

SAUDI ARABIA

*By the Deputy Ministry for Mineral Resources (DMMR)
Jeddah, Kingdom of Saudi Arabia*

The major objectives of the Deputy Ministry for Mineral Resources (DMMR) are to foster the development of the minerals sector so that it becomes a major contributor to national economic development, and to provide a fair and balanced fiscal and regulatory framework to national and foreign investors. The DMMR is the sole supervising agency for the application of the Kingdom's Mining Code. Together with the provision of advice and information, these are important considerations for investors.

Other roles include the surveillance of developments in the international mining industry, and of document holders' activities. The DMMR will gladly assist all prospective investors interested in exploring the mineral resource sector of the Kingdom. A handbook entitled 'A brief for the Prospective Investor', containing an introduction to the Kingdom, its mineral resource sector, mining legislation and taxation, investment procedures and incentives, and recent developments, is available free to interested parties.

In line with other restructuring, the Kingdom has recently undertaken to modernise its economic policy and diversify the economy. The Ministry of Petroleum and Mineral Resources has retained consultants Watts, Griffis and McOuat to prepare a comprehensive strategy for mining development in the Kingdom. The strategy plan is designed to attract investment and develop a stronger mineral industry by combining the resources, processes and competences necessary to develop long-term direction of the mineral sector.

The plan identifies domestic mineral requirements and potential export opportunities, and makes recommendations for solutions to infrastructure problems and methods of reducing mineral development costs; facilitation of access by mineral exploration companies to geoscientific databases; encouragement of investment in the mining sector; and establishment of regulatory protocols to protect the environment and determine mining impacts on local communities. The revision of the present mining code and regulations, undertaken to increase the level of investment in the sector by creating a transparent code reflecting world trends, and to increase efficiency and ease of administration, will be reconciled with the recommendations of the strategy plan.

A Mining Investment Service Centre (MISC) has been established at the DMMR. The objective of MISC is to provide all the information available that will facilitate a potential investor's application for a licence document under the Mining Code. DMMR is also developing a website that will market the Kingdom's mineral potential and ultimately allow virtual project generation.

During 2002, a further 21 zones were reserved for mining activities, bringing the total to 110. These zones are reserved for such minerals as salt, silica

sand, gypsum, bentonite, pozzolan, granite, marble, iron ore, phosphate, bauxite and silver, and cover a total area of more than 7,000 km².

At the end of 2002, 27 mining leases were in existence, 12 for cement raw materials; five for gold and accompanying metallic minerals; and ten for industrial minerals. Two new mining leases were issued during the year, to SABIC (for salt) and Saudi Ceramic Co. (for clay). Four new small mine permits were also issued, bringing the total extant to 28. These permits are for salt, clay, silica sand, barite, feldspar, diatomite, basalt, limestone, marble, iron ore, dolomite and pozzolan. The number of building material permits for crushers, sand, granite, marble and other building materials increased to 913. These concessions represent a total area in excess of 854 km².

Twenty-five exploration licences were held by Saudi and foreign mining companies, for gold and other metallic and industrial minerals, covering a total area of 121,859 km². Twenty-five reconnaissance permits to investigate all types of minerals were also extant.

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Saudi Geological Survey (SGS), Jeddah, Kingdom of Saudi Arabia

Report by Ghazi J. Abdulhay. The year 2002 marked the third year of operations of the Saudi Geological Survey (SGS) and, during the year, SGS continued work on a number of metallic and non-metallic projects begun in previous years and started a number of new projects. In general, exploration focused on the identification and detailed study of deposits of kaolin, feldspar, high-silica sand, copper, and gold, and a wrap-up of regional assessments in the Arabian Shield and two parts of the Arabian Shield.

Industrial minerals

In fulfilment of the SGS mandate to explore for industrial rocks and minerals, attention was given to: dolomite at Ar'Ar, in the northern part of the Kingdom; kaolin, close to Riyadh, in central Saudi Arabia; high-silica sand in the central and northwestern parts of the country; and feldspar pegmatites at Wadi Yiba and Wadi Tannumah, east of Qunfudhah, in the southern part of the Kingdom.

The Ar'Ar dolomite deposits consist of large amounts of powdery to semi-hard dolomite contained within the Aruma formation (Upper Cretaceous) in the northern part of Saudi Arabia. The dolomite averages more than 29% CaO and 20% MgO, and has a whiteness index greater than 87%, making it eminently suitable for filler-grade and refractory applications.

Kaolin deposits were investigated in the Wasia Formation (Upper Cretaceous) at Jabal ash Shahbah and Darb Sa'd, 180 km southeast and 90 km northeast, respectively, of Riyadh. The majority of samples collected along a 50 km belt at south Jabal ash Shahbah contains 15-30% Al₂O₃ and <4% Fe₂O₃ giving possible resources of 50 Mt of coloured kaolinitic clay and 2.6 Mt of pale-coloured kaolinitic clay. Firing tests indicate that the raw material is suitable

for tile manufacture and, after processing and upgrading, would be suitable for sanitary-ware manufacture. Lenses of high alumina clay at Darb Sa'd (>30% of Al_2O_3) represent possible resources of 18 Mt of coloured kaolinitic clay and 10.5 Mt of pale-coloured kaolinitic clay. This would provide feed for tile and refractory manufacture and, after simple processing, maybe will be suitable for sanitary ware and other ceramic products.

In northwestern Saudi Arabia, silica sand was explored at Tayma south area; silica-rich sandstone in the Saq Formation (Early Ordovician) was tested by drilling 90 core-holes down to 30 m for a total of 1,994 m. The sandstone is high grade (96.3-99.2% SiO_2), is 30 m thick and covers an area of 488 km^2 , yielding a reserve of 14,640 Mm^3 . Further assessment and a feasibility study are planned.

Preliminary work indicates that feldspar pegmatites at Wadi Yiba and Wadi Tannumah are promising targets in terms of tonnage and quality, with chemical analyses revealing K_2O and Fe_2O_3 contents of 10.66-12.77% and <0.27%, respectively, which make the feldspar suitable as feed for the glass and ceramic industry.

Metallic minerals

During 2002, SGS briefly examined 12 occurrences for gold and base metals, of which two gold prospects were selected for further exploration.

Base-metal exploration was chiefly a continuation of work on the Wadi Yiba copper prospect (lat. $19^\circ 10'$, long. $41^\circ 49'$), about 580 km south-southeast of Jeddah. Work at the prospect started in 2001, with reconnaissance and preliminary surface sampling. Analysis of 85 samples revealed grades in the range 1.1%-6.8% Cu. Five profiles were made across the prospect and IP measurements were made on three of the profiles. Work in 2002 involved construction of a grid over the prospect (covering about 4 km^2), detailed geologic mapping of three parts of the prospect at a scale of 1:1000, and the excavation of five trenches totaling 560 m, from which 304 samples were collected. The results of trench sampling suggest that copper grades may actually be lower than those indicated by the 2001 sampling programme, but a drill programme was planned for execution in 2003.

Regional assessment of the Musayna`ah district, approximately 230 km south of Hail in the northern Arabian Shield, began in 2001. The district is defined by five main prospects for base and precious metals, and rare-earth elements (68 occurrences in all). Fieldwork was completed at the end of 2002, and an assessment report is in progress.

A similar regional assessment of the Ar Rayn terrane, in the eastern part of the Arabian Shield, was started in 1999. Thirteen deposit types have been identified, including: adularia-sericite epithermal Au-Ag-Zn-Cu-barite (Al Amar, Umm ash Shalahib, and Umm ad Dabah districts); porphyry Cu±Au (Al Eitaby, Umm Eshash); Fe-oxide Cu-Au (Jabal Idsas and Dwara districts); Khnaiguiyah-type (VMS modified by shearing?) (Khnaiguiyah, B'ir al Khais, Wadi Sidarah); mesothermal low-sulphide Au veins (Fawarah, Selib); and

porphyry-related Mo-W±Cu (Wadi Gharrah). Previous exploration activity in the Ar Rayn terrane focused on the search for epithermal, Khnaiguiyah-type, and VMS deposits. The regional assessment indicates that although the Ar Rayn terrane is prospective for the discovery of these types of deposits (possibly less so for VMS deposits), it is also prospective for the discovery of Fe-oxide Cu-Au and porphyry copper deposits. Such deposit types have a potential for enormous size, and exploration for porphyry copper and Fe-oxide Cu-Au deposits represents a new exploration frontier in the Ar Rayn terrane. The assessment report will be completed in 2003.

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Table: Mineral Prospects

Name	Host rock	Type of mineralisation	No. of samples	Selected results
Musayna`Ah	Acidic to intermediate volcanics	Veinlets of pyrite and magnetite.	12	1.5% Cu 1.17 Au
Size (km) 7x1	And felsic dykes	Disseminated pyrite, magnetite, Haematite and sphalerite.		
		Gold-bearing quartz veinlets.		
Al Hamra	Acidic to intermediate volcanics	Magnetite-hosted copper oxides	76	3.19% Cu 1.59 Au
Size (km) 9x5	Intrusives and breccias carbonate-basic rocks and felsic dykes	Disseminated pyrite, magnetite, Specular haematite, chalcocopyrite, and sphalerite.		
Bir Taluhah	Ultramafics	Chromite lenses (1.5mx0.5m).	8	40.4% Cr
Size (km) 3.5x0.5		Disseminated chromite, and chromite veinlets along fractures.		
Jabal At Tuwalah	Granite	REE-bearing pegmatite veins	30	14.9% Zr Uranium, Thorium,
Size (km) 3.5x2.5				
Others	Acidic to intermediate volcanics and intrusives	Barite, copper oxides and fluorite bearing quartz veinlets	6	0.5% Cu Traces of barite and fluorite.