QAZGEOLOGY

PROSPECTIVE PROJECTS OF KAZGEOLOGY JSC

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5 prospective projects

- *gold*
- *copper*
- *rare earth*

Prospecting of gold ores and accompanying components on the site **BORSHETUKEN** in the Karaganda region

General information: The area is located 30 km from the highway, the nearest settlements are the Dzhambul mine, located 80 km to the north, and the Saryshagan town, located 165 km to the east of the site.

Total area: 69.82 square km

Project implementation period: 3 years.

Required investments: 481 million tenge / 1,3 million US dollars

Geological information: In the South Kazakhstan part of the belt, a large number of gold-sulphide-quartz veined deposits are known, including large - Akbakai, a number of medium - Aksakal, Svetinskoye, Kenzhem and small - Altynsay, Zhaksy. The combination of indirect and direct search signs for gold mineralization at the site allows to consider the area as promising for identifying the Akbakai - type average reserves of gold (availability of gold up to 3.0-5.0 g / t) on Au, Bi, Ag manifestation No.12 allow to predict on the Borshetuken site two ore zones with a medium-sized gold deposit of the Akbakai type, similar to the Kenzhem deposit, with reserves of about 40 tons of gold with a grade of 5.0 g / t.

Resources	Average content
40 tons gold (forecast)	Gold content - 5.0 g / t

Exploration of non-ferrous and precious metals on **ARGO** area in Kostanay region

Useful component: non-ferrous and precious metals

Area: 387,727 sq. km.

Required investments: 4,8 million USD

Field Information: In the 1950s and 1960s, Soviet geologists conducted major regional exploration programs throughout the Soviet Union to determine mineral reserves. The Turgay expeditions are credited with discovering numerous large mineral deposits, including large magnetite iron ore deposits near the cities of Rudny and Lisakovsk in the Kostanay region. During the course of geological exploration, geologists have recorded numerous deposits of titanium and zircon throughout the Turgay Basin.

The area of Argo was allocated by ILUKA during the 2015-2018 exploration works for the state study of subsurface resources for the search of placer titanium-zirconium deposits (ilmenite, rutile, zirconium and tin) at three sites in Kostanay, North Kazakhstan and Akmola regions. Exploration work was carried out on three sites.

One of the wells was drilled in the North-Eastern part of the prospect area, along the profile next to the boundary between the underlying Ordovician-Silurian granodiorite/diorite Intrusive complex and pre-Cambrian meta-deposits of the Borovian formation. At a depth of 30-36 m, abnormal values of copper (250 g/t) and zinc (145g/t) were determined.

The Baksy copper-gold skarn Deposit is located in the South along the same contact area. The Baksy Deposit is described in stock reports as garnet, calcite-garnet and pyroxene-garnet-magnetite scarn. Resources in the Soviet C2 category are 1.65 million tons of ore containing 2.1% copper (34,500 t), 1.59 g/t gold (2.92 t) and 5.56 g/t silver (10 t).

Exploration of precious and non-ferrous metals on **BESSHOKY** area in the Karaganda region

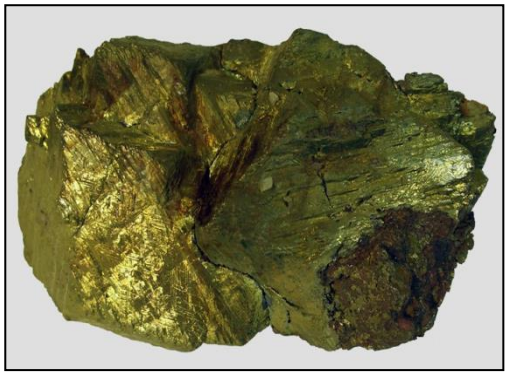
General information: it is located in Karaganda region 265 km South-East of Karaganda, 200 km North of Balkhash. The Deposit consists of 6 copper porphyry deposits: the Eastern, Northern, southern Besshoky, Candidacy, Satire, Zhilandy. Geologically and structurally, a group of copper manifestations of Besshoky is located in the Eastern part of the Tokrau synclinorium in the Central Kazakhstan deep fault zone.

Total area: 205.59 sq. km.

Subsoil use contract: concluded 06.03.2015

Geological information: Structurally, the manifestations form an ellipsoid hemisphere measuring 20 x 10 km and 1 to 2 km wide, extending in a northeasterly direction. The distance between the epicenters of manifestations varies from 5 to 10 km. higher sulfide mineralization with an average copper content (0.7-0.8%) is mainly associated with the cement of these hydrothermal breccias; average mineralization (0.29-0.45%) is associated with berezites and mudstones. Mineralization extends deep, traced by some boreholes to a depth of 500-700m. Mineralization is considered easy to process, predominantly pyrite-chalcopyrite, and in the secondary sulfide enrichment zone containing bornite and chalcocite.

Revealed + forecast	Cu average content, %	Cu reserves, thousand tons	Mo average content, %	Mo reserves, thousand tons
Balance sheet:		**1026,38**		**18,65**
- Eastern	0,61-0,77	191,31	0,01-0,014	3,04
- Southern	0,36-0,37	691,55	0,007-0,011	14,91
- Kaindyshoky	0,38	143,52	0,001	0,7
Off-balance sheet	-	**853,11**	-	**5,93**
TOTAL		**1 879,49**		**24,58**



Exploration of precious and non-ferrous metals on BESSHOKY area in Karaganda region

Total reserves on Beshokinskaya area (according to Wardell Armstrong International, 2012):

- Balance: Cu - 1026,4 thousand tons, Mo-18,6 thousand tons;
- Off-balance: Cu - 853,11 thousand tons, Mo-5,93 thousand tons.

During 2015-2019, only two of the 6 sites were surveyed: six manifestations, such as the Eastern and southern Beschoky, were studied in detail. The drilling depth did not exceed 250 meters.

There is a great potential for increasing the field's reserves during additional exploration activities.

Rate	Value
Sum of investments, thousand dollars of USA	302,845
NPV discount rate 10%, thousand dollars of USA	145,690
IRR, %	20%
EBITDA, thousand dollars of USA	988,676
Income before tax, thousand dollars of USA	790,456
Discount payback period, year	8

AKBULAK site in Kostanay Region

General information: located near the Arkalyk city in Kostanay region, which is connected (via Yessil) by rail and highways with the largest centers of the Republic.

Investment amount: 1.53 mln. USD

Project implementation time: 6 years

Geological information: The area of the Akbulak deposit is about 2 sq. km. Mineralization is confined to linear weathering crusts. The power of the ore zones varies from 1.4 m to 31 m, with a total depth of the weathering crust from 10 to 50 m. the Mineral form of rare earths is xenotimum, rhabdophanite, churchite and bastnesite.

In addition to yttrium and rare earths (lanthanum, cerium, praseodymium, neodymium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium), the ores contain tin (50-200 g/t), and zirconium (150-300 g/t). The expected stripping capacity is 13 m.

Forecast data		
Useful component	**Forecast reserves**	**Average content**
Yttrium oxide	Approved	272 g/t
Oxides of the rare earths		790 g/t

State of geological exploration and geological structure of Akbulak site

Systematic study of the area began in the late 40s of the last century with its Northern part (Arkalyk-Ashutau structures) in connection with prospecting and exploration geological and geophysical works on the Amangelda group of bauxite deposits.

Subsequently, the research extended to the South and East towards the Kurgasyn lead mine, capturing the Arganatinsky uplift of Northern Ulutau.

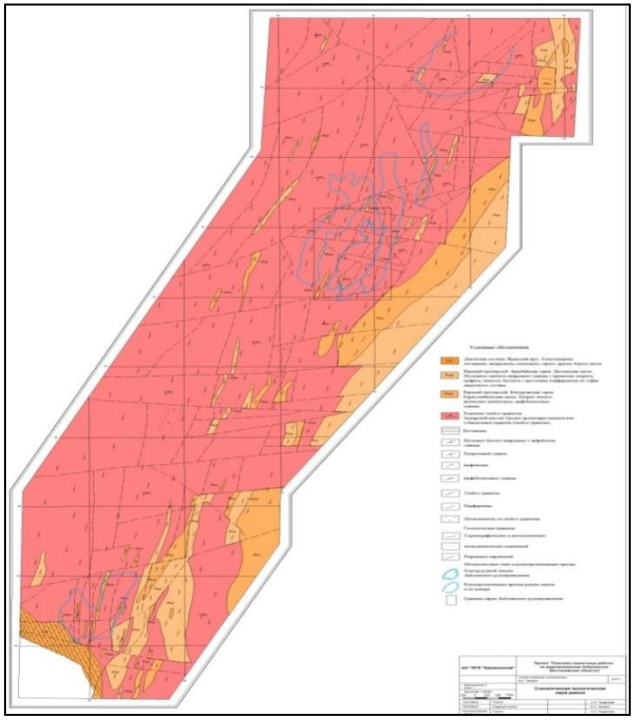
Since the late 50s in the area revealed many anomalies of rare earths, tin, lead, zinc, gold, niobium, but objects of industrial importance is not established.

In the course of geochemical searches of 1986-90, the Akbulak zone of rare earth elements was discovered, which is characterized by yttrium contents from 0.01% to 0.1%.

Not far from the Akbulak site there is a Zhanaarkalyk site. Yttrium and lanthanides, the total value of which in the ore is 90-95%, and the valuable associated components are the remaining components in the ore: zinc, gold, silver, clay and sand. In addition, the ore can be found – titanium, scandium, technical diamonds and fullerene.

Actually Akbulak mineral occurrence and anomalous halos (zone 2, 3, 4) compose the Central area. The REE halos are allocated to the South and North of the Akbulak manifestation, respectively, the Southern section (zone 1) and the Northern (zone 5).

In the geological structure of the area involve Proterozoic and Paleozoic rocks composing a folded Foundation, and meso-Cenozoic deposits form a platform cover. On the maps, the platform cover is removed.



Exploration of rare earth elements at the deposit **AKKENSE** in Karaganda Region

General information: Yttrium-rare earth ore occurrence Akkense is located in Ulytau district of Karaganda region, to South-East of Zhezkazgan city.

Project implementation time: 3 years

Required investments: 1.43 million USD

Geological information: The REE site was discovered during the search for uranium in the 90s, after testing the core of the mapping well 17541, at a depth of 55-80 m from the surface in permeable Sands, REE were found. Preliminary assessment of rare earth mineralization by drilling core wells in a network of 800 x 800 m allowed us to identify a promising site.

Forecast data	
Resources	**Average content**
Approved	0,04%

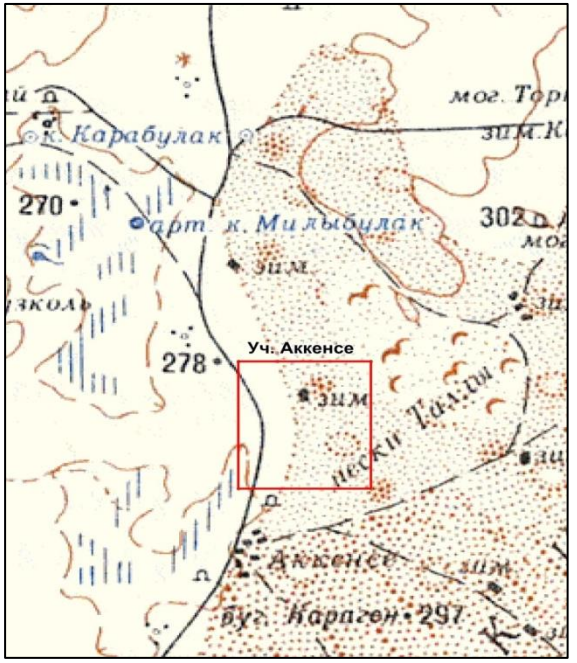
State of geological exploration of Akkense site

The area is fully covered with aerial photography done by State design and survey Institute of land cadastral surveys in 1977. In 1988-90 B.Slobodchikov and others carried out underground geological, geological exploration of the surface and prospecting for minerals on the areas covering the ore field Zhaman-Aibat copper Deposit and the immediate area.

Since 1969, **complex (gamma-spectrometry, magnetometry) aerogeophysical survey was carried out** with a scale of 1: 50000. By 1989 the entire area of the district was recorded by comprehensive survey of aeroparties of the company "Volkovgeology". Since the late 50s many anomalies **of rare earths, tin, lead, zinc, gold, niobium** were revealed in the area, but objects of industrial importance are not established.

In 1974, in order to study the deep structure of the earth's crust of the trust "special Geophysics" conducted seismological studies by the method of passing exchange waves of earthquakes in combination with deep seismic sounding.

In 1972-1975 and in 1987 PGA "Volkovgeology" conducted seismic experimental and methodological work in order to clarify the possibilities of seismic exploration to study the structure of the section of Mesozoic-Cenozoic deposits. As a result, the depth of occurrence and morphology of the roof of the Paleozoic Foundation was determined; the position of tectonic disturbances, the nature of tectonics in platform sediments, breaks and kinks of layers, the amplitude of displacement.



Geological structure of Akkense

The geological structure of the region includes shales of the Proterozoic-lower Paleozoic, siltstones, sandstones, limestones of the devonian and carbon and perm, overlain by a powerful cover of meso-kainazoic deposits of continental and marine facies (clays, mudstones, Sands).

In addition to the natural association of **rare earths with yttrium**, they are most often present together with cobalt, whose content varies between **0.01-0.08%, and Nickel** (approximately the same concentration limits).