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

خريطة جيولوجية مختلفة
MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-200 A

GEOLOGIC EXPLANATION

Eolian sand (Qes)
Mostly mobile. (See legend for description of sand terrain types)

Sabkhah deposits (Qsb)
Silt, clay, and muddy sands, commonly saline, underlying coastal and inland playas

Terrace alluvium (Qt)
Gravel, sand, and silt deposited as much as 15 meters above Wadi or Khowr and its tributaries

Silt and gravel (Qs)
Silt and associated fine sediments including calcic-lithe and gypsiferous deposits in undrained depressions; Qc, fog and other gravels of local origin, partly the fog from originally extensive gravel sheets and trains; in southern part of quadrangle components consist of sandstone and some chert derived from nearby outcrop, Qg. The Al Buwaiji gravel plains consist primarily of tan to brown and cream to white chert derived from rocks of Eocene age; unconsolidated surficial deposits of sand, silt, alluvium, and gravel, Qu, may include unrecognized equivalents of other units of Quaternary age

Gravel (Qg)
Quartz gravel as sheets and trains with varying proportions of limestone and basement-complex pebbles; probably for the most part near its original relative elevation. In the vicinity of Tubah and northward includes a fine lenticle, thin exposures of Tpm equivalents

Calcareous duricrust (Qdc)
Discontinuous mantle of red, brown, gray, tan, and yellow, usually hard, sandy limestone, commonly containing imbedded fragments of underlying rocks; varies in thickness from a few centimeters to three or four meters. Coarse fronted quartz sand grains are usually present, also a few fresh-water molluscs. In places the resistant duricrust outcrops weaks underlying rocks and where extensive hides underlying structure. In the vicinity of Al Khot duricrust is mixed with chert, duricrust, and calcareous sandstone gravel with common caliche

Basalt (Qtvs)
Olivine basalt, in Al Harrah, with local thin aphlic dikes; in places scoriaceous; red resinder; includes bolded pyroxitics, plugs, and cones. Thin lava fields discontinuously cover underlying rocks; in places, block to reddish-brown, crystalline, olivine basalt interbedded with units of Tpm is not mapped

Sandstone, marl, and limestone (Tpm)
Red, brown, and gray marly to calcareous sandstone with occasional conglomerate lenses; sandy marl with minor red sandy shale; white, gray, and brown sandy limestone at top. In Al Hāj area: off-white to gray and cream sandy limestone grading to calcareous sandstone with common small sandstone, limestone, and shale pebbles and grussoles; locally resembles duricrust, Qdc, and is underlain by thin shaly, silty, beds; at places sandy limestone grades downwards into calcareous and ferruginous sandstone. Includes local conglomerate and conglomeratic sandstone beds, fanglomerate, and brown and black sandstone, limestone, and shale debris derived from Jauf and Sakaka formations underlies the duricrust-like surface, Tsm?, of questionable late Tertiary or possibly Quaternary age

Baghama formation (Tbg)
Sandstone, mudstone, limestone, tuff, and tuffaceous siltstone. Conglomerate and cross-bedded sandstone at base; includes interbedded conlomerate, basalt, and rhyolite flows and agglomerate. Total thickness 300 meters plus. Exposed in an eroded dome at the southern end of the Midyan peninsula and on the islands of Tiran and Qināfir. Considered part of the thick Miocene evaporite section dawn dropped in the Red Sea rift. Based on mapping by E. G. Bogue, G. Bleiker-Bernburg, and W. Schott

Gravel (Tg)
Mostly well-rounded white quartz gravel at southeastern corner of Al Hāj; west of Al Tubayq includes narrow raised gravel trains of unknown composition; of questionable Tertiary age

Limestone, chalk, and marl (Tu)
In northeastern part of map upper member consists of gray, white, ten to brown, massive, crystalline, commonly sandy limestone at top; thin, white, chalk and marl with echinoids; and a thin, gray, detrital fossiliferous limestone unit belh to middle part; grey to white, porous, chalky limestone with thin, white, chalk and marl interbeds; and gray limestone in lower part. Lower member consists of cream, white and gray buff to tan weathering, chalky, crystalline limestone with several nummulitic zones, ten to black nodular chert units, several siliceous horizons and occasional calcite geodal zones; locally chert altered to tripoli. Dark chert residuum, limestone, and other gravel covers part of the Al Qunaid plains and other smaller plains. Ten to pink crystalline limestone and gray crystalline dolomite with common grey and brown chert overlies the Aruma formation south of 30° latitude. Near Sha'ib Turrag' at east end of Al Tubayq: white to gray, brown to buff, hard, chalky, nonnodular limestone with gray and brown, bedded and nodular chert zones at several levels, locally with quartz pebbles at base

Aruma formation (Ka)
Variegated, white, gray, lavender, red, yellow, and brown massive to crossbedded, partly calcareous, poorly consolidated quartz sandstone at Jebel ash Shuhā'; northwestward consists of buff, pink, and brown locally coarse-grained, massive to crossbedded, partly calcareous and shaly quartz sandstone with interbedded gray-green and yellow shale and siltstone; thin, gray, chert zones at several horizons; may wedge out to the northwest. Aruma formation mapped with undivided Eocene rocks at Ash Shū'bā

Sakaka sandstone (Ks)
Buff, white to pinkish and light orange, brown to black weathering, cross-bedded, locally silty sandstone; slightly micaceous in lower part. Pre-Cretaceous to post-Devonian in age

Jauf formation (Dj)
Gray, buff, and greenish-gray sandstone with minor silty shale and several thin, gray, tan, cream, and pinkish, locally fossiliferous dolomitic limestone and dolomite units in upper member. Middle member consists of a thick series of greenish-gray, red bended, silty to sandy shale, and locally conglomeratic sandstone and siltstone with gypsum and rare carbonate units; basal member consists of greenish-gray, and olive, silty to sandy shale with several sandstone units and occasional thin, gray limestone units near base; gray to tan, locally fossiliferous, equilamose, impure limestone with algal or coral head structures at top of member at places. Nor fossil evidence places all of formation in Devonian age

Tabuk formation (Dtw, DSOt)
Tuwil sandstone member, Dtw, at top: buff, light-brown to white, locally gray, yellow, red, and purple, dark brown to black weathering strongly crossbedded quartz sandstone with common quartz pebble zones and interbedded, thin, discontinuous, gray and maroon, shaly siltstone zones; transtone convention zones at several levels most abundant in lower part; Qtw, Tuwil sandstone member, is mapped and described as a formation as it is considered the upper member of the Tabuk formation.
Tuwil sandstone member overlying Tabuk formation, Dtw

DSOt

Tabuk formation, may include Tuwil sandstone, DSOt. In vicinity of Al Tubayq includes undifferified shale
Tabuk formation: Units from top to base: pastel and light-gray, mottled fine sandstone with abundant Scolithos?-Tigillonus? worm burrows; gray, olive, brown and reddish-brown, fine, silty sandstone and micaceous shale; gray, micaceous, silty sandstone and micaceous shale; sandstone and micaceous shaly siltstone with subordinate, micaceous, silty shale; green to greenish-gray, micaceous, shaly siltstone and purple, and green, to part micaceous shale (pyroplastic zone in lower part) with subordinate fine silty sandstone; gray, purple, and green shale, (several greoplastic zones) in part silty and micaceous with bedsof light-gray, platy, fine sandstone; gray, fine, partly micaceous sandstone and green, micaceous, silty shale; green, purple, and gray shale (pyroplastic zone in lower part) with subordinate fine sandstone and siltstone; black weathering, massive, medium-to coarse-grained quartz sandstone; brown to gray, fine- to medium-grained quartz sandstone, partly crossbedded, with interbedded silty, fine, micaceous sandstone in upper part; purple and gray, calcareous, graoplastic silty shale with a few, thin, irregular, impure limestone horizons; uppermost part of map unit probably of Devonian age

Ilam and Umm Sahm sandstones, undivided (Cu)
Buff, light-gray, red, and brown, dark-brown to black and purple weathering, crossbedded sandstone with common quartz granule and pebble zones; locally conglomeratic. Includes red, ferruginous, usually quartz cemented "Nubian" sandstone facies; ferruginous, usually quartz cemented but in part iron hardened; upper part. Lower part consists of buff, tan, and purple to off-white weathering, massive, quartz sandstone in distinctive rounded forms; common quartz granule and pebble zones; strongly fractured. May be in part equivalent to Saq sandstone of Wadi ar Rimah quadrangle, I-204A; lower part may be of Cambrian age

Quweira sandstone (Cq)
Reddish-brown, black and maroon weathering, massive to crossbedded, locally silty quartz sandstone with common conglomeratic zones of quartz and feldspar granules and pebbles; lactly becomes a sub-graywacke. May be in part equivalent to the Saq sandstone of Wadi ar Rimah quadrangle, I-204A

Siq sandstone (Cs)
Moderate-bedded to massive,dark-red sandstone forming cliffs at Shi'b Siq above crystalline rocks; locally conglomeratic with pebbles from underlying Precambrian complex. Fractures to smooth upper surface which contrast sharply with overlying jointed and rugged terrane of Quweira or Ilam sandstones. May be equivalent in part to the Saq sandstone of the Wadi ar Rimah quadrangle, Map I-204A

CRYSTALLINE ROCKS
(Rock descriptions after R. G. Bogue, H. R. von Gaertner, and H. Schurmenberg)

NONCONFORMITY

Diken of rhyolite, diabase, and andesite (r, d, a)
Includes some aplite, pegmatite, and quiben

Shammar rhyolite (r)
Flows, tuff, and agglomerate; hypabyssal siliceous intrusive, generally red

Granite (gm)
Massive,light-colored calc-alkalic granite, mostly without dikes, in large discordant stocks and batholiths on the flanks of Jabal al Lawz, Jabal Ithnēl, and Jabal ash Shāq'i

Granite (gr)
Red or salmon, coarse-grained, commonly highly altered especially in the mountains on the eastern shore of the Gulf of Aqaba; widely altered through the underlying granite and granodiorite and cut by many dikes of basalt, rhyolite, and diabase

Hadiyah slate (h)
Green and maroon slate,and conglomerate, oracle, and phyllite. Conglomerate consists of well rounded pebbles and boulders of andesite and rhyolite, rare phyllite, and very rare red jasplite. Tightly folded and cut by younger granites

Granite and granodiorite (gg)
Syntectonic type; includes medium-grained alkite and hornblende granite, adamellite, and monzonite; at places gneissic, sheared, with many xenoliths of schist, slate, and fine-grained basic fine rocks; commonly smothers with coarse aoyloce

Diorite, gabbro, and serpentinite (d, gb, sp)
In stocks and sills associated with the granostone. Some basic intrusions may be younger than the granite and granodiorite unit, gg

Greenstone (gs)
Diabase, andesite, and basalt; mostly flows, somerkat metamorphosed to greenschist facies, locally to amphibolite

ANGULAR UNCONFORMITY

Silasia formation (Ss)
Folded calcareous and siliceous schist and slate; minor marble, orbanic sandstone, and conglomerate; in the lower part conglomerate boulders are felsite and andesite some anagglobial basalt, quartz, rare rhyolite and felsite. Thickness 1,000 meters plus. Exposed in the core of the dome at typical Precambrian rock formation of hematite, amphibolite and schist or dolomite. Commonly intruded by diorite and related rocks; at Jabal Khariz intruded by younger granite, forming amphibolite. Type locality in Wādī Sulaygāiah where at least 1,500 meters are exposed in folds and faulted block. Not seen in contact with older rocks; somoformably overlain by greenstone, most of which is slightly metamorphosed andesite

Geologic contact
Dashed where approximately located; short dashed where indefinite

Fault or shear zone
Dashed where approximately located; dotted where concealed
U, upthrown side; D, downthrown side

Strike and dip of beds
Symbols queried where identification doubtful. Fractional symbols, Tsm, Tu and DSOt, indicate both formations present but not separated; color of fractional symbol indicates dominant formation

Rubidium-strontium and potassium-argon ages, in millions of years
As determined by L. T. Aldrich, Carnegie Institution of Washington

Eolian sand — Qes
Sabkhah deposits — Qsb
Terrace alluvium — Qt
Silt and gravel — Qs
Gravel — Qg
Calcareous duricrust — Qdc
Basalt — Qtvs
Sandstone, marl, and limestone — Tpm
Baghama formation — Tbg
Gravel — Tg
Limestone, chalk, and marl — Tu
Aruma formation — Ka
Sakaka sandstone — Ks
Jauf formation — Dj
Tabuk formation — Dtw
Tuwil sandstone member — DSOt
Ilam and Umm Sahm sandstones, undivided — Cu
Quweira sandstone — Cq
Siq sandstone — Cs
Diken of rhyolite, diabase, and andesite — r, d, a
Shammar rhyolite — r
Granite — gm
Granite — gr
Hadiyah slate — h
Granite and granodiorite — gg
Diorite, gabbro, and serpentinite — d, gb, sp
Greenstone — gs
Silasia formation — Ss

QUATERNARY
TERTIARY AND QUATERNARY
Miocene and Pliocene
Miocene
Eocene
UPPER CRETACEOUS
PALEOZOIC OR MESOZOIC
DEVONIAN
CARBONIFEROUS AND ORDOVICIAN
CAMBRIAN
PRECAMBRIAN

MAP LEGEND

POPULATED PLACES
City
Town or Village
Village, name not given
Fort, usually ruins
Ruins

TRANSPORTATION
Railroad with station
Dashed where abandoned
Major road, paved
Major road, unpaved
Secondary road
Road of questionable permanency
Trail
Airport
Landing field

HYDROGRAPHIC FEATURES
Only isolated wells are shown
Dug well
Drilled water well
Flowing well or spring
Dahl *(see glossary)*
Intermittent stream
Marsh or swamp
Sabkhah
Silt flat
Reef
Bathymetric contours in meters
Ecologic importance; not intended for navigational purposes

HYPSOGRAPHIC FEATURES
Generalized relief
Sand
Dense stipple represents mobile sand over consisting primarily of active dunes, but may include other individual sand forms, that are shown where mapping is at larger scales; open stipple represents more stabilized continuous sand cover; open stipple represents thinner sand cover.

Types of sand terrain
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.*
Longitudinal. *Primarily dikkbah and seriese types of undulating sand sheets, in general oriented parallel to the prevailing wind direction, and separated by individual topographic forms parallel to the prevailing wind direction, and commonly established by sparse vegetation.*
Urūq. *Various forms of long, narrow parallel, sharp crested narrow sand ridges and dune complexes; includes some individual types usually including elements of type I and terrain. Urūq are oriented parallel to the pattern of the dominant wind directions and are identical to the nafūd dunes of North Africa.*
"Sand mountains." *Dominated by large sand mounds commonly cresting 50 to 300 meters above the substratum, often with super-imposed dune patterns of crescentic, star, and complex barchans. Common forms are giant barchans and giant star dunes; others range from horn to horn; giant bicrescentic and pyramidal mounds; and in the Rub' al Khālī giant seif to elongate sand mounds.*

MISCELLANEOUS FEATURES
Oil pipeline with pumping station
Water pipeline
Underground aqueduct
Kilometer post
Measured from Al Qunfidah
Spot elevation
International boundary

INDEX MAP OF ARABIAN PENNSULA

GLOSSARY

Abraq . . . . . Rocky hill with sand on slopes
Ajn . . . . . Spring, solution pit, or well
Barqā' . . . . . Broad rocky hill with sand on slopes; larger than abraq
Bīr; pl. Abyār, Ābār . . . . . Dug well
Birkah (n) . . . . . Cistern
Dahl . . . . . Deep sink hole or solution pit
Dū'; pl. Duār . . . . . Hill, usually smaller than a jabal
Faydah (t) . . . . . Closed basin with firm, flat, vegetation-covered mud surface, occasionally rocky and sandy
Ḥamād; (refer to Al Ḥamād on map) . . . . . Stony upland plain
Harrah (t); (refer to Al Ḥarrah on map) . . . . . Lava flow and volcanic debris
Ḥiṣn . . . . . Fort
Jabal; pl. Jibāl . . . . . Hill or mountain
Khabb . . . . . Hollow between dunes or ḥrqs
Khabīrah (t) pl., Khabārā . . . . . Closed basin with gypsiferous, saline mud and silt surface, commonly barren and lacking vegetation
Khaḍ . . . . . Way, gully
Khashm . . . . . Headland or promontory along a cliff or mountain front
Khawr . . . . . Salty or brackish well; saline bay or inlet
Mishash . . . . . Shallow hand-dug well
Qā'; pl. Qī'ān . . . . . Depressed plain
Qal'ah (t) . . . . . Fort
Qārah (t); pl. Qīr . . . . . Flat-topped hill, usually rounded
Qaṣr . . . . . Fort, palace, or castle
Qulīb; plural of Qulīb . . . . . Well, spring
Rīf . . . . . Passage in a cleft or gap of the mountains
Rijlah (t) . . . . . Small tributary stream
Sabkhah (t) . . . . . Silt, clay, and sand flats, often with saline incrustations
Sha'b; pl., Shi'ābān . . . . . Same as wādī, usually smaller
Tall; pl., Tilāl . . . . . Hill, mound
Thaniyah (t) . . . . . Pass or defile between heights, usually shorter than a wā
'Urayn, diminutive of 'Ira . . . . . Small linear sand ridge
Wādī . . . . . Valley or dry water course

SOURCES OF BASE COMPILATION

Compilation and topographic representation by the Arabian American Oil Company: A, adjusted aerial photographic surveys, 1951; B, unadjusted aerial photographic surveys, 1951; C, reconnaissance surveys by A. A. Castro, Arabian American Oil Company. Compilation and topographic representation by U. S. Topographic Division, U. S. Geological Survey: C, adjusted aerial photographic surveys, 1951; Army Map Service Sketchmaster, Asia, 1:250,000 Series K503 maps. Detail of Northern Hijaz quadrangle, Map I-204, and Northern Najd quadrangle, map I-204, as the Wadi as Sirhan base was prepared from controlled aerial photo compilation after publication of Map I-200A. Boundaries of the Saudi Arabia taken from B.G.N. Gazetteers. Translation, transliteration, and spelling of names by Geographic Div. U. S. Navy, C. L. Matthews, and M. H. Khoury.

SOURCES OF GEOLOGIC COMPILATION

Geologic mapping by the Arabian American Oil Company compiled by L. R. Bamtrex and others from: A, photogeologic interpretation based on reconnaissance field surveys by D. A. Holm, S. D. Bowers, H. W. Schmidt, and others; B, reconnaissance field work by J. H. Schultz, J. C. Wells, R. Beverly, Jr., and Max Stalcker; B, photogeologic interpretation based on reconnaissance field surveys by R. A. Bramkamp, N. M. Layne, Jr., D. O. Rees, S. J. Rauch, A. F. Pocock, J. J. Donohue, H. G. Bogue (U.S.G.S.), G. F. Brown (U.S.G.S.), and some recent field observations by H. R. Von Gaertner (Bundesanstalt für Bodenforschung); U.S.G.S. photointerpretation provided megafossil identifications; C, D, and E, photogeologic interpretation based on reconnaissance field surveys cited in B above but only sparsely covering these areas. Geology in area D is incompletely known and further complicated by graben type faulting; several units of unknown lithology and age are present. Translation of the geologic explanation by G. F. Brown from notes by H. G. Bogue, H. R. Von Gaertner, H. Schurmenberg, G. Richter-Bernburg and W. Schott.

Translation of the geologic explanation edited by Harold W. Glidden, U.S. Department of State.

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Lambert conformal conic projection; standard parallels 17° and 33°

Indicated positions of boundary lines not demarcated on the ground are not necessarily definitive

GEOLOGY OF THE WADI AS SIRHAN QUADRANGLE, KINGDOM OF SAUDI ARABIA

By
Richard A. Bramkamp, Glen F. Brown, Donald A. Holm, and Newton M. Layne, Jr.

خريطة جيولوجية لوجه وادي السرحان بالمملكة العربية السعودية

Scale 1:500 000

1963 A.D.
1383 A.H.

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.G4

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