DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

KINGDOM OF SAUDI ARABIA
MINISTRY OF PETROLEUM AND MINERAL RESOURCES

MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-270 A

GEOLOGIC EXPLANATION

Double or fractional symbols indicate grouped formations; color-pattern of uppermost formation shown. Symbols queried where identification doubtful.

SAUDI ARABIA (Includes western Saudi Arabia and northern Yemen)

QUATERNARY
- Qe — Eolian sand
- Qa — Alluvium and related surficial deposits
- Qsb, Qs — Sabkhah and silt deposits
- Qb — Basalt and pyroclastic rocks
- Qt — Terrace sand and gravel

TERTIARY AND QUATERNARY (Pliocene?)
- QTb — Basalt and andesite
- Tm — Molasse-like clastic rocks

TERTIARY
- Miocene or Pliocene
  - Tc — Lacustrine sediments
  - Tb — Basalt and andesite
  - Td — Andesite and dolsae
- Miocene
  - Tbm, Tbl — Baid and Baghaara Formations
- Eocene
  - Tshb — Shumaysi Formation
  - Twh — Wadi ar Rimah Formation
- Paleocene and Eocene
  - Tuh — Umm er Radhuma Formation
- CRETACEOUS
  - Kh — Khuff Formation
  - Tt — Trap Series to phase upper part overlies Med-ur Series
  - Kt — Tawilah Group
  - Kk — Kahf Formation
  - Kkm — Khuff and Makhul Formations
  - Kha — Hanifa Formation
  - Kjm — Jubaila Formation
  - Kma — Arab Formation
  - Kkm — Khuff Formation
- JURASSIC
  - Jt — Tuwaiq Mountain Limestone
  - Jdm — Dhruma Formation
  - Jm — Marrat Formation
  - Jsm — Sudair Formation
  - Jj — Jurassic rocks, undivided
- TRIASSIC
  - Tsk — Sakaka Formation
  - Tk — Khuff Formation
  - Pw — Wajid Sandstone
- PERMIAN OR PERMIAN AND PENNSYLVANIAN
  - Pj — Jauf Formation
- PENNSYLVANIAN AND MISSISSIPPIAN
  - Pt — Tubuk Formation
- MISSISSIPPIAN AND DEVONIAN
  - Dsq — Sag Sandstone
- DEVONIAN AND SILURIAN
  - Dsu — Unnamed Silurian and Devonian sandstone
- SILURIAN
  - Sq — Qusaiba Sandstone
- ORDOVICIAN
  - Ok — Hanadir Complex equivalents
- CAMBRIAN
  - Cr — Ra'an Formation
  - Cu — Unnamed Cambrian sandstone
- PRECAMBRIAN
  - Ag — Alkali-muscovite granite
  - Rhy — Rhyolite, trachyte and phonolite
  - Bt — Basinner Rhyolite
  - Pa — Peralkaline granite and syenite
  - Di — Diorite
  - Ab — Abis and Fatima Formations
  - Mz — Marble
  - Sc — Sericite and chlorite schist
  - Mh — Murdama and Hadiyah Formations
  - Hi — Hilmi Formation
  - Gr — Calc-alkaline granite
  - Sd — Diorite and quartz diorite
  - Ub — Ultramafic rocks and serpentinite
  - Ha — Halaban Formation
  - Sa, Sandstone bi, clastic rocks
  - Gr — Calc-alkaline granite
  - Gd — Quartz diorite and adamellite
  - Gr — Granite, granite and granodiorite, undifferentiated
  - Gg — Granodiorite and diorite
  - Di — Diorite and gabbro
  - Mg — Altered basic igneous rocks
  - Bg — Bahr Group, Greenstone bi, greenschist, amphibolite schist
  - Jg — Jiddah Greenstone gn, greenschist
  - Hg — Hinnia Formation
  - Ams — Amphibolite
  - Ah — Abt Schist
  - Hs — Hail Schist
  - Lc — Lith Complex
  - Pzu — Precambrian rocks undivided
  - Pzm — Precambrian metamorphic rocks
  - PzGg — Precambrian(?) syenitic and Paleozoic granitic rocks
  - Gn — Granite and hybrid rocks
  - Hg — Hybrid rocks
  - Gr — Diorite rock

PRECAMBRIAN AND PALEOZOIC

PRECAMBRIAN

YEMEN

- Qe — Eolian sand
- Qa — Alluvium and related surficial deposits
- Qb — Aden Volcanic Series *May include rocks of Pliocene age*
- Tm — Basalt and andesite
- Tmg — Granites
- Tlm — Lamrolite *May include intrusive rocks of Late Cretaceous age*
- Tr — Rus Formation
- Tj — Jeza Formation
- Tu — Umm er Radhuma Formation
- TKt — Trap Series
- Kt — Tawilah Group
- Kk — Kahf Formation
- Kkm — Khuff and Makhul Formations
- Kha — Hanifa Formation
- Jsm — Sudair Formation
- Jm — Marrat Formation
- Jdm — Dhruma Formation
- Jt — Tuwaiq Mountain Limestone
- Jj — Jurassic rocks, undivided
- Pw — Wajid Sandstone
- PzGg — Precambrian(?) syenitic and Paleozoic granitic rocks
- Gn — Granite and hybrid rocks
- Hg — Hybrid rocks
- Gr — Diorite rock

WESTERN ADEN PROTECTORATE

- Qe — Eolian sand
- Qa — Alluvium, loess, silt, sand, gravel, terraces, and raised beach deposits
- Qb — Lava flows, basaltic, and pyroclastics scattered cones and craters; at places covered with tuff and volcanic basin deposits
- Tc — Massive gypsum, at places with chert and marly beds; at places includes Lower Eocene rocks; at places equivalent to the Ra Formation of Saud, Arabia
- Tl — Calcareous shale with beds of foraminiferal limestone; at places includes Lower Eocene rocks; at places includes basalt, includes some marls. Of Lower Eocene age. Partly equivalent to the upper part of the Umm er Radhuma Formation of Saudi Arabia
- Tbl — Thick bedded, massive, hard, compact, partly crystalline Qad Limestone, to Wadi Hadhramaut, southward and eastward, where it is thin bedded and contains abundant nodular limestone and a lower part known variously as Hadhramaut limestone, Qara limestone, and Habshan limestone in age but in part includes Lower Eocene
- Tbs — Thin bedded limestone, shale, and gypsiferous, and gypsiferous
- TKt — Trap Series and Tawilah Group
- Pzm — Mainly dolomitic limestone, quartzite, and schist; at places includes basalt, and pyroclastics

OMAN (includes part of Dhufar)

- Qe — Eolian sand
- Qa — Alluvium and related surficial deposits
- Qb — Aden Volcanic Series *May include rocks of Pliocene age*
- Tm — Basalt and andesite
- Tmg — Terrace sand and gravel
- Tg — Gravel
- Tk — Khuf Formation
- Tr — Rus Formation
- Tj — Jeza Formation
- Tu — Umm er Radhuma Formation
- Tk — Hadrukh Formation
- Tl — Limestone, chalk, marl, and evaporite
- Tu — Limestone and marl
- Tdm — Dammam Formation
- Tdr — Dammam and Rus Formations
- Tr — Rus Formation
- Tu — Umm er Radhuma Formation
- Ka — Aruma Formation
- Kwa — Wasia Formation
- Kwb — Wasia and Kuwaiti Formations
- Kh — Hiyadh Sandstone
- Kb — Biyadh Formation
- Kw — Wasia Formation
- Kbw — Biyadh and Wasia Formations
- Kj — Jubaila Formation
- Jh — Hanifa Formation
- Jtw — Tuwaiq Mountain Limestone
- Jd — Dhruma Formation
- Jsm — Sudair Formation
- Jm — Marrat Formation
- Jj — Jurassic rocks
- Tsk — Sakaka Formation
- Tk — Khuff Formation
- Pw — Wajid Sandstone
- Pj — Jauf Formation
- Dtk — Tubuk Formation
- Dsq — Sag Sandstone
- Dsu — Unnamed Silurian and Devonian sandstone
- Sq — Qusaiba Sandstone
- Ok — Hanadir Complex equivalents
- Cr — Ra'an Formation
- Cu — Unnamed Cambrian sandstone
- PzGg — Precambrian(?) syenitic and Paleozoic granitic rocks
- Gn — Granite and hybrid rocks
- Hg — Hybrid rocks
- Gr — Diorite rock

EASTERN ADEN PROTECTORATE (Includes part of Dhufar)

- Qe — Eolian sand, commonly mobile
- Qa — Alluvium, loess, silt, sand, gravel, and river terraces in coastal regions of Pliocene(?) and Pleistocene age; in Ireland includes fluviatile terraces, localized lacustrine deposits, loess, silt, alluvium, gravel, and sand; marine deposits in sea
- Tm — Basalt, lapilli tuff, and minor ash; locally includes basalt flows; at places includes Pliocene(?) rocks
- Tmg — Gravel, sand, and silt; locally includes gypsum
- Tg — Gravel
- Tgy — Terrace, marl, flat and gypsum deposits
- Tcl — Calcareous duricrust
- Tlm — Lime Series
- Tb — Basalt
- Tbm — Marl and sandstone
- Tmg — Terrace sand and gravel
- Tg — Gravel
- Tk — Khuf Formation
- Tbm — Sandstone, marl, and limestone
- Tbf — Hadrukh Formation
- Tl — Lower Fars Formation
- Tdf — Dam Formation
- Tk — Hadrukh Formation
- Kwm — Sandstone, marl, and limestone
- Tsm — Sandstone, marl, and conglomerate
- Tbr — Bihr Group and equivalents
- Thd — Habshiya Formation
- Thj — Habshiya and Jeza Formations
- Tj — Jeza Formation
- Tr — Rus Formation
- Tu — Umm er Radhuma Formation
- Tmd — Marl and limestone
- TKs — Sedimentary rocks
- Kmi — Mesozoic Igneous Complex
- Kg — Hawasina Complex
- Kt — Tawilah Group
- Kdv — Malva Group
- Kbg — Alfan Series
- Kt — Tawilah Group
- Kdv — Malva Group
- Kmi — Limestone, marl, and sandstone
- Kh — Hauterivian Sandstone
- Kbg — Alfan Series
- Kmi — Mesozoic Igneous Complex
- Kg — Hawasina Complex
- PzGg — Precambrian(?) syenitic and Paleozoic granitic rocks
- Vs — Volcanic Series
- Tha — Thaniya Group
- Gn — Granite and hybrid rocks
- Gr — Granite, granitic rock and schist

SAUDI ARABIA (Includes southern Iraq, Kuwait, Saudi Arabia and Kuwait Neutral Zone, Bahrain, and Qatar)

- Qe — Eolian Sand
- Qsb — Sabkhah deposits
- Qg — Gravel, sand and clay
- Qg — Gravel
- Tg — Gravel
- Tgy — Terrace, marl, flat and gypsum deposits
- Tcl — Calcareous duricrust
- Tlm — Lime Series
- Tb — Basalt
- Tbm — Marl and sandstone
- Tmg — Terrace sand and gravel
- Tg — Gravel
- Tk — Khuf Formation
- Tbm — Sandstone, marl, and limestone
- Tbf — Hofuf Formation
- Tl — Lower Fars Formation
- Tdf — Dam Formation
- Tk — Hadrukh Formation
- Tl — Limestone and marl
- Tdm — Dammam Formation
- Tdr — Dammam and Rus Formations
- Tr — Rus Formation
- Tu — Umm er Radhuma Formation
- Ka — Aruma Formation
- Kwa — Wasia Formation
- Kwb — Wasia and Kuwaiti Formations
- Kh — Hiyadh Sandstone
- Kb — Biyadh Formation
- Kw — Wasia Formation
- Kbw — Biyadh and Wasia Formations
- Kj — Jubaila Formation
- Jh — Hanifa Formation
- Jtw — Tuwaiq Mountain Limestone
- Jd — Dhruma Formation
- Jsm — Sudair Formation
- Jm — Marrat Formation
- Jj — Jurassic rocks
- Tsk — Sakaka Formation
- Tk — Khuff Formation
- Pw — Wajid Sandstone
- Pj — Jauf Formation
- Dtk — Tubuk Formation
- Dsq — Sag Sandstone
- Dsu — Unnamed Silurian and Devonian sandstone
- Sq — Qusaiba Sandstone
- Ok — Hanadir Complex equivalents
- Cr — Ra'an Formation
- Cu — Unnamed Cambrian sandstone
- PzGg — Precambrian(?) syenitic and Paleozoic granitic rocks
- Gn — Granite and hybrid rocks
- Hg — Hybrid rocks
- Gr — Diorite rock

SAUDI ARABIA AND JORDAN

- Tl — Limestone and chalk
- Tu — Umm er Radhuma Formation
- Ka — Aruma Formation
- Kwa — Wasia Formation
- Kwb — Wasia and Kuwaiti Formations
- Kh — Hiyadh Sandstone
- Kb — Biyadh Formation
- Kw — Wasia Formation
- Kbw — Biyadh and Wasia Formations
- Kj — Jubaila Limestone
- Jh — Hanifa Formation
- Jtw — Tuwaiq Mountain Limestone
- Jd — Dhruma Formation
- Jsm — Sudair Formation
- Jm — Marrat Formation
- Jj — Jurassic rocks
- Tsk — Sakaka Formation
- Tk — Khuff Formation
- Pw — Wajid Sandstone
- Pj — Jauf Formation
- Dtk — Tubuk Formation
- Dsq — Sag Sandstone
- Dsu — Unnamed Silurian and Devonian sandstone
- Sq — Qusaiba Sandstone
- Ok — Hanadir Complex equivalents
- Cr — Ra'an Formation
- Cu — Unnamed Cambrian sandstone
- PzGg — Precambrian(?) syenitic and Paleozoic granitic rocks
- Gn — Granite and hybrid rocks
- Hg — Hybrid rocks
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SAUDI ARABIA

- Tl — Limestone, chalk, marl, and evaporite
- Tu — Limestone and marl
- Tdm — Dammam Formation
- Tdr — Dammam and Rus Formations
- Tr — Rus Formation