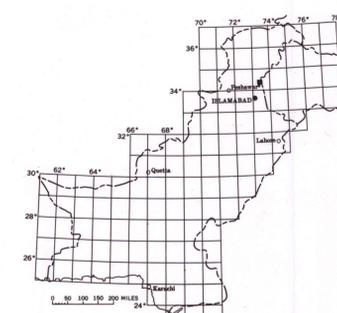


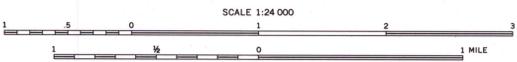
- EXPLANATION**
- QUATERNARY**
- Qal Alluvium
Unconsolidated deposits or reworked loess, stream gravels, and slope wash
- UNCONFORMITY**
- TERTIARY**
- Tk Kala Chitta Group
Nodular limestone and calcareous shale; contains abundant Foraminifera
- UNCONFORMITY**
- CRETACEOUS**
- Kk Kawagarh Limestone
Gray, dense, fine-grained; contains Globotruncana
 - Kjc Lumshival Sandstone and Chichali Formation
undivided
Medium-grained, calcareous sandstone and black, thin-bedded shale
- JURASSIC**
- Jss Samana Suk Limestone
Dark-gray, thick-bedded, pelletal, crossbedded
- UNCONFORMITY**
- Jdqu Datta Formation
Jdqu, upper quartzose sandstone unit
Jds, shale unit; red, iron-rich hematitic shale in Galdanian area
Jdql, lower quartzose sandstone unit
- UNCONFORMITY**
- CARBONIFEROUS TRIASSIC**
- Tckd Kingriali Formation
Tckd, dolomite and cherty dolomite member
Tckq, conglomerate, quartzose sandstone, and siltstone member
- UNCONFORMITY**
- PRECAMBRIAN(?) ORDOVICIAN(?) DEVONIAN(?)**
- Dot Tanawal Formation
Laminated fine-grained quartzose schist, biotite-quartz schist, and black slate
 - OpCh Hazara Formation
Black slate, brown phyllite, graywacke, and siltstone
- Contact**
Dashed where approximately located; dotted where concealed
- Fault**
Dashed where approximately located; dotted where concealed; showing dip where measured; U, upthrown side; D, downthrown side; Arrows show relative horizontal movement
- Thrust fault**
Dashed where approximately located; showing dip where measured; South on upper plate
- Fault zone**
- Anticline**
Showing trace of crestal plane and direction of plunge
- Overturned anticline**
Showing trace of axial surface, direction of dip of limbs, and direction of plunge
- Syncline**
Showing trace of trough plane and direction of plunge
- Overturned syncline**
Showing trace of axial surface, direction of dip of limbs, and direction of plunge
- PLANAR FEATURES**
May be combined with planar features
- Inclined Overturned Vertical Strike and dip of beds
Showing top of beds, τ , where known
 - Inclined Vertical Strike and dip of foliation
- LINEAR FEATURES**
May be combined with planar features
- Intersection of bedding Mineral alignment and cleavage
 - Plunging Horizontal Axis of larger fold; wavelength usually a few inches to a few feet
 - Axis of microcrinkle; wavelength usually a few millimeters
 - Combined types of parallel lineation
- Bearing and plunge of lineation**
- Iron-manganese lenses
 - Phosphate locality
See plate 4 for cross sections



Base map compiled by Photogrammetric Group, Geological Survey of Pakistan

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1972

Geology mapped by J. A. Calkins and A. S. A. Matin in 1962-64



GEOLOGIC MAP OF THE KAKUL-GALDANIAN AREA, HAZARA DISTRICT, PAKISTAN
PREPARED UNDER THE AUSPICES OF THE
UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT