وزارة الداخلية
مصلحة المساحة الجيولوجية الأمريكية

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

المملكة العربية السعودية
وزارة المالية والاقتصاد الوطني
المديرية العامة لشؤون الزيت والمعادن

KINGDOM OF SAUDI ARABIA
MINISTRY OF FINANCE AND NATIONAL ECONOMY
DIRECTORATE GENERAL OF PETROLEUM AND MINERAL AFFAIRS

أبحاث جيولوجية مختلفة
خريطة رقم ١-٢١٢A

MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-212A

GEOLOGIC EXPLANATION

التفسير الجيولوجي

SEDIMENTARY ROCKS

الصخور الرسوبية

QUATERNARY

Qas — **Sand**
Aeolian, mostly mobile.

Qsi — **Silt**
Silt and associated fine sediments including caliche-like and gypsiferous deposits in undrained depressions.

Qg — **Gravel**
Composed mainly of limestone and other rocks of local origin. In some areas unidentified older gravels are included.

Qgq, Qgp — **Gravel**
Mostly lag gravels, Qgq, composed of quartz and other pebbles from the basement complex. In south, Qgp is a gravel sheet in which dark rocks predominate. Possibly includes beds of Tertiary age.

TERTIARY — *Miocene and Pliocene*

Tg — **Gravel**
Mostly well-rounded white quartz pebbles.

Tk, Tkl — **Kharj formation**
Tk, *Limestone and associated lacustrine gypsum and gravel.* Tkl, *lacustrine limestone.*

Tn — **Sandstone and marl**
Marly sandstone white and pink sandy marl, and sandy limestone; locally cherty.

Paleocene and Eocene (lower)

Tu — **Umm er Radhuma formation**
Light-colored limestone, dolomitic limestone, and dolomite.

CRETACEOUS — *Upper Cretaceous*

Ka, Kas — **Aruma formation**
Gray, tan, and cream-colored limestone interbedded with minor dolomite and olive-drab shale; upper part is yellow-tan and yellow-brown calcareous shale, clayey dolomite, and limestone. The middle and lower parts of formation grade southward to quartzite with minor marly matrix and soft marly white sandstone, Kas. Of Campanian(?) and Maestrichtian age.

Kw — **Wasi'a formation**
Buff, gray, brown, and varicolored quartz sandstone with dispersed quartz pebbles interbedded with varicolored shale and locally with thin layers of dolomite; platy ironstone at several stratigraphic positions. Of Cenomanian age.

Kb — **Biyadh sandstone**
Sandstone interbedded with varicolored shale; ironstone layers at several stratigraphic positions, particularly in lower part; two thin dolomite members 60 to 70 meters below the top in the extreme northern part. Of Aptian and Albian age.

Lower Cretaceous — *Thamama group*

Kbu — **Buwaib formation**
Dominantly soft limestone with a few thin calcarenite beds containing numerous shell fragments in the lower part; soft sandstone in the upper part. Probably of Aptian age.

Ky — **Yamama formation**
Calcarenite interbedded with soft limestone. Probably of Neocomian age.

Ks — **Sulaiy formation**
Light-colored compact limestone with infrequent thin calcarenite and coquina layers, locally partially dolomitized; basal part includes much interbedded calcarenite and some breccia. Probably of Neocomian age.

JURASSIC — *Upper Jurassic*

Jhi, Ja — **Hith anhydrite and Arab formation**
Anhydrite and gypsum interbedded with fine-grained limestone, dolomite, and calcarenite; massive anhydrite in the upper part, the Hith anhydrite, Jhi. The interbedded evaporite and calcareous beds of the lower part constitute the Arab formation, Ja.

Jj — **Jubaila limestone**
In central and northern part, cream-colored compact limestone containing a few calcarenite layers and, near the top, a few dolomite units. In the southern part the Jubaila mainly consists of a dolomite unit overlying a brown marine sandstone. Of Kimmeridgian age.

Jh — **Hanifa formation**
Cream and tan-colored soft limestone; minor interbedded marl and tan-colored clay shale; several brown calcarenite beds, partly oolitic in middle and upper part. Colonial corals often in position of growth in middle and upper part. Possibly of Oxfordian age.

Jtm — **Tuwayq Mountain limestone**
Massive light-colored compact limestone forming major cliffs of Tuwayq Mountains; includes a basal marly member and locally a few thin calcarenite layers; colonial corals in position of growth at many levels. Of Callovian age.

Middle Jurassic

Jd — **Dhruma formation**
In north, light-colored limestone with interbedded brown calcarenite, partly oolitic; olive-drab clay shale at top. Between latitudes 22°00′ and 22°30′ N., sandstone units appear in the Dhruma and increase in prominence to the south, where the entire section is buff, brown, and red sandstone, varicolored shale, and minor platy ironstone layers. Of Bajocian and Bathonian age.

Lower Jurassic

Jm — **Marrat formation**
At north, golden-brown to tan-colored limestone and dolomite with a middle unit of dark brick-red silty shale and thin sandstone beds; unit grades southward into shale and sandstone. At about latitude 22°00′ N., the Marrat cannot be distinguished from overlying and underlying formations. Of Toarcian age.

TRIASSIC OR JURASSIC

J̄Rm — **Minjur sandstone**
Buff-colored, massive, usually cross-bedded sandstone with irregularly distributed varicolored shale, sandy shale, and shaly sandstone; minor beds of ironstone at several horizons. Quartz pebbles are numerous in some sandstone beds.

TRIASSIC

R̄j — **Jilh formation**
Sandstone, silty to massive and coarse-grained; interbedded green, purple, and red siltstone and shale; minor limestone beds; arenaceous oolite and oolitic sandstone in uppermost beds; thin layers of platy black and brown ironstone are abundant in the upper part. Marine fossils occur in limestone in middle and upper part.

PERMIAN OR TRIASSIC

R̄Ps — **Sudair shale**
Brick- to dark-red massive shale; minor pale-greenish-white siltstone and soft fine-grained sandstone near the base. In north massive crystalline gypsum in beds a meter or more thick occurs in the middle and lower part.

PERMIAN

Pk — **Khuff formation**
Light-colored limestone, interbedded argillaceous limestone, dolomite, marl, and gypsiferous clay; a varicolored sandstone and shale unit is usually present at base. In the southern part exposures are poor; most of the formation is probably shale and marl.

IGNEOUS AND METAMORPHIC ROCKS

الصخور النارية والمتحولة

PRE-PERMIAN

Dikes of rhyolite, diabase, and andesite
Includes some aplite and pegmatite.

g — **Granite**
Generally red or pink; includes some layered intrusive rocks.

d — **Diorite and related rocks**

m — **Andesite and fine-grained dioritic rocks, flows, and intrusives**
Includes interbedded phyllite, quartzite, graywacke, conglomerate, and marble.

a — **Amphibolite schist with mafic undifferentiated intrusive and extrusive rocks**

as — **Amphibolite schist**
Includes minor beds of quartzite.

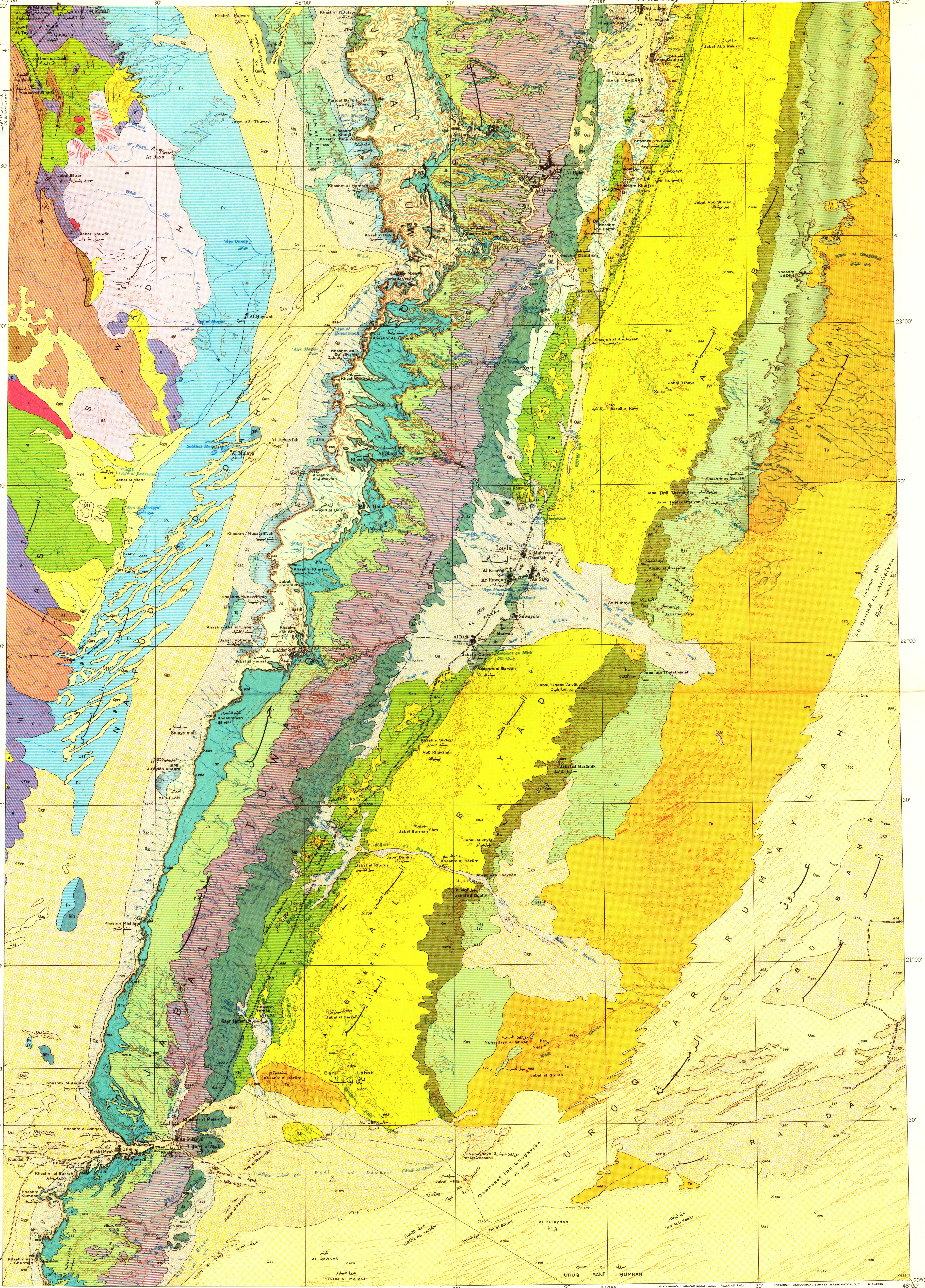
s — **Sericite and chlorite schist**
Includes minor lenses of quartz and marble.

gg — **Granite gneiss**
Generally gray, with at least two systems of foliation.

Trend lines
Showing lineation in basement rocks.

Contact
Dashed where approximately located.

Fault
Dashed where approximately located; U, upthrown side; D, downthrown side.



Prepared by the U. S. Geological Survey and the Arabian American Oil Company under the joint sponsorship of the Kingdom of Saudi Arabia and the U. S. Department of State.
Lambert conformal conic projection; standard parallels 17° and 30°.

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MAP LEGEND

اصطلاحات الخريطة

POPULATED PLACES — الأماكن الآهلة بالسكان

- Town — مدينة
- Village — قرية
- Areas under cultivation — مناطق زراعية
- Date gardens — جنائن نخل

TRANSPORTATION — طرق المواصلات

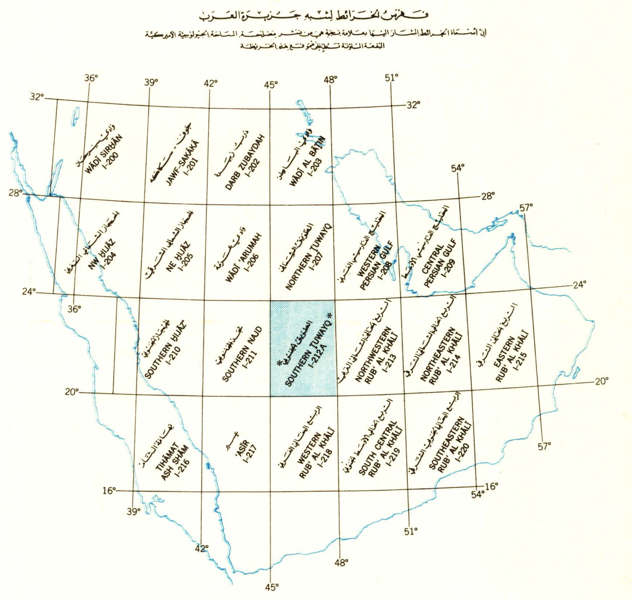
- Secondary road — طريق إعتيادية
- Road of questionable permanency — طريق غير ثابتة
- Camel trail — مسلك للجمال

HYDROGRAPHIC FEATURES — الأوصاف الهيدروغرافية
Only isolated wells are shown.

- Dug well
- Salt-water well
- Intermittent stream
- Sabkhah or silt, clay, and sand mud flat

HYPSOGRAPHIC FEATURES — الأوصاف الهبسوغرافية

- Generalized relief
- Sand — *Dense stipple represents active sand with dunes and linear ridges. Open stipple represents thin or discontinuous sand cover.*
- ×455 Spot elevation in meters
- Mine — منجم

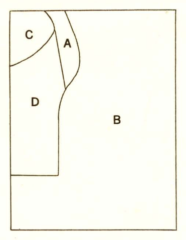


INDEX MAP OF ARABIAN PENINSULA
Maps published by the U. S. Geological Survey shown by asterisk following name.
Area of this map shown by tint.

GLOSSARY

إيضاحات

Abraq	Rocky hill with sand on slopes
'Ayn	Spring, solution pit, or well
'Aqabah(t)	Pass
Bi'r; pl., Bi'ār	Dug well
Farāyid, Farā'id	Chain of rather isolated hills
'Irq; pl., 'Urūq	Long linear sand ridge
Jabal; pl., Jibāl	Hill or mountain
Jilh	Barren ground
Khafs	Pond in a natural depression
Khashm	Headland or promontory, along a cliff or mountain front
Nafūd	Large area of sand dunes
Qaṣr	Fort, palace, or castle
Ramlah(t)	Sand area
Sāqiyah(t)	Ditch
Sha'īb	Same as wadi
Sabkhah(t)	Silt, clay, and sand flats, often with saline incrustations
'Urayq (diminutive of 'Irq)	Small linear sand ridge
Wādī; pl., widyān	Valley or dry water course



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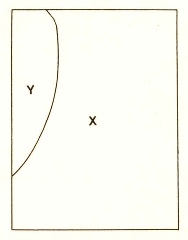

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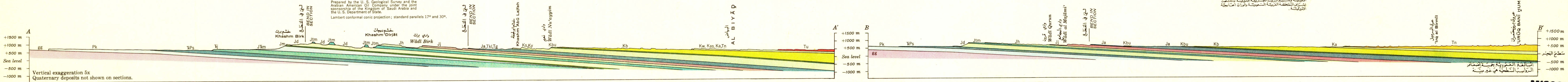

Vertical exaggeration 5x
Quaternary deposits not shown on sections.

GEOLOGY OF THE SOUTHERN TUWAYQ QUADRANGLE, KINGDOM OF SAUDI ARABIA

By
Richard A. Bramkamp, Ruel D. Gierhart, Glen F. Brown, and Roy O. Jackson

خريطة جيولوجية للوحة الطويق الجنوبي بالمملكة العربية السعودية
وضع
السادة ريتشارد برمكامب ، رونيل جيرهارت ، خلين براون ، وروي جاكسون

أبحاث جيولوجية مختلفة
خريطة رقم ١-٢١٢A
MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-212A

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