



EXPLANATION

PLUTONIC AND HYBRYSSAL INTRUSIVE ROCKS

Qal
Silt
Silt and associated fine-grained alluvial sediments in major wadis

Qal
Sand
Alluvial, sheet wash, and scolian sand; includes sparse older deposits of terrace gravel and collecting alluvial fans along the flanks of the Jabal Bitran range

UNCONFORMITY

EP **gpp** **gpa**
Peralkalic granite, biotite granite porphyry, quartz porphyry, and spilit
Fine-grained, gray to pink, quartz-poor, feldspathic biotite granite and biotite granite porphyry (gp); hypabyssal plugs of fine-grained quartz porphyry and liparite (gpp); spilit dikes (gpa)

ac **ab** **am**
Alu Formation
Fine- to coarse-grained dark green to dark gray chlorite-sericite schist, sericite-chlorite schist, and chlorite-sericite phyllite formed from pelitic graywacke, calcareous graywacke, and associated volcanic rocks (ac); fine- to medium-grained, dark gray biotite-muscovite schist (ab) formed from chlorite-sericite schist along walls of intrusive plutons of peralkalic granite, white to dark gray marble (am)

UNCONFORMITY

ds **dsp** **mdl** **dl** **dip** **drd**
Andesite, rhyolite, and granite dikes
Dark-green, dark-brown, and dark gray dikes of andesite (ds); andesite porphyry, diabase, and fine-grained diorite (dsp); dark-gray plug of microiorite and fine-grained diorite dikes (mdl); gray, brown, and dark-red dikes of rhyolite (dl) and rhyolite porphyry (dip); locally gabbroiferous, grading into dikes of gray to dark-red granite and microgranite (dnd); generally massive and unmetamorphosed, but where rhyolite is involved with N. 70°W-trending faults the rhyolite has cataclastic foliation

gh **ghl**
Biotite-hornblende granite
Gray, locally pink or red, massive to faintly gneissic biotite-hornblende granite (gh); locally biotite-free or hornblende-free; locally, as west of Jabal Bitran, gray with much epidote; strong primary flow banding near contacts, where rock commonly grades into granodiorite or diorite; locally red to pink biotite-hornblende granite with many inclusions of diorite, gabbro, and amphibolite (ghl)

dgp **gbs** **sp**
Kiorite, gabbro, pyroxenite, amphibolite, hornblende, and ultramafic rocks
Dark-gray, dark-green, to nearly black, fine- to coarse-grained intrusive complexes of diorite, gabbro, and pyroxenite exposed outside major tectonic lineaments (dgp); amphibolite (gbs), principally hornblende, formed from gabbro and pyroxenite; ultramafic rocks (sp), including peridotite, pyroxenite, and serpentinite inside major tectonic lineaments and spatially associated with marble (am)

ba **bgo**
Badryah Formation
Dark-green, green, dark-brown, and nearly black andesite, andesite porphyry, andesitic agglomerate, spilit, and keratophyre (ba); commonly massive flows, some pillow lava, locally strongly epidotized or sheared to form greenstone and chlorite-sericite schist (gsc); extensive agglomerate in the hills west and southwest of Sella mine; thin carbonate layers locally present

sc
Alu Sasar Formation
Gray to dark-gray, fine- to medium-grained chlorite-sericite schist (sc) formed by diagenetic metamorphism of graywacke, luficaceous graywacke, and nearly black siltstone; thin carbonate layers and calcareous quartzite, locally hematite-bearing, present; thin meta-andesite flows locally interbedded

fm
Fawara Formation
Gray, black, brown, and red fine-grained marble, dolomitic marble, schistose marble, silicified marble, and dolomite; grades downward locally into calcareous conglomerate

lc **la**
Idisa Formation
Gray, green, and brown metaconglomerate (lc) with chloritic matrix and pebbles and boulders of hornblende granodiorite, andesite, amphibolite, diorite, hornblende-biotite granite gneiss, and, in the area north of the Fawara mine, common detrital magnetite; includes calcareous schists in prominent ridges 2-3 km south-southeast of Sella mine; at the north edge of the quadrangle the unit is notably agglomeratic (la)

UNCONFORMITY

ua **uho** **uh** **uhm** **us**
Umm M. shirah Formation
Gray, green, and dark-green, fine- to coarse-grained amphibolite, schistose andesite, gneiss, and meta-andesite (ua) formed from andesite; includes layers of quartzite schist; magnetite-bearing in areas of dotted pattern west of Jabal Idisa; hornblende (uhb) formed from andesite at contact of peralkalic granite, hornblende gneiss and hornblende schist (uh); lenticles of dark-blue, gray, and brown marble (um) in sedimentary-volcanic rocks associated with gneissic granodiorite; andesite-bearing sars (us)

UNCONFORMITY

gnd
Gneissic granodiorite
Light-colored to dark-green gneissic granodiorite (gnd) including epidotized, chloritized, and feldspathized diorite and associated volcanic rocks

gg
Hornblende-biotite granite gneiss
Gray, hornblende-biotite granite gneiss (gg) intimately intruded by diorite, gabbro, andesite, rhyolite, and biotite-hornblende granite; appears to have been deformed at least twice

CONTACT
Dashed where approximately located or inferred; dotted where concealed

FAULT
Showing relative horizontal movement where known. Dashed where approximately located or inferred; dotted where concealed. U, upthrown side; D, downthrown side

ANTICLINE
Showing crestline and direction of plunge

SYNCLINE
Showing troughline and direction of plunge

STRIKE AND DIP OF BEDS
Strike and dip of beds

STRIKE OF FOLIATION SHOWING PLUNGE
Strike of foliation showing plunge

STRIKE AND DIP OF FOLIATION SHOWING HORIZONTAL LINEATION
Strike and dip of foliation showing horizontal lineation

ISOLATED OUTCROP OF MARBLE
Isolated outcrop of marble

QUARTZ
Quartz

PROMINENT MASSES AND KNOTS OF MILKY QUARTZ, QUARTZ VENS, OR CORE OF PAGETITE; STRATIGRAPHIC POSITION UNASSIGNED
Prominent masses and knots of milky quartz, quartz vens, or core of pagetite; stratigraphic position unassigned

LINEAMENT FROM AERIAL PHOTOGRAPHS
Prominent lineament not checked on ground; may be dikes, bedding, foliation, joints, or fault

DIKES
Dikes, undivided, mainly andesite, rhyolite, granite, and lamprophyre

WATER WELL
Water well

MARKED DRY WELL WHERE ABANDONED
Marked Dry Well where abandoned

ANCIENT WORKING
Abandoned mine or prospect

ANCIENT SPOILAGE PILE OF MAGNETITE COBBLES AND BOULDERS VISIBLE ON 1956 AERIAL PHOTOGRAPHS, BUT MAGNETITE REMOVED BY 1964
Ancient spoilage pile of magnetite cobbles and boulders visible on 1956 aerial photographs, but magnetite removed by 1964

20ppm Cu or less **30 to 70ppm Cu**
>100ppm Zn **>100ppm Zn**
>5ppm Mo **>5ppm Mo**

LOCATION AND METAL CONTENT BY CHEMICAL ANALYSIS OF SAMPLE OF WADI SEDIMENT EXPRESSED IN PARTS PER MILLION (PPM)
Location and metal content by chemical analysis of sample of wadi sediment expressed in parts per million (ppm)

3ppm Mo
Wadi sand containing molybdenum by spectrographic analysis (located by adjacent copper symbol)

Scheelite and/or powellite
Present in concentrates from wadi sand (superimposed on symbol for copper)

ANOMALOUS ELEMENT IN WADI SAND BY SPECTROGRAPHIC ANALYSIS
Anomalous element in wadi sand by spectrographic analysis

Nickel (Ni) 700ppm (located by adjacent copper symbol)
Nickel (Ni) 700ppm (located by adjacent copper symbol)

B Co Cr Cu Ni Se Y
Threshold elements in wadi sand by spectrographic analysis:
Boron (B) 30ppm; cobalt (Co) 30ppm; chromium (Cr) 1000 and 1000ppm; copper (Cu) 70ppm; nickel (Ni) 70, 100, and 150ppm; scandium (Sc) 30ppm; yttrium (Y) 30ppm (located by adjacent copper symbol)

Cu Mo Zn W
Threshold elements in concentrate or detrital magnetite by chemical analysis: Copper (Cu) 100, 110, 130, and 300ppm in concentrate; 100ppm in magnetite; molybdenum (Mo) 20ppm in magnetite; zinc (Zn) 110 and 250ppm in concentrate; tungsten (W) 30, 40, 300, and 400ppm in concentrate (located by adjacent copper symbol); where reporting interval is same for concentrate and magnetite the value for magnetite is preceded by asterisk

3.3
Radioactivity, times background (located by adjacent copper symbol)

×19
Sample for isotopic age

Potassium 40/argon isotopic age of 581.12 m. y. for biotite from white granite. Specimen #19 collected by Glen F. Brown; age determined by isotopes, Inc., U. S. A.
Potassium 40/argon isotopic age of 581.12 m. y. for biotite from white granite. Specimen #19 collected by Glen F. Brown; age determined by isotopes, Inc., U. S. A.

AREA OF THIS MAP
125
126
127
128
129

AREA OF OTHER MAPS IN THIS SERIES
125 Ayn Qunay quadrangle
126 Bt' al Badryah quadrangle
127 Sabkhat Muray sis quadrangle
128 Bt' al Ghannrah quadrangle
129 Wadi Mahragah quadrangle

QUADRANGLE LOCATION

1:100,000
0 2 4 6 8 10 KILOMETERS
0 2 4 6 8 10 MILES

Compiled from geologic investigations by V. P. Kahr, Directorate General of Mineral Resources, October-November 1961, August 1961, June-July 1963, and March-April 1964; and geologic and geochemical investigations by W. C. Overstreet and J. W. Whitlow, U. S. Geological Survey, and C. O. Ankary, Directorate General of Mineral Resources, March-April 1964

23°00' 45°00' Aerial photography 1956 and controlled mosaic 1958 Aero Service Corporation, Philadelphia, Penn., USA



RECONNAISSANCE GEOLOGIC MAP OF THE JABAL BITRAN QUADRANGLE, KINGDOM OF SAUDI ARABIA

By
Viktor P. Kahr, William C. Overstreet,
Jesse W. Whitlow, and Abdullah O. Ankary
1972