وزارة الداخلية
مصلحة المساحة الجيولوجية الأمريكية
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

المملكة العربية السعودية
وزارة البترول والثروة المعدنية
KINGDOM OF SAUDI ARABIA
MINISTRY OF PETROLEUM AND MINERAL RESOURCES

أبحاث جيولوجية مختلفة
جريطة رقم A ٢١٩ -I
MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-219 A

التفسير الجيولوجي
GEOLOGIC EXPLANATION

QUATERNARY (رباعي)

Qes — **Eolian sand** (الرمال المتكونة بفعل الرياح)
Mostly mobile. (See legend for description of sand terrain types)

Qs — **Silt** (الطمي)
Silt and associated fine sediments including caliche-like and gypsiferous deposits in undrained depressions

Qg₂ — **Gravel** (الحصاة)
Sheets and trains of gravel composed of varying proportions of limestone and basement complex pebbles, probably for the most part near its original relative elevation; includes, in places, unmapped Tsm, gypsum, silt and probably some lake-terrace deposits composed of interbedded white, tan and brown, fine quartz sandstone with micaceous, silty, occasionally gypsiferous clay and fossiliferous silt; late Pleistocene(?) to early Recent in age

Qdc — **Calcareous duricrust** (الصلبة الارضية الكلسية)
Gray to tan, sandy limestone, locally gypsiferous, grades locally into thin calcareous cemented sandstone. Distribution incompletely known

TERTIARY AND QUATERNARY — Pliocene and Recent

QTgs — **Gravel and sand** (الحصاة والرمل)
Fluviatile terraces, lacustrine deposits, loess flats, alluvium, gravel and sand; distribution of individual units incompletely known

TERTIARY (ثلاثي)

Miocene and Pliocene

Tsm — **Sandstone and limestone** (حجر الرمل وحجر الكلس)
White and gray, fine-grained, soft, chalky fossiliferous limestone with Clementia papyracea; includes some white to light gray silty to sandy marl, and sandstone. May also include unmapped lake deposits

Eocene — Middle Eocene

Tha — **Habshiya formation** (تكوين منطقة حبشية)
Yellow and variegated shale and marl with interbedded chalk and limestone; equivalent to the Dammam of Saudi Arabia

Lower and middle Eocene

Tdr — **Dammam and Rus formations, undivided** (تكوينا منطقتي الدمام وام الروس، غير منفصلتان)
White, buff, light yellow, gray and tan, fine-grained, hard, dense to vuggy limestone; locally recrystallized and dolomitized with siliceous zones of tan, white and reddish-brown, commonly nummulitic chert; siliceous limestone and chert in places weathered to tripolite. Rus formation incompletely known in Rub' al Khālī; includes limestone and evaporites

Lower Eocene

Tr — **Rus formation** (تكوين ام الروس)
Massive gypsum with occasional chert bands and marly horizons; limestone bands may occur near top and base; equivalent to the Rus formation of Saudi Arabia

Tj — **Jeza' formation** (تكوين منطقة الجزع)
Yellowish-green, calcareous shale with thin beds of marine foraminiferal limestone; in places, becomes chalky with slightly massive bedding; includes some marl. Partly equivalent to the upper part of the Umm er Radhuma formation of Saudi Arabia

Paleocene and lower Eocene — Paleocene and Eocene

Tu — **Umm er Radhuma formation** (تكوين ام الرضمة)
Thick bedded, massive, hard, compact, semi-crystalline limestone; in Wādī Ḩaḑramawt and to the south divisible into an upper buff and white weathering, nodular limestone, and a lower massive, dark brown weathering, locally dolomitic limestone unit

CRETACEOUS (طباشيري)

Kt — **Tawilah group** (مجموعة جبل الطويلة)
Maximum exposed thickness in quadrangle is uppermost 300 feet in W. Ḩaḑramawt. In Ḩaḑramawt occurs in a caliche facies of sandstone with siltstone and subordinate shale and marl; of lagoonal, shallow water to deltaic origin; plant remains present locally. May be partly equivalent to the Aruma, Wasi'a, and Biyadh formations of Saudi Arabia, and equivalent to the Mahra group of Southeastern Rub al Khali quadrangle, map I-220A; also equivalent to the Taouillah series of Yemen (Lamare, et al).
In coastal southwestern Ḩaḑramawt the uppermost Cretaceous consists of sandstone and siltstone with marl and shale. The middle part of the Cretaceous is a similar facies including limestone tongues with shale and marl units. The lowermost part of the Cretaceous consists of clastic rocks with a limestone unit near the base. Age range of the Tawilah group is Barremian to Maestrichtian

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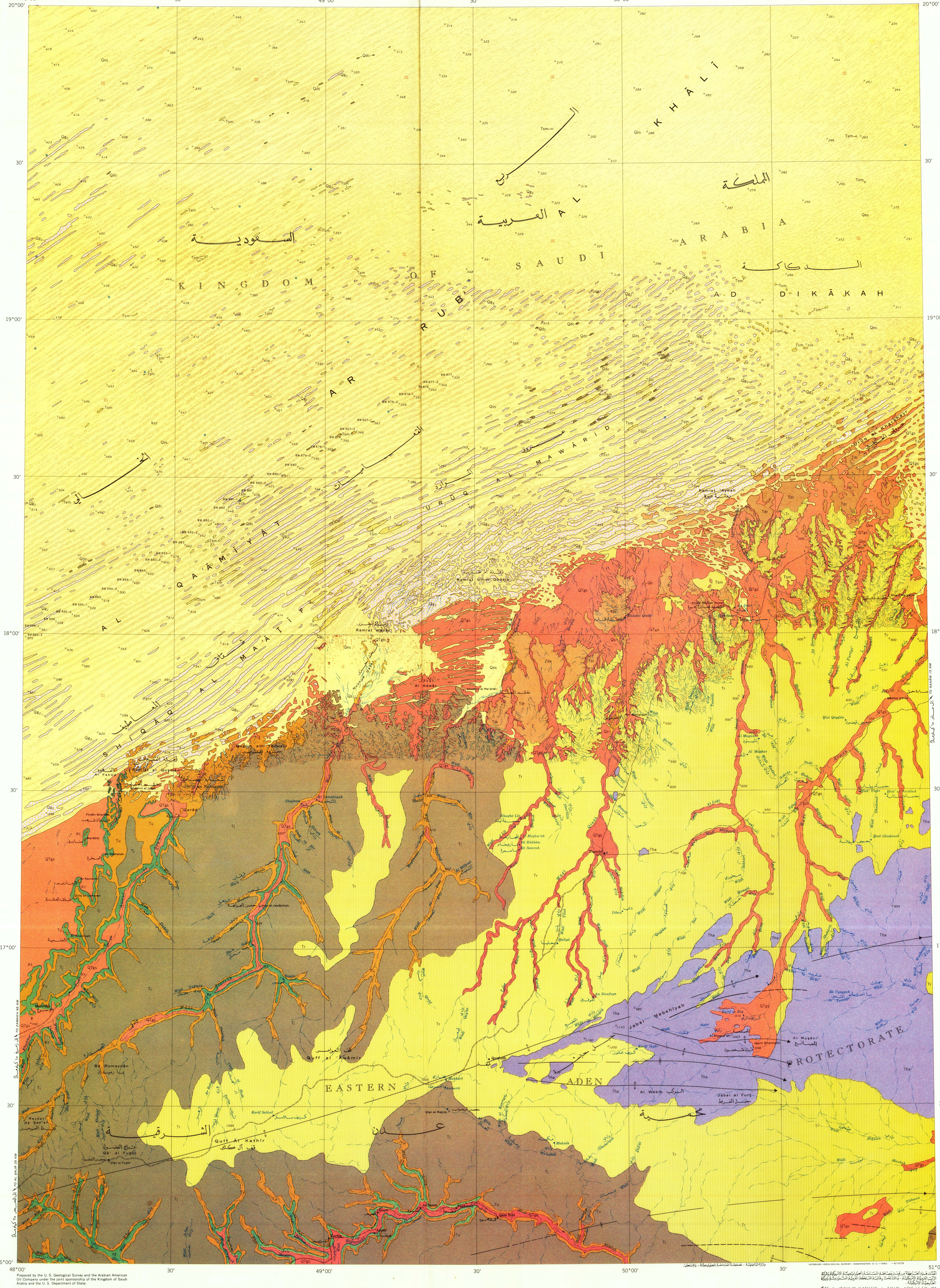
الاتصال الجيولوجي — **Geologic contact**
Dashed where approximately located; short dashed where indefinite

الصدع — **Fault**
Dashed where approximately located

التواء الطبقات الصخرية الحدبي — **Anticline, showing plunge**
Dashed where approximately located

التواء الطبقات الصخرية الجوفي — **Syncline, showing plunge**
Dashed where approximately located



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 13°

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1963—61439

اصطلاحات الخريطة
MAP LEGEND

POPULATED PLACES (الأماكن الآهلة بالسكان)
- Village or town (قرية أو بلدة)
- Village or town, name not given
- Fort (حصن أو قلعة)

TRANSPORTATION (طرق المواصلات)
- Major road, unpaved
- Secondary road
- Road of questionable permanency
- Khalīf (see glossary)
- Landing field

HYDROGRAPHIC FEATURES (الأوصاف الهيدروغرافية)
Only isolated wells are shown
- Dug well
- Drilled water well
- Daḩl (see glossary)
- Intermittent stream
- Silt flat

HYPSOGRAPHIC FEATURES (الأوصاف الهيبسوغرافية)
- Generalized relief
- Prominent topographic features
- Sand

Dense stipple represents mobile sand cover consisting primarily of dunes, linear ridges, and other individual sand forms, that are shown where map scale permits; moderately dense stipple represents more stabilized continuous sand cover; open stipple represents discontinuous sand cover.

Types of sand terrain (أنواع الأراضي الرملية)

I — Transverse. *Predominantly simple and compound barchan dunes in areas of more mobile sand, and/or simple rounded ridges, both oriented transverse to the prevailing wind direction.*

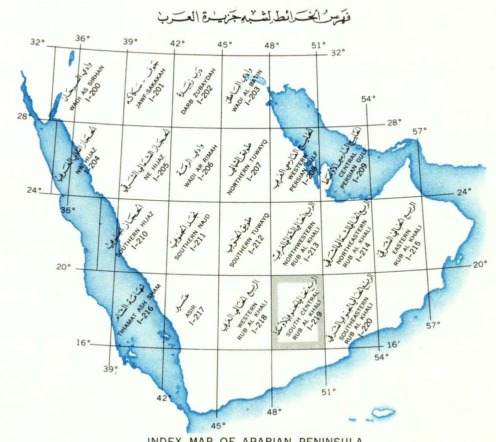
II — Longitudinal. *Primarily dikākah and various types of undulating sand sheets, in general characterized by elongation of the individual topographic forms parallel to the prevailing wind direction, often partially stabilized by sparse vegetation.*

III — 'Urūq. *Various forms of long, nearly parallel, sharp crested narrow sand ridges and dune chains separated by broad sand valleys usually including elements of type I sand terrain. These are the resultant of a system of two dominant wind directions and are identical to the sayf dunes of North Africa.*

IV — "Sand mountains." *Dominated by large sand massifs commonly cresting 50 to 300 meters above the substratum, often with super-imposed dune patterns consisting of various types of complex barchans. Common forms are giant barchans spanning several kilometers from horn to horn; giant bisigmoidal and pyramidal sand peaks as well as other less common peak forms; and giant oval to elongate sand mounds.*

MISCELLANEOUS FEATURES (أوصاف مختلفة)
- BM 886 × 548 meters — Bench mark
- × 409 meters — Spot elevation

فهرس الخرائط لشبه جزيرة العرب

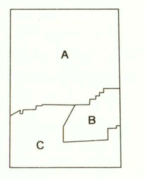


INDEX MAP OF ARABIAN PENINSULA

إيضاحات
GLOSSARY

دحل	Daḩl	Deep sink hole or solution cavity
حائرة ج حوائر	Ḩā'irah (t); pl., Ḩawā'ir	Terminal basin of a wādī or sha'īb
حسي ج حساء	Ḩasī, Ḩisī; pl., Ḩisā'	Dug well, seasonal
حصن	Ḩişn	Fort
حزوم مفردها حزم	Ḩuzūm; (pl. of Ḩazm)	Elevated rocky terrain
عرق ج عروق	'Irq; pl., 'Urūq	Long linear sand ridge
جبل	Jabal	Hill or mountain
خليف	Khalīf	Motorable pass
خشم	Khashm	Headland or promontory along a cliff or mountain front
قاع	Qā'	Depressed plain
قرن	Qarn	Prominent mountain front
رملة	Ramlah (t)	Sand area
شعب ج شعاب	Shi'b, Sha'b; pl. Shi'āb	Same as wādī, often a tributary
شقاق مفردها شقة	Shiqāq; (pl. of Shaqqah)	Valley or depression between 'urūq
وادي	Wādī	Valley or dry water course

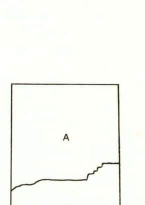
مصادر المجموعات الأساسية



Compilation and topographic representation by the Arabian American Oil Company: A, controlled aerial photographic surveys, 1958-1959; B, recompiled from ground surveys; C, recompiled from various published sources partly modified and amended from reconnaissance ground surveys. Topographic representation by E. L. Elberg, Jr., Arabian American Oil Company. Translation, transliteration, calligraphy and Arabic typography by S. H. Kfoury, C. D. Matthews and M. H. Kfoury.

SOURCES OF BASE COMPILATION

مصادر المجموعات الجيولوجية



Geologic mapping by the Arabian American Oil Company compiled from: A, photogeologic interpretation based on limited reconnaissance ground surveys by R. D. Frazer, R. A. Bramkamp, S. B. Henry, L. F. Ramirez, R. B. Carr and H. H. Helley; and B, "Synopsis of the Geology of East Aden Protectorate" by Z. R. Beydoun published by the 1960 International Geological Congress in Copenhagen, and "The Stratigraphy and Structure of the East Aden Protectorate", Doctorate of Philosophy Thesis, Oxford University, 1961, (pending publication) by Z. R. Beydoun.
Translation of the geologic explanation edited by Harold W. Glidden, U.S. Department of State.

SOURCES OF GEOLOGIC COMPILATION

This map printed in two sheets; Sheet A, geology and geography combined; Sheet B, geography only. Available at the Ministry of Petroleum and Mineral Resources, Jiddah and Ad Dammām, Saudi Arabia, and at the U.S. Geological Survey, Washington, D.C., U.S.A.

المقياس ١ : ٥٠٠٠٠٠
Scale 1:500 000

10 0 10 20 30 40 50 Kilometers
10 0 10 20 30 Miles

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GEOLOGY OF THE SOUTH CENTRAL RUB AL KHALI QUADRANGLE, KINGDOM OF SAUDI ARABIA

By
Leon F. Ramirez, Edward L. Elberg Jr., and Hans H. Helley

خريطة جيولوجية للوحة الربع الخالي الجنوبي الأوسط بالمملكة العربية السعودية

وضع
ليون راميرز وادوارد إلبورغ وهانز هيلي

أبحاث جيولوجية مختلفة
جريطة رقم A ٢١٩ -I
MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-219 A

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