



# Minerals in Afghanistan

*Limestone in Herat Province, Afghanistan*  
AGS Investor Data Package No. 3

***Excellent Exploration & Development Potential***

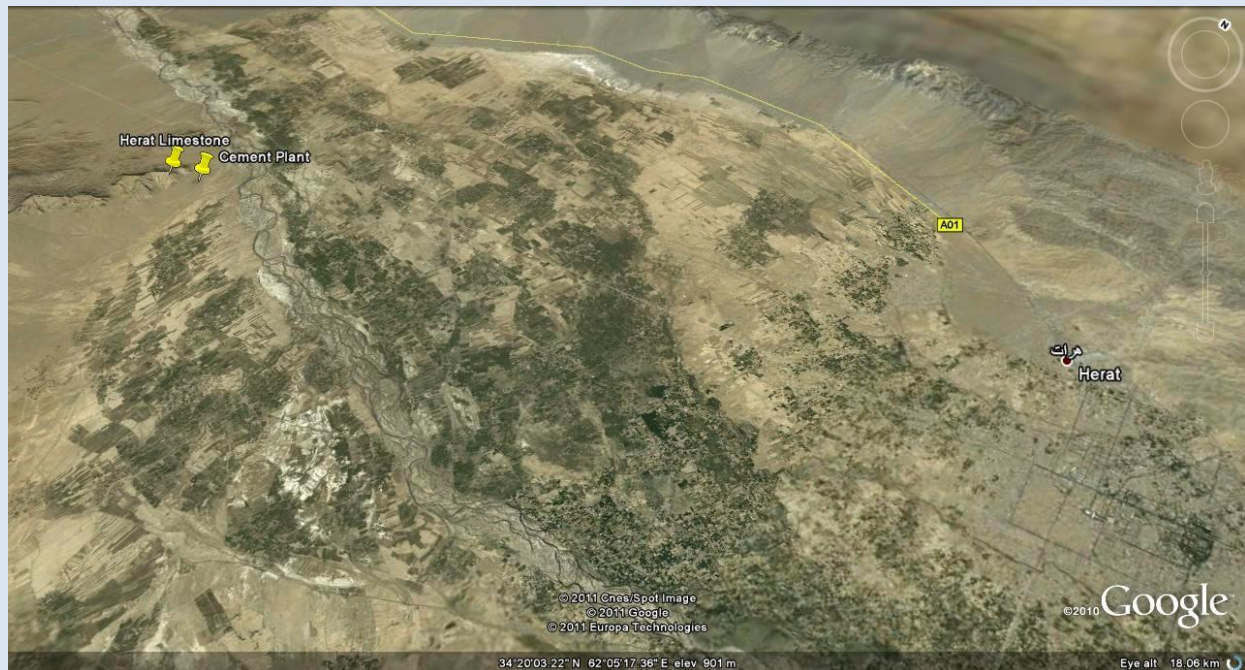
## ***SUMMARY***

While Afghanistan is undergoing a process of stabilization and reconstruction, there is huge demand for good quality cement. Although the country is blessed with abundant limestone resources, about 2 million tons of cement are currently being imported annually.

The Government of Afghanistan (GoA) has recognized the need for developing a cement manufacturing industry as high priority target for national development for creating much needed local employment, reducing the country's dependence on foreign imports, and improving building standards.

One of several major resources of limestone suitable for cement production is located in the Zandajan District of Herat Province, some 35 km to the West of the city of Herat.

The potential reserves of high quality limestone of Lower and Middle Jurassic is estimated more than 1.0 billion tons



**Figure 1: Location of limestone deposit, cement plant and Herat City**

## *LOCATION*

The area is located 32km west of the city of Herat in the Zandajan (other spellings: Zenda Jan, Zandashon) District. Most of the road to the Zandajan is asphalted. The Harirud River with abundant water supply is crossing the district. In addition, the Herat cement plant, construction of which was halted in 1980 during the internal conflicts, is located in the immediate area. Parts of the plant needs to be completed, others are in need of refurbishment (Fig. 2 and 3).



**Figure 2: View of unfinished cement plant immediately across from the limestone-marl outcrops**



**Figure 3: View of unfinished cement plant immediately across from the limestone-marl outcrops**

## ***CEMENT PRODUCTION IN AFGHANISTAN***

*Cement production in Afghanistan is the lowest in the world at 2 kg/capita/year (50,000t/a), compared with Pakistan at 92 kg/capita and the UK at 200 kg/capita.*

*In 2005, Afghanistan cement consumption was 2.5 million tonnes, but demand has been forecast to reach 7.2 million tonnes/year in 2020. In 2005, Afghan cement production was only 16,000 tonnes/a, down from 100,000 t/a (from the Ghori Cement Factory at Pul-i-Khumri in Baghlan); the balance of the demand in 2005 came from Iran (1.8 million tonnes), Pakistan (400,000 tonnes) and Uzbekistan and Turkmenistan (300,000 tonnes) (Mitchell and Benham, 2008). The reported wholesale cost of cement in Kabul is about \$110/tonne, inferring a total value for the sector of about \$275 million/year.<sup>1</sup>*

*Currently, Afghan Cement LLC operates the Ghori I and Ghori II cement plants in Baghlan with production capacity of 400 and 1000 t/d respectively (i.e., approximately 500,000 tonnes/a). The new Ghori III will have a 4,000 t/d (1.4 million t/a) capacity and is expected to be operational in late 2010. All told, Ghori cement's operations will eventually supply about 2 million t/a or about 80% of the current national demand, and requiring gypsum inputs of about 85,000 t/a, sourced from the Dodkash deposit, 18 km from the Ghori operations in Pul-i-Khumr (Mitchell and Benham, 2008).<sup>1</sup>*

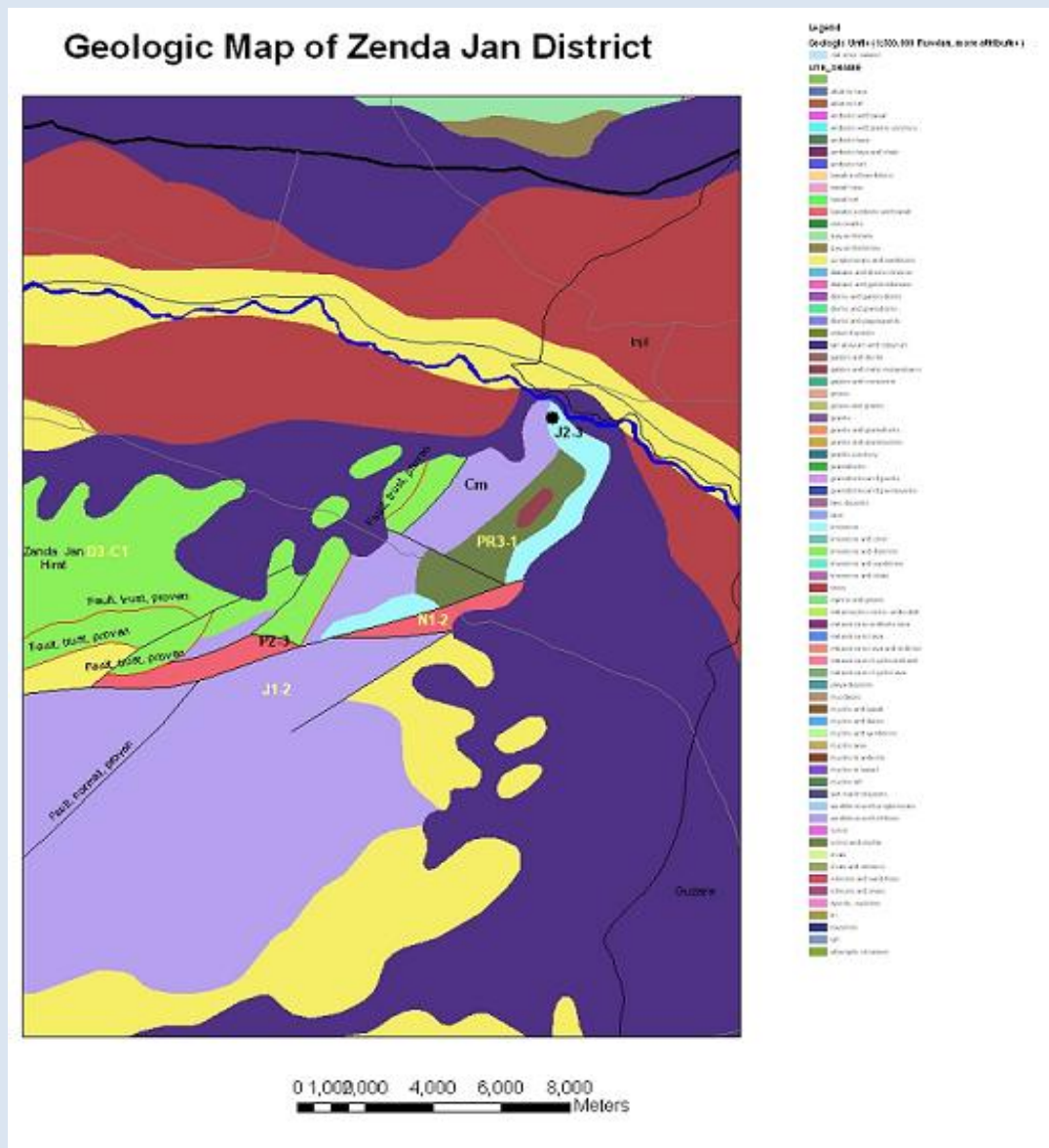
*The Jebel Seraj cement plant in Parwan (35.0920° N, 69.1630° E) is currently not operating because of lack of power, whereas construction of the Zandajan plant near Herat was abandoned in 1980 at approx. 80% completion. Negotiations are underway, however, with the Iranian Majd Industrial Pishgaman Company (MIP) to rebuild and operate the Zandajan cement facility near Herat. The new MIP plant will produce 1,000,000 tonnes of cement/year.*

## ***LOCAL GEOLOGY***

*Based on studies conducted in 1980 mapping of 1:500,000 scale, the limestone-marl unit in the Zandajan area is of Middle Upper Jurassic (J2-3, Figure 4 next page) age and of bright gray, in some places reddish color. The unit underlies the Upper Proterozoic metamorphic rocks (Fig. 4, next page) which is composed of green schists, metaterrigenous rocks, marble, and metavolcanics; and Cambrian rocks which are composed of sandstone, siltstone, limestone, dolomite, and mafic volcanic rocks. The Jurassic limestones and marls are overlain with a tectonic contact by the Eocene-Oligocene volcanogenic-terrigenous rocks which is made of andesitic basalts, basalt, trachyte, dacite, rhyolite, ignimbrite, tuff, conglomerates, sandstones, siltstone, and the Quaternary (Q4) sediments made of detrital sediments, gravel, sand, clay, clay sand, loess, and travertine. The Jurassic rocks strike to the NE, with a dip direction of 120° – 150° and dip angle of 40° – 55°.*

---

<sup>1</sup> According to the Afghanistan Statistical Yearbook 2009-10, only 571,940 tonnes of cement were legally imported into the country, valued at \$38,265,000 (\$67.00/tonne) (Afghanistan Ministry of Commerce, 2010).



**Figure 4: Geological setting of limestone and marl units**

According to analytical results from the local sampling program, the average percentage of  $\text{CaCO}_3$  is 87.03% ( $\text{CaO}$  48.6%). Average percentages of relevant oxides are shown in Table 1.

**Table 1: Laboratory analysis of limestones and marls from Zandajan District, Herat Province**

Sample No.	CaO	MgO	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>
1001	47.39	0.3380	4.494	0.7448	0.3939
1003	48.32	0.3974	2.564	0.3711	4.345
1511	29.42	18.47	7.132	0.2089	0.8508
1507	58.12	3.479	0.7660	0.1883	0.7354
1505	33.82	21.45	6.541	0.6470	1.418
1503	41.69	0.773	2.801	0.3873	0.93
1021	50.64	0.1561	0.5508	0.04087	0.09175
1019	60.02	0.5331	0.8435	0.2591	0.3063
1017	58.57	0.1632	0.5731	0.02893	0.1762
1013	42.93	0.1809	0.9711	0.1143	0.1495
1009	51.71	0.2848	2.940	0.5607	0.4314
1007	55.21	0.8817	5.372	1.107	0.00039
1015	52.32	0.2174	2.243	0.4523	0.00039
1005	50.82	0.2872	4.012	0.6947	0.2614
<b>Average Percentage</b>	47.03	3.405	2.98	0.411	0.779

## RESOURCE ESTIMATION

A preliminary estimation of limestone resources was made applying outcrop dimensions to a depth of 155m taking into account limestone thickness above ground and applying a correction factor of 0.5.

**Table 2: Zandajan Limestone resource estimation**

Specification	Outcrop 1	Outcrop 2	Outcrop 3
<b>Length</b>	1,400m	600m	630m
<b>Width</b>	835m	400m	535m
<b>Area</b>	1,169,000m <sup>2</sup>	240,000m <sup>2</sup>	337,050m <sup>2</sup>
<b>Depth</b>	155m	155m	155m
<b>Volume (factor 0.5)</b>	181,195,000m <sup>3</sup> 90,597,500m <sup>3</sup>	37,200,000m <sup>3</sup> 18,600,000m <sup>3</sup>	52,242,750m <sup>3</sup> 26,121,375m <sup>3</sup>
<b>Specific weight</b>	2.72g/cm <sup>3</sup>	2.72g/cm <sup>3</sup>	2.72g/cm <sup>3</sup>
<b>Tons</b>	246,425,000t	50,592,000t	71,050,000t
<b>Coordinates</b>		N - 34° 19'48.9" E - 61° 56'19.7"	N - 34° 19'59.9" E - 61° 56'10.0"

## CONCLUSION

From a geologic and economic point of view, the area is very suitable for investment and it is essential to build a cement plant with high production capacity. According to AGS assessment, the Zandajan area contains more than 370 million tons of limestone and the resources can be quite easily expanded because the limestone and marl units are extending further SW (Fig 2).

## GOVERNMENT STRATEGY ON INFRASTRUCTURAL DEVELOPMENT

The GoA and donor agencies involved with the reconstruction of the country have recognized and adopted mineral resources development as a national priority goal. Under this framework, the government is seeking to align the development of infrastructures with the exploitation of major mineral resources, in order to promote and enhance the development of other natural resources within the same transportation corridor. With this objective, the GoA is in the process of continuously improving and upgrading various transportation options favorable for the development of natural resources, including minerals, construction materials and hydrocarbons.<sup>ii</sup> Furthermore, the GoA has recently endorsed and adopted major changes in mineral laws, policies, and fiscal regimes to promote Afghanistan as an attractive destination of foreign exploration and development investments.

## CONTACTS

The GoA has recognized the country's mineral resources as valuable assets that can be developed to create employment and promote economic independence. Under this goal, the GoA has recently made significant policy changes following its transition from state operator to regulator and is now driving infrastructural development with a view to enhancing and promoting mineral resource development. The GoA is constantly seeking investment from private and foreign investors to develop the huge and very diverse mineral resource potential of Afghanistan.

For further information on technical and investment matters, please contact the following offices within the Ministry of Mines, Islamic Republic of Afghanistan.

<p>Afghanistan Geological Survey Ministry of Mines Kabul, Afghanistan Telephone: +93 (0) 752 00 1 714 E-mail: <a href="mailto:aqs@mom.gov.af">aqs@mom.gov.af</a> E-mail: <a href="mailto:amsediqi@sbcglobal.net">amsediqi@sbcglobal.net</a></p>	<p>Investment Promotion Directorate Ministry of Mines Kabul, Afghanistan Telephone : + 93 (0) 794 216 006 E-mail: <a href="mailto:miningenquiries@mom.gov.af">miningenquiries@mom.gov.af</a> Website: <a href="http://www.mom.gov.af">http://www.mom.gov.af</a></p>
---	---

## **REFERENCES**

*Afghanistan Ministry of Commerce, 2010. - Afghanistan Statistical Yearbook, 2009-2010, Table 12-3: Import of goods 2007-10, and Table 12-4: Value of imported goods.*

<sup>i</sup> *Mitchell, C., and Benham, A., 2008. - Afghanistan revival and redevelopment, IM Magazine, June 2008, British Geological Survey.*