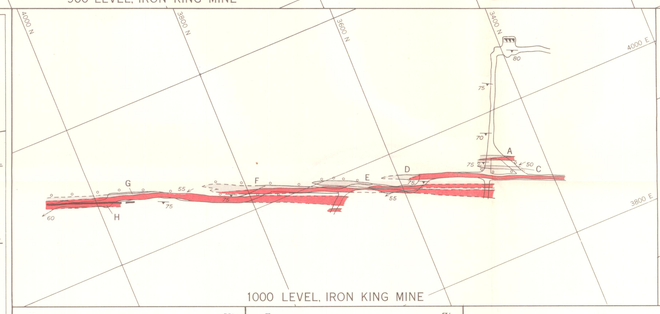


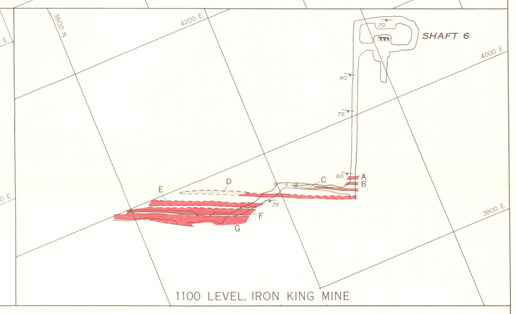


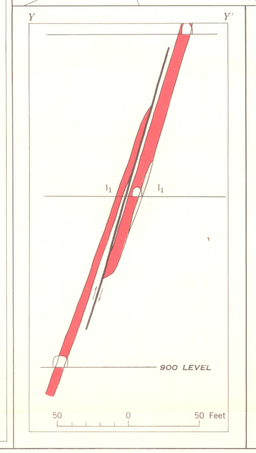


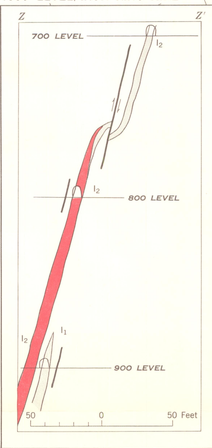


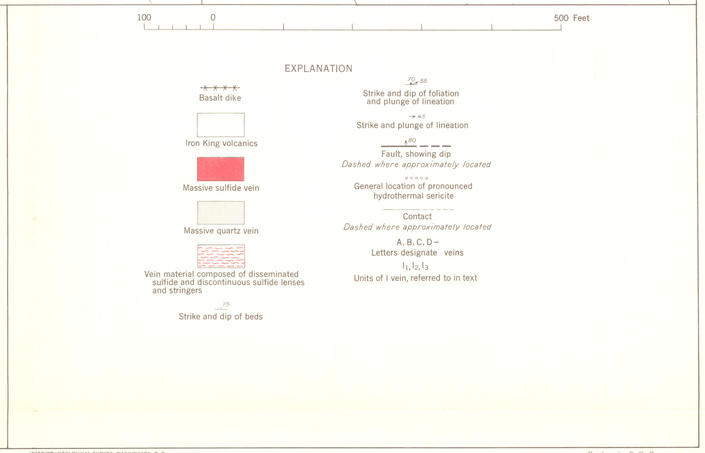












Compiled from data furnished by Shattuck Denn Mining Co

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.
MR 0000

Geology by S. C. Creasey.

MAP OF SOME OF THE UNDERGROUND WORKINGS AND SECTIONS, IRON KING MINE, YAVAPAI COUNTY, ARIZONA