

Review of cooper-porphyritic deposits

February, 2016

Limited liability partnership «KAML Kazakhstan Holding»



BATALINSK DEPOSIT

Location of prospecting works site



LOCATION

- Denissov district, Kostanay region.
- 40 km to the north of district center set. Denissovka.
- 125 km to the south-west of regional center Kostanay city.
- Site area is 12,1 sq. km.

HISTORY

- Discovered by Shishkova L.Y in 1967.
- Studied in the period from 1968 - 2008 by Gachkevich I.V., Scherbin S.S., Russinov M.I., Klochkov P.D., Popkov V.N. and other geologists.

Geography-economical description of deposit area



TRANSPORT CONDITIONS

- Railway stations: «Tobol», 55 km to the east; «Bataly», 15 km to the east.
- Asphalt road: «Kostanay-Zhitikara», 35 km to the south; «set. Denissovka-set.Zaayatskoye», 14 km to the west.

POWER SUPPLY

- Local TEP – ca 10%.
- Ekibastuz GRES – ca 90%.
- ETL-500 kV, 35 km to the south.
- ЛЭП-35 kV, 8 km to the north.

RELIEF

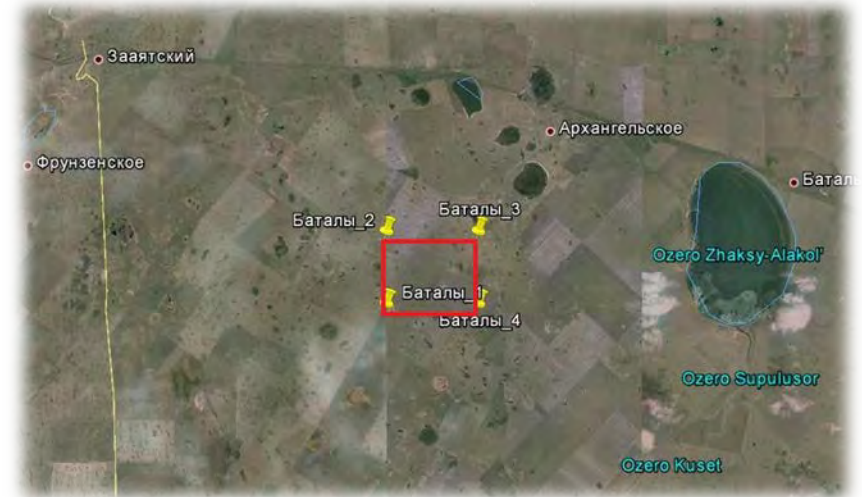
- Sag-and-swell flat land with hills and cavities

WATER RESOURCE

- Zhaltyrkol lake, 10 km to the east.
- Tobol river, 40 km to the south. Ayat river, 20 km to the north.
- Numerous groundwater deposits.

CLIMATE

- Extreme continental.
- Average annual temperature:
July – ca +20,2°C; January – ca -17°C.
- Prevailing wind direction: north and south-west.



Description of projected activities

PURPOSE

Within geological allocation to carry out a complex of exploration works with calculation of explored reserves on categories C₁ and C₂ up to the depth of 300 m and probable resources on category P₁ up to the depth of 700 m. Exploration period - 6 years.

GEOLOGICAL TASKS

In the project of evaluation works at the Batalinsk deposit the following problems are planned to solve:

- Analysis of geological materials of earlier performed works
- To carry out exploration works on deposit by core drilling method;
- To support prospecting hole drilling by sampling, laboratory testing, geophysical (logging) land works and topographic-geodesic surveying work;
- To carry out hydrogeological and geotechnical surveying;
- To make geoenvironmental surveying (EIA);
- To study material structure of industrial sampling and to carry out technological tests in the certified laboratory (institute) for the purpose of development of effective ore concentrating technology
- To create electronic data base;
- To draw up scoping study and report with calculation of reserves on industrial categories and its approval in GKZ of RK.

RESULT

By results of the prospecting and evaluation works the assessment of industrial value of the Batalinsk deposit with the statement of the measured mineral resources in GKZ of RK will be given.

Geological aspects of the deposit

- The territory of the Batalinsk deposit, is on east slope of South Ural, within the Trans-Uralian anticlinorium, the Aleksandrov-Denissov structural and formational zone. The deposit is assigned to the southern part the Aleksandrov graben synclinorium which represents meridian extended, tectonic block limited from the west by the Tobolsk deep fault, from the east – by Denissov one.
 - In a geological structure of the works' area the Paleozoic formations presented by a complex of igneous-sedimentary rocks take part from which formations of Silurian, Devonian and carboniferous systems are separated.
 - The field is presented by 7 ore bodies of stockwork type. A shape of ore bodies in the plan is blanketlike. Depth of an industrial assessment of ores is 200 - 600 m. Ore bodies of the deposit represent zones of hydrothermal changed granodiorites, granodiorite-porphyrates, quartz diorites, quartziferous porphyric diorites, rarer - diorites and diorite porphyrites. The copper mineralization has a stringer-porphyry character.
 - The deposit is localized in the subvolcanic massif of rocks of granitoid rank which invaded in Middle-Carbonic period into the volcanic vessel of the central type which is already created by this time. Volcanogenic and pyroclastic formations of Upper-Visean age carry out a classical volcanic caldera with a diameter about 6 km of subsidence and represent a roof of the subvolcanic intrusion.
 - Intrusive formations compose the Batalinsk intrusive stock which formation happened by multiphase introduction of various structure of magmatic fusion that led to formation of intrusive rocks of diorite-granodiorite-granite structure. Intrusive rocks are strongly changed by the following after their formation by processes of a hydrothermal metasomatism as a result of which metalliferous metasomatism with a copper mineralization were formed.
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Mineral composition of ores of the deposit

The chemical analysis in initial ore of the Batalinsky field defined 26 constituents, including copper, molybdenum, gold.

MAIN ORE MINERALS:

chalcopyrite, molybdenite, pyrite, bornite, rarer – cubanite, arsenopyrite, sphalerite, cobaltite, galenite.



Chalcopyrite



Molybdenite

ACCESSORY MINERALS:

emphelctite, wittichenite, safflorite, pyrrotine, stannite

NONMETALLIC MINERALS:

feldspars, quartz, chlorite, biotite, phlogopite, amphiboles, calcite, epidote, ziosite.



Emphelctite

Geological investigations

- ❑ During the period from 1973 to 1989 - 96 wells in volume of 23991,1 r.m. were drilled.
- ❑ In 2006-08 - 36 wells in volume of 6050 r.m. were drilled, 3142 tests were analyzed.



Core sample with ore mineralization



Core recovery from wells

- ❑ During the prospect evaluation works on the Batalinsk deposit the density of prospecting network taking into account earlier drilled wells made 200x200m with concentration to 100x200m.
- ❑ As a result of the carried-out prospect evaluation works on deposit the ore bodies are tracked up to the prospecting depth of 200 m.

Technical survey

2006 – 2008

- Analytical researches are made by laboratories of Tsentrgeolanalit LLP.
- External control of analyses - Sevkazgra Plus LLP.
- The complex of laboratory researches consisting from semi-quantitative spectral and spectral-gold assay analyses, allowed to allocate intervals with the raised content of the main valuable components. Tests with their raised contents were exposed to the chemical analysis on copper, molybdenum and to assay analysis on gold.
- For the purpose of definition of accessory elements 40 group tests are analysed. Geochemical features of ores are studied: correlation coefficients on copper, molybdenum and gold are calculated.

2008

- Sampling weighted 322,7 kg is presented by sulphidic copper-molybdenum gold ore. Industrial value has the following components: copper, accessory molybdenum and gold.
 - The main extraction method of valuable components from this ore is flotation. This ore is free-milling.
 - Initial contents in ore of: copper - 0,33%, molybdenum - 0,0065%, gold - 0,16 g/t, silver - 1,35 g/t.
 - According to bulk-differential flowsheet the following concentrates are received:
 - copper concentrate - KM-3 brand (tails of control molybdene flotation) with the copper content 26,16% (extraction - 78,13%); gold content - 11,36 g/t (extraction - 69,87%);
 - molybdene concentrate - KMF-2 brand with the molybdenum content 51,53% at extraction 71,35%.
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Reserves of the Batalinsk deposit

Reserves on Batalinsk deposit are approved by the RK GKZ Protocol No. 825-09-A dd. 19.05.2009 as of 01.01.2009.

PARAMETERS OF ESTIMATION TERMS:

- The copper grade in the samplings included in calculation of reserves by drilling out of ore body - 0,20%;
- The minimum thickness of ore body included in calculation contour of reserves - 5,0 m;
- Maximum thickness of band of dead rocks or sub-standard ores included in calculation contour of reserves - 5,0 m.

Item	Unit	On-balance reserves, C ₂ category
Copper	thous. ton	561,7
ore	thous. ton	130 899,7
content	%	0,43-0,45
Molybdenum	ton	971,9
ore	thous. ton	42 300,6
content	%	0,0023
Gold	ton	10,161
content	g/t	0,24

Probable reserves of Batalinsk deposit

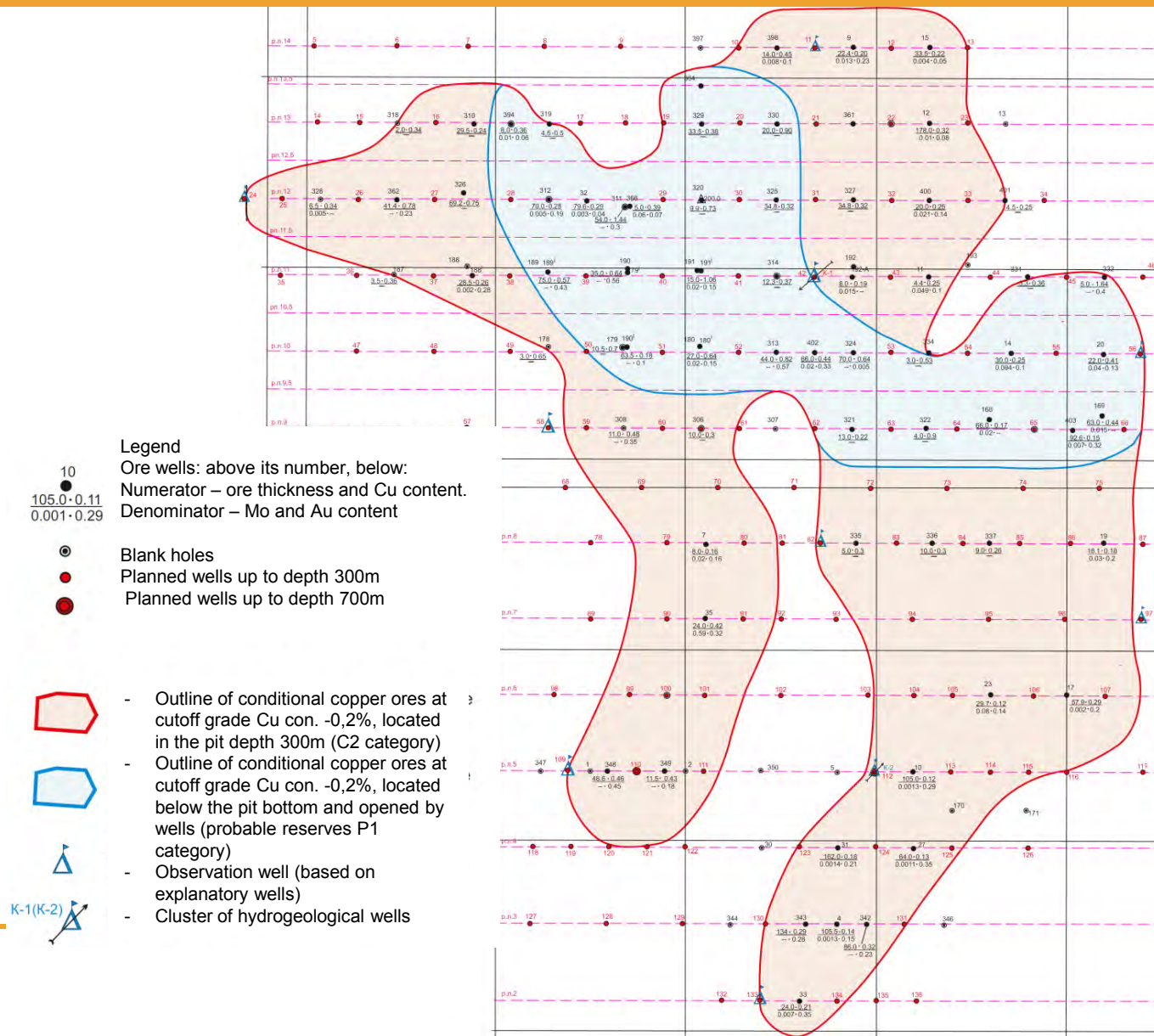
Having evaluated the geological materials it was made revaluation of the surveyed copper ores reserves according to GKZ approved conditions which are to be considered as appropriate ones for the deposit:

- the cutoff grade of nominal copper for extracting the ore intervals of complex copper ores is - 0,2%, copper ores- 0.25%;
- the minimal thickness of ore intervals of complex copper ores included in reserves calculation is -2 m, copper -4 m;
- the maximum thickness of dead rocks and substandard ore layer included in reserves calculation is -4 m;
- the minimal copper content, taken into account at complex ores ore intervals extraction is - 0,1%, copper ores - 0,15%;
- the conversion coefficients for nominal copper calculation are as follow: molybdenum -11, gold 0.4 (approved by GKZ);
- the calculation depth of balance ores (mine) reserves is 300 m, under pit bottom is 700 m.

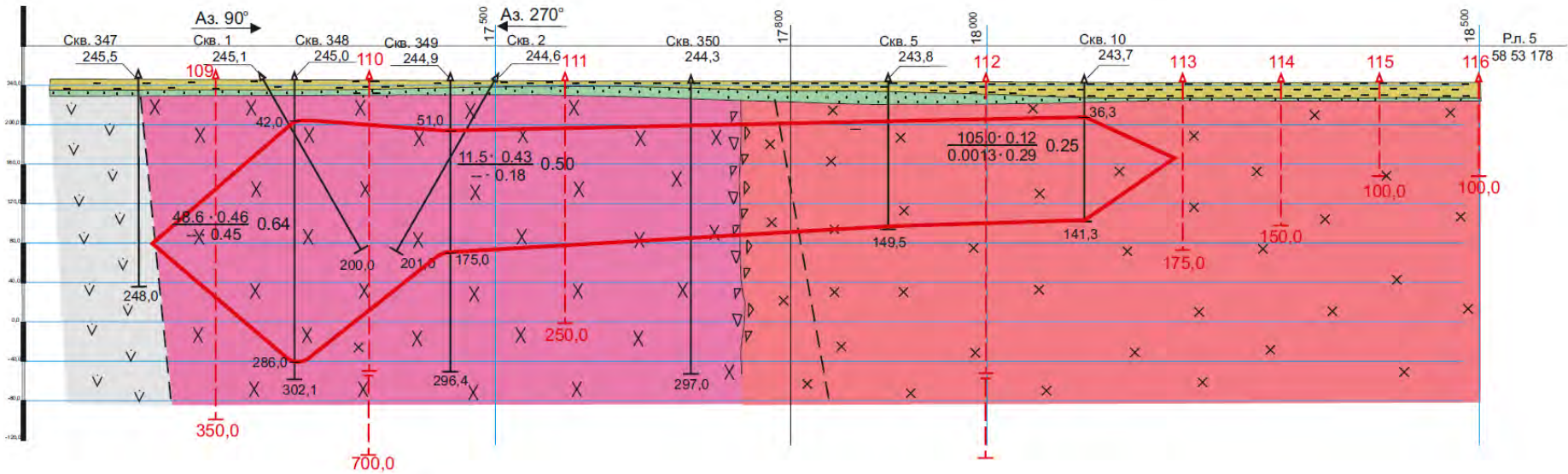
There were two ways to calculate reserves – typical way and upon ore content rate control way. The calculations results are at the table below:

Deposit exploration depth	Valuable components reserves		
	copper, thous. t %	molybdenum, thous. t %	gold, t g/t
In closure of open-pit up to depth 300 m	<u>1205.8</u> 0.43	<u>22,2</u> 0,007	<u>57,1</u> 0,14
For underground mining within depths 300-700 m	<u>1 420.8</u> 0.44	<u>22,6</u> 0.007	<u>64.6</u> 0.20
Total up to depth 700 m	2626.6	44.8	121.7

Layout of drilled and planned wells



Geological section on exploratory line 5



Legend

126
↑
100,0

Project well



- Andesite porphyrite



- Granodiorite, granodiorite-porphyre, quartz granodiorite



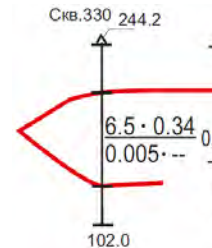
- diorite, diorite porphyrite



- Rocks of covered complex



- Residuum of underlying rocks



- Wellhead elevation
- Outline of conditional copper ores at cutoff grade Cu con. -0,2%, located in the pit depth 300m (C2 category)
- Numerator – thickness of ore and Cu content
- Denominator – Mo and Au content, in center Cu conditional
- Well depth

Time schedule of main kinds of exploration to carry out prospecting and evaluation works

Kind of geological exploration works	1 year of exploration				2 year of exploration				3 year of exploration				4 year of exploration				5 year of exploration				6 year of exploration			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Preparatory period and designing	■	■	■	■	■																			
Topographical survey					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
Core drilling of holes					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
Hydrogeological and geotechnical investigations					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
Geophysical exploration of holes					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
Sampling and sample handling					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
Laboratory research					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			
Office studies					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Reporting																					■	■	■	■

Составление плана																					■	■	■	■
Составление бюджета					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Управление проектом					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Status of the object

SUBSOIL USER –«SPK «Tobol» JSC

PROJECT INITIATOR – INVESTMENT PARTNER – «Bataly Med'» LLP

JV –«Mystau» LLP

CONTRACT REGISTERED – 20.02.2015.



LIABILITIES:

- ❖ ***Expenses for social and economical development of the region and its infrastructure*** – 10 000 US dollar per year.
- ❖ ***Kazakh content in staff:***
 - Top management – 90%;
 - Middle management – 95%;
 - Experts – 95%;
 - Skilled worker – 98%.
- ❖ ***Kazakh content in equipment and products*** – not less 40%.
- ❖ ***Kazakh content in works and services*** – not less 90%.
- ❖ ***Annual CAPEX in abandonment fund*** – no less than 1% from expenses for exploration.
- ❖ ***Estimated distribution of shares and incomes in the project:***
 - «Mataly Med'» LLP – 85 %;
 - «SPK «Tobol» JSC – 15 %.



KRASNOARMEISK
DEPOSIT

Location of prospecting works site



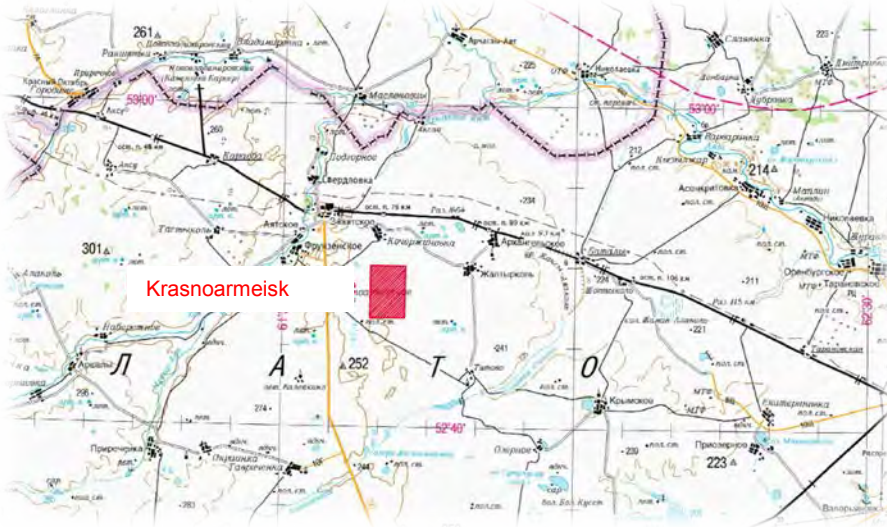
LOCATION

- Denissov district, Kostanay region.
- 40 km to the north of district center set. Denissovka.
- 135 km to the south-west of regional center Kostanay city.
- Site area is 24 sq. km.

HISTORY

- Discovered by Gachkevich I.V. in 1973.
- Studied in the period from 1973 to 2008 by Gachkevich I.V., Udris K.P., Scherbin S.S., Russinov M.I., Sotnikov Y.G., Popkov V.N. and other geologists.

Geography-economical description of deposit area



TRANSPORT CONDITIONS

- Railway stations: «Tobol», 60 km to the east; «Zaayatsky» (crossing loop), 10 km to the north-west.
- Asphalt road: «Kostanay-Zhitikara», 35 km to the south; «set. Denissovka-set.Zaayatskoye», 7 km to the west.

POWER SUPPLY

- Local TEP – ca 10%.
- Ekibastuz GRES – ca 90%.
- ETL-500 kV, 35 km to the south.
- ЛЭП-35 kV, 8 km to the north.

RELIEF

- Low sloped to the east flat land with cavities

WATER RESOURCE

- Zhaltyrkol lake, 16 km to the east.
- Tobol river, 40 km to the south. Ayat river, 20 km to the north.
- Numerous groundwater deposits.

CLIMATE

- Extreme continental.
- Average annual temperature ca +21,2°C
- Prevailing wind direction: north and south-west.



Description of projected activities

PURPOSE

Within geological allocation to carry out a complex of exploration works with calculation of explored reserves on categories C₁ and C₂ up to the depth of 300 m and probable resources on category P₁ up to the depth of 700 m. Exploration period - 6 years.

GEOLOGICAL TASKS

In the project of evaluation works at the Krasnoarmeisk deposit the following problems are planned to solve:

- Analysis of geological materials of earlier performed works;
- To carry out exploration works on deposit by core drilling method;
- To support prospecting hole drilling by sampling, laboratory testing, geophysical (logging) land works and topographic-geodesic surveying work;
- To carry out hydrogeological and geotechnical surveying;
- To make geoenvironmental surveying (EIA);
- To study material structure of industrial sampling and to carry out technological tests in the certified laboratory (institute) for the purpose of development of effective ore concentrating technology
- To create electronic data base;
- To draw up scoping study and report with calculation of reserves on industrial categories and its approval in GKZ of RK.

RESULT

By results of the prospecting and evaluation works the assessment of industrial value of the Krasnoarmeisk deposit with the statement of the measured mineral resources in GKZ of RK will be given.

Geological aspects of the deposit

- The ore field is presented by the Krasnoarmeisk ore occurrence of copper and porphyritic type, spatially and genetically connected with the massifs of the granitoids of the same name which are breaking through volcanogenic thickness of Upper Vise age. Thickness composes Aleksandrovsky graben syncline which is limited from the west by the Tobolsk deep fault, from the east – by Burlinsky fault.
 - The stratified deposits of ore field are presented by a complex of igneous-sedimentary rocks of the Paleozoic age, composing the base from which formations of Silurian, Devonian and Carboniferous systems and loose formations of the Mesozoic and Cenozoic are outlined.
 - Ore zones of the deposit are concentrated in two ore bodies of stockwork type: the western (ore bodies 1, 4 and 5) and the east (ore bodies 2 and 3), being in northern part of the Krasnoarmeisk intrusive massif. They have close connection with stocks of granodiorite-porphyrines and are localized in the zone of stockwork fracture which arose at the contraction shrinkage of the subvolcanic intrusion.
 - Initial ore is presented by primary and secondary copper-porphyry ores formed during intensive hydrothermal activity of the magmatic center. A shape of ore bodies in the plan is blanketlike. Ore zones are presented by the ore stockwork controlled by bodies of granodiorite-porphyrines, sites of intensive hydrothermal reaming of diorites and granodiorites, and at same places – Upper Visean volcanites. Ore mineralization has vein, stringer-pophyry and pockety character.
 - Intrusive formations on the deposit are composed by the Krasnoarmeisk massif in size of 8,3x6 km extended in the meridional direction. Peripheral parts of the massif are put by quartz diorites, axial part – by granodiorites.
 - The copper mineralization of the deposit is connected with tourmalin, propilite and beresite formations. Chalcopyrite is observed in vein formations in external zones of metasomatite.
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Mineral composition of ores of the deposit

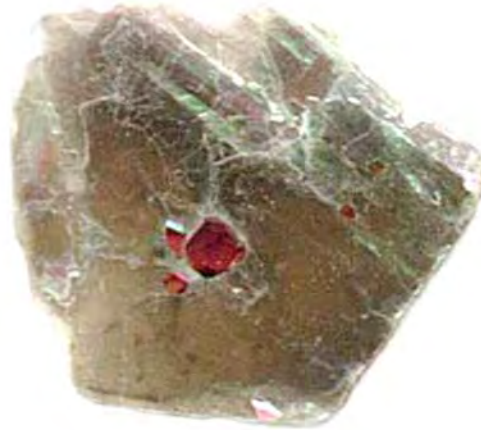
By atomic emission analysis in initial ore of the Krasnoarmeisk deposit were defined 30 elements, including copper, molybdenum, gold

MAIN ORE MINERALS:

chalcopyrite, pyrite, bornite, chalcocite, molybdenite, rarer – cubanite, tenorite, cuprite, malachite, chrysocolla.



Bornite



Muscovite

ACCESSORY MINERALS:

Siderite, ankerite, barite, leucoxene, muscovite, pyroxene

NONMETALLIC MINERALS:

plagioclases, kalifeldspath, quartz, amphiboles, chlorite, biotite, calcite, sericite, epidote, tourmaline.



Quartz, siderite, galenite

Geological investigations

- ❑ For the period from 1974 to 1989 - 69 wells in volume of 17215,7 r.m. were drilled
- ❑ 2007-09:
 - 1 stage – drilled 120 wells in volume of 3150 r.m. (Cu, Mo и Au zones specification)
 - 2 stage – drilled 21 wells in volume of 4003,6 r.m. (core drilling).Analyzed 3012 samples.



Core recovery from wells



Core sample with ore mineralization

- ❑ During the prospect evaluation works on the Krasnoarmeisk deposit taking into account earlier drilled wells the density of prospecting network made 200x200m with concentration to 100x200m.
- ❑ As a result of the carried-out prospect evaluation works on deposit the ore bodies are tracked up to the prospecting depth of 300 m.

Technical survey

2007 – 2009

- Analytical researches are made by laboratories of Tsentrgeolanalit LLP.
- External control of analyses - Sevkazgra Plus LLP.
- The complex of laboratory and analytical researches includes semi-quantitative spectral (atomic emission) and spectral gold assay analyses of all selected core samplings. Samples with the raised content of useful components were subjected to atomic absorption and chemical (photometric) analyses.
- To study all range of useful and harmful components 20 group samples were analyzed. To draw up the geochemical characteristic of the deposit more than 3 thousand atomic emission analyses are made and generalized.

2009

- Sample weighted 313,8 kg is presented by the core material characterizing the sulphidic copper-porphyrite type of ore presented by intrusive and effusive rocks, and also metasomatites with impregnation of ore minerals. Industrial value is made by the following components: copper, molybdenum, the accompanying ore - gold.
 - The main method of valuable components extraction from this ore is flotation. Initial content in ore: copper - 0,21%, molybdenum - 0,0092%, gold - 0,15 g/t.
 - According to the floatation collective-selecting scheme the concentrates are received:
 - copper concentrate - KM-0 brand, copper content - 46,28% at extraction of 88,06%; gold content - 24,9 g/t;
 - molybdenic concentrate - KMF-3 brand with molybdenum content - 49,85% at extraction of 70,79%.
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Reserves of Krasnoarmeisk deposit

Reserves on the Krasnoarmeisk deposit are approved by the RK GKZ Protocol No. 882-09-A dd. 24.11.2009 as of 01.01.2010.

PARAMETERS OF ESTIMATED CONDITIONS :

- The cutoff grade of nominal copper (copper) in sampling – 0,20 %;
- The minimum thickness of ore intervals included in calculation contour of reserves – 5,0 m;
- Maximum thickness of band of dead rocks or sub-standard ores included in calculation contour of reserves – 5,0 m.

Item	Unit	On-balance reserves, C ₂ category	Probable reserves, P ₂ category
Copper	thous. ton	203,9	-
ore	thous. ton	85 050,2	-
content	%	0,24	-
Molybdenum	ton	7 228,9	1 144,6
content	%	0,0096	0,01176
Gold	kg	5 580,9	3 161,3
content	g/t	0,138	0,142

Probable reserves of the Krasnoarmeisk deposit

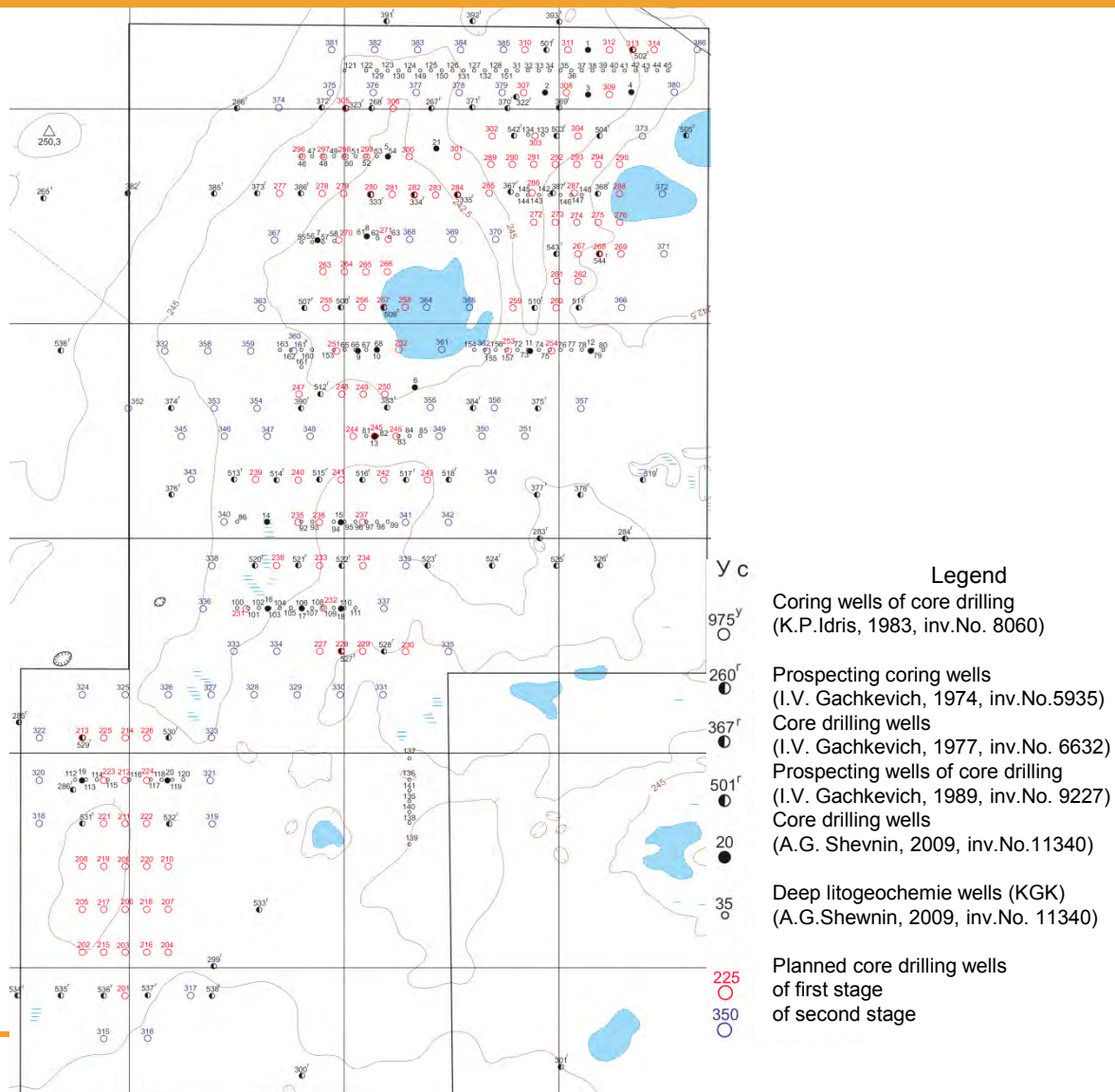
Having evaluated the available geological materials it was made revaluation of the surveyed copper ores reserves according to GKZ approved conditions which are to be considered as appropriate ones for the deposit:

- the cutoff grade of nominal copper for extracting the ore intervals of complex copper ores is - 0,2%, copper ores- 0.25%;
- the minimal thickness of ore intervals of complex copper ores included in reserves calculation is -2 m, copper -4 m;
- the maximum thickness of dead rocks and substandard ore layer included in reserves calculation is -4 m;
- the minimal copper content, taken into account at complex ores ore intervals extraction is - 0,1%, copper ores - 0,15%;
- the conversion coefficients for nominal copper calculation are as follow: molybdenum -11, gold 0.4 (approved by GKZ);
- the calculation depth of balance ores (mine) reserves is 300 m, under pit bottom is 700 m.

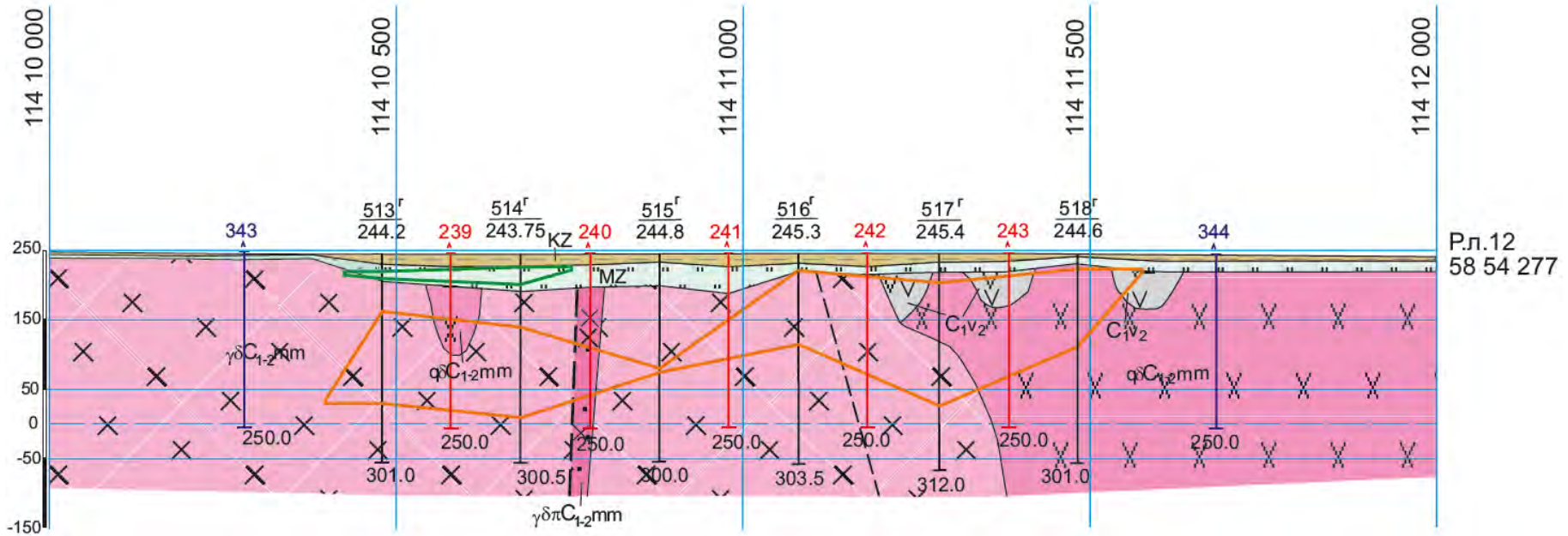
There were two ways to calculate reserves – typical way and upon ore content rate control way. The calculations results are at the table below:

Deposit exploration depth	Valuable components reserves		
	copper, thous. t %	molybdenum, thous. t %	gold, t g/t
In closure of open-pit up to depth 300 m	<u>457.4</u> 0.24	<u>22.193</u> 0,011	<u>19.193</u> 0,10
For underground mining within depths 300-700 m	<u>805.1</u> 0.23	<u>42.706</u> 0.011	<u>42.359</u> 0.142
Total up to depth 700 m	1262.5	64.899	61.552

Layout of drilled and planned wells



Geological section on exploratory line 12

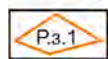


P.л.12
58 54 277

Legend



Outline and number of ore bodies of second ores



Outline and number of ore zones of primary copper-porphyre ores

210



300.0

Prospecting wells on sections:
of first stage:
depth 250m and confirmatory wells – depth 700m

320

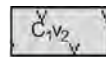


300.0

of second stage:
depth 250m and exploration well – depth 700m



Outlines of ore bodies not included in reserves calculation



Volcanogenic strata, basalt, basalt tuffs, andesite basalts and its tuffs, dacite, dacite lava-breccia



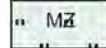
Milyutinsk-Michailovsky complex
Granodiotites



Quartz diorites



Cainozoic sediments (only on sections)
Loam, sand loam, clay, sand, opoka-like clay, opoka



Mesozoic residuum (only on sections)
Clay, arena-clay, arena-gravel formations

Time schedule of main kinds of exploration to carry out prospecting and evaluation works

Kind of geological exploration works	1 year of exploration				2 year of exploration				3 year of exploration				4 year of exploration				5 year of exploration				6 year of exploration							
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV				
Preparatory period and designing	■	■	■	■																								
Topographical survey					■	■	■	■	■	■	■	■	■	■	■	■												
Core drilling of holes						■	■	■	■	■	■	■	■	■	■	■												
Hydrogeological and geotechnical investigations						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
Geophysical exploration of holes						■	■	■	■	■	■	■	■	■	■	■												
Sampling and sample handling						■	■	■	■	■	■	■	■	■	■	■												
Laboratory research						■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
Office studies		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Reporting																					■	■	■	■	■	■	■	■

COCTIBUUGHNE 014615

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Y900B50B996 b900P1

Status of the object

SUBSOIL USER –«SPK «Tobol» JSC

PROJECT INITIATOR – INVESTMENT PARTNER – «Bataly Med'» LLP

JV –«Mystau» LLP

CONTRACT REGISTERED – 20.02.2015.



LIABILITIES:

- ❖ **Expenses for social and economical development of the region and its infrastructure** – 10 000 US dollar per year.
- ❖ **Kazakh content in staff:**
 - Top management – 90%;
 - Middle management – 95%;
 - Experts – 95%;
 - Skilled worker – 98%.
- ❖ **Kazakh content in equipment and products** – not less 40%.
- ❖ **Kazakh content in works and services** – not less 90%.
- ❖ **Annual CAPEX in abandonment fund** – no less than 1% from expenses for exploration.
- ❖ **Estimated distribution of shares and incomes in the project:**
 - «Mataly Med'» LLP – 85 %;
 - «SPK «Tobol» JSC – 15 %.



**THANK YOU FOR YOUR
ATTENTION!**
