SHALKIYA MINE EXPANSION PROJECT

(KYZYLORDA REGION, KAZAKHSTAN)

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

Final version

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ISSUE AND REVISION RECORD

Version	Date	Author	Reviewer/ approver	Description
A	3 November 2015	Marina Khotuleva, Ph.D. Sean O'Beirne Tatiana Strizhova, Ph.D. Tatiana Laperdina, Ph.D. Vladimir Chechetkin, Ph.D. Anna Kuznestova Timothey Shumskiy Maia Gachechiladze-Bozhesku, Ph.D .	Marina Khotuleva, Ph.D. Maia Gachechiladze-Bozhesku, Ph.D.	First draft for Hatch and JSC ShalkiyaZinc LTD comments
B	9 December 2015	Marina Khotuleva, Ph.D. Sean O'Beirne Tatiana Strizhova, Ph.D. Tatiana Laperdina, Ph.D. Vladimir Chechetkin, Ph.D. Anna Kuznestova Timothey Shumskiy Maia Gachechiladze-Bozhesku, Ph.D.	Marina Khotuleva, Ph.D. Maia Gachechiladze-Bozhesku, Ph.D.	Final report for internal use of JSC ShalkiyaZinc LTD
C	28 April 2016	Marina Khotuleva, Ph.D. Sean O'Beirne Tatiana Strizhova, Ph.D. Tatiana Laperdina, Ph.D. Maia Gachechiladze-Bozhesku, Ph.D. Vladimir Chechetkin, Ph.D. Anna Kuznestova Timothey Shumskiy Olga Zubritckaia	Marina Khotuleva, Ph.D. Sean O'Beirne Maia Gachechiladze-Bozhesku, Ph.D.	Final report for Lenders
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DISCLAIMER

This ESIA Report Version E is based on the information available at the time of its preparation. Additional information received from the HATCH and JSC ShalkiyaZinc LTD after 22 June 2016 is not considered in this version. The project description and alternatives were provided by HATCH and JSC ShalkiyaZinc LTD and have been accepted as provided. The Ecoline Environmental Assessment Centre accepts no liability for the consequences of any actions taken on the basis of the information provided herein.

LIST OF ABBREVIATIONS

APP	Air pollution potential
EBRD	European Bank for Reconstruction and Development
Ecoline EA Centre	Ecoline Environmental Assessment Centre Non-profit Partnership
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
EU	European Union
GDP	Gross Domestic Product
GRP	Gross Regional Product
GHG	Greenhouse gases
ICWC	Interstate Commission for Water Coordination
IFC	International Finance Corporation
IFI	International Financial Institutions
IPCC	Intergovernmental Panel on Climate Change
LOM	Life-Of-Mine
OVOS	Environmental Impact Assessment per Kazakhstani legislation requirements (Otsenka Vozdeistvia na Okruzhauschuu Sredu in Russian)
PR	Performance Requirements of the EBRD
PS	Performance Standards of the IFC
RK	Republic of Kazakhstan
SanPiN	Sanitary Rules and Norms
SEP	Stakeholder Engagement Plan
SN	Sanitary Norms
SPA	Special Protected Area
SPZ	Sanitary Protection Zone
Syr Darya (RBMA)	Syr Darya River Basin Management Authority
TSF	Tailings Storage Facility
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
UNEP	United Nations Environmental Programme

SYMBOLS

d	Day
h	Hour
km	Kilometre
m^3	cubic meter(s)
m^3/a	cubic meters per annum
m/s	meter per second
mln or M	million
mm	millimetre
t	tonne(s)
tpa	tonnes per annum
g	gram(s)
str.	street
tel.	telephone
CH_4	Methane
N_2O	Nitrous oxide

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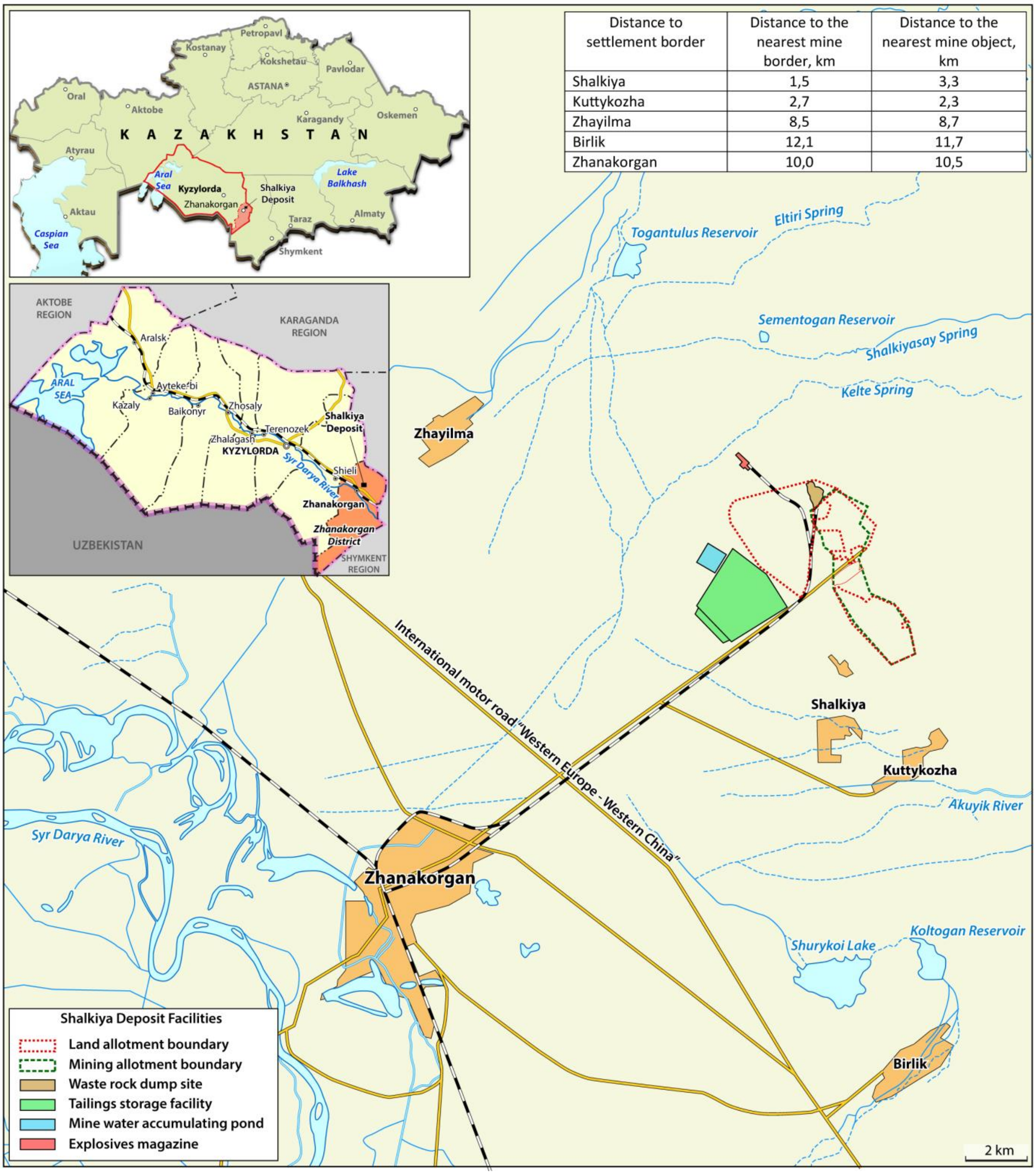
1. INTRODUCTION

1.1. About the Project

JSC ShalkiyaZinc LTD (‘the Owner’, ‘the Company’ or ‘the Mine’) is proposing an expansion of the Shalkiya Mine as part of the Shalkiya Lead-Zinc Expansion Project (‘the Project’). The Project is located in Kyzylorda Region (Oblast), in the south of Kazakhstan (**Figure 1**). The Project entails an expansion of operations of the existing Shalkiya Mine and the construction and operation of a new Processing Plant and supporting surface infrastructure.

External investments are required to implement the Project and, to this end, the Owner plans to approach International Financial Institutions (IFIs). The IFIs have very specific requirements in respect of the Feasibility Study (FS) and the associated Environmental and Social Impact Assessment (ESIA).

The FS has been undertaken by Hatch. The ESIA has been prepared by the Ecoline Environmental Assessment Centre (‘the Ecoline EA Centre)’ and SE Solutions (jointly, the ‘ESIA Consultant’), with support of Hatch.



Distance to settlement border	Distance to the nearest mine border, km	Distance to the nearest mine object, km
Shalkiya	1,5	3,3
Kuttykozha	2,7	2,3
Zhayilma	8,5	8,7
Birlik	12,1	11,7
Zhanakorgan	10,0	10,5

Figure 1: Location of the mine in southern Kazakhstan and surrounding settlements and other features

Source: Ecoline EA Centre, own map.

1.2. Geographical Scope and Administrative Division

The Shalkiya Lead Zinc Project is located in Zhanakorgan District, Kyzylorda Region, Republic of Kazakhstan (RK) (**Figure 1**). This region is located east of the Aral Sea, in the Lower Syr Darya River Basin. The River runs in a twisted channel and divides into a large number of arms and branches, with vast wetlands across the river delta. The River flows through the central part of the Region from the south-east to the north-west for about 1,000 km.

The Kyzylorda Region occupies 226,000 square kilometres or 8.3% of the country's area. The distance between the northernmost and southernmost points in the Region is over 1,000 km. The Region comprises 265 settlements and villages, 145 rural and Aul communities with the capital being based in Kyzylorda. The Region is divided into seven administrative districts and a city of republican significance - Baikonur[1].

The Shalkiya Mine is located close to two settlements that are part of the Shalkiya Village Settlement, namely Shalkiya village and Kuttykozha settlement.

1.3. Environmental and Social Impact Assessment (ESIA) Deliverables

The ESIA has been undertaken as part of the FS and is in line with the requirements of the IFIs, in particular:

- International Finance Corporation (IFC);
- European Bank for Reconstruction and Development (EBRD); and
- The Equator Principles (EP).

In accordance with the requirements of the IFIs, the ESIA includes the following deliverables/documents:

- An ESIA Report that incorporates the findings of the ESIA, including the description of the social and environmental baseline, analysis of alternatives, the impact assessment, proposals for the management of risks and impacts, and environmental monitoring program.
- An Environmental and Social Action Plan (ESAP); and
- A Stakeholder Engagement Plan (SEP);
- An Environmntal and Social Management Plan (ESMP).

[1] Baikonur is a city of the republican significance, administered by the Russian Federation on the basis of the long term lease (see "The Kyzylorda Oblast Metallurgical Complex Development Concept". PROECO Consulting, 2014).

2. THE PROPOSED PROJECT

2.1. Current Status of the Mine Expansion Project

The development of the Shalkiya lead and zinc mine expansion is at the stage of detailed design and Environmental Impact Assessment per Kazakhstani legislative requirements (OVOS) preparation. A bankable FS is being developed simultaneously to obtain funding from the IFIs. Pursuant to national practice the approved project[2] is divided into two projects: (1) mine expansion (mining works) and (2) construction of the processing plant with a capacity of 4 million metric tonnes per annum (Mtpa).

At the time of completing the ESIA, the mine expansion project in respect of national legislative requirements was still being developed. The national OVOS for the mine expansion project was under preparation as part of the design documentation. Originally the OVOS report was scheduled for completion in December 2015, however the completion was delayed. Preparation of the design project for the construction of the processing plant, including the OVOS for the project specified, is now scheduled for completion in late 2016.

2.2. Geology and Mineralisation[3]

The Shalkiya lead-zinc deposit is a typical stratiform deposit with the spatial extent of the deposit shown in **Figure 2**. The deposit's geological structure includes Lower and Upper Devonian carbonate formations, broken through by thin (up to 3 m) granitoid lamprophyre dikes with few insignificant hydrothermal veined formations (quartz veins and silicification zones). Hypergene altered (silicified) breccia-like rocks associated with outcrops of ore-hosting formations of dolomite-siliceous member were identified in the weathering zone of the deposit. These rocks occur widely throughout the area, but are not significant in terms of their depth. The main deposit reserves are associated with the Upper and Lower ore bodies.

The mineralization is concentrated in laminated and massive carbon-quartz-dolomite rhythmites. The immediate ore-hosting rock is a dipping upturned syncline fold, complicated by a series of tectonic faults. The ore bodies have a stratal and lenticular shape complicated by numerous minor low-angle folds. The deposit includes North-Western and South-Eastern properties with

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[2] "The project of industrial exploitation of polymetallic ores of the Shalkiya Deposit using underground methods" approved on 06.11.2012 by the Committee for Geology and Subsoil Use of the RK (ref. №17-06 / 4233-kgn).

[3] Information summarized in this subsection draws on the following sources:

- KazGiproTsveMet. 2008. Environmental Impact Assessment (OVOS). Volume 3. Book 2. Project. Construction of the mine at the Shalkiya Deposit (corrective project);
- Proekt. Plan of Mining Operations with the Increased Productivity of Shalkiya to 4 million tonnes of ore per year (2008). Almaty;
- 'KazGorProektService' JCS. 2012. Project of industrial exploitation of the Shalkiya polymetallic deposits using an underground way mining method. Volume 1, Book 1. Geology of the deposit. Almaty.

identical geological structures. In the North-Western property, the ore bodies are located between 40-50 m up to 680 m below the surface, whereas In the South-Eastern property, the mineralization extends deeper and is concentrated at the levels of -200 m and -620 m, at a depth of 530-860 m. The ore of this deposit belongs to the sulphide lead-zinc technological type.

In terms of its geological complexity, the deposit is classified as Class 2 in compliance with the Classification of Solid Mineral Reserves and Possible Resources of Deposits[4]. The actual exploration grid density on the North-Western property for “B” reserves delineation was 80 m x 40 m and for “C1” reserves 180 m × 80-100 m. Currently, the deposit reserves are accessed by three vertical shafts, haulage ramps, and horizontal workings on levels 1 and 2, which are at elevations of +163 m and +100 m, respectively. For the purpose of the exploitation of the deposit, reserves were updated and approved in 2004-2006. In terms of its metal reserves Shalkiya is a major deposit comprising more than 30% of the zinc reserves of Kazakhstan and is the 5th largest in the world deposit with the proven and probable reserves of 6.5 Mt of zinc as per the JORC[5] Code. The classification of the resources in terms of the 2012 JORC Code has been refined as part of the FS.

[4] Minutes No. 495-06-У of GKZ (the State Reserves Committee) of the RK from 28.03.2006. “Consideration of the report with the estimated reserves of the Southeast property of the lead-zinc deposit Shalkiya”. Kokshetau, 2006.

[5] http://zinc.kz/%D0%BE-%D0%BA%D0%BE%D0%BC%D0%BF%D0%B0%D0%BD%D0%B8%D0%B8/%D0%BE%D0%B1%D1%89%D0%B0%D1%8F-%D0%B8%D0%BD%D1%84%D0%BE%D1%80%D0%BC%D0%B0%D1%86%D0%B8%D1%8F/

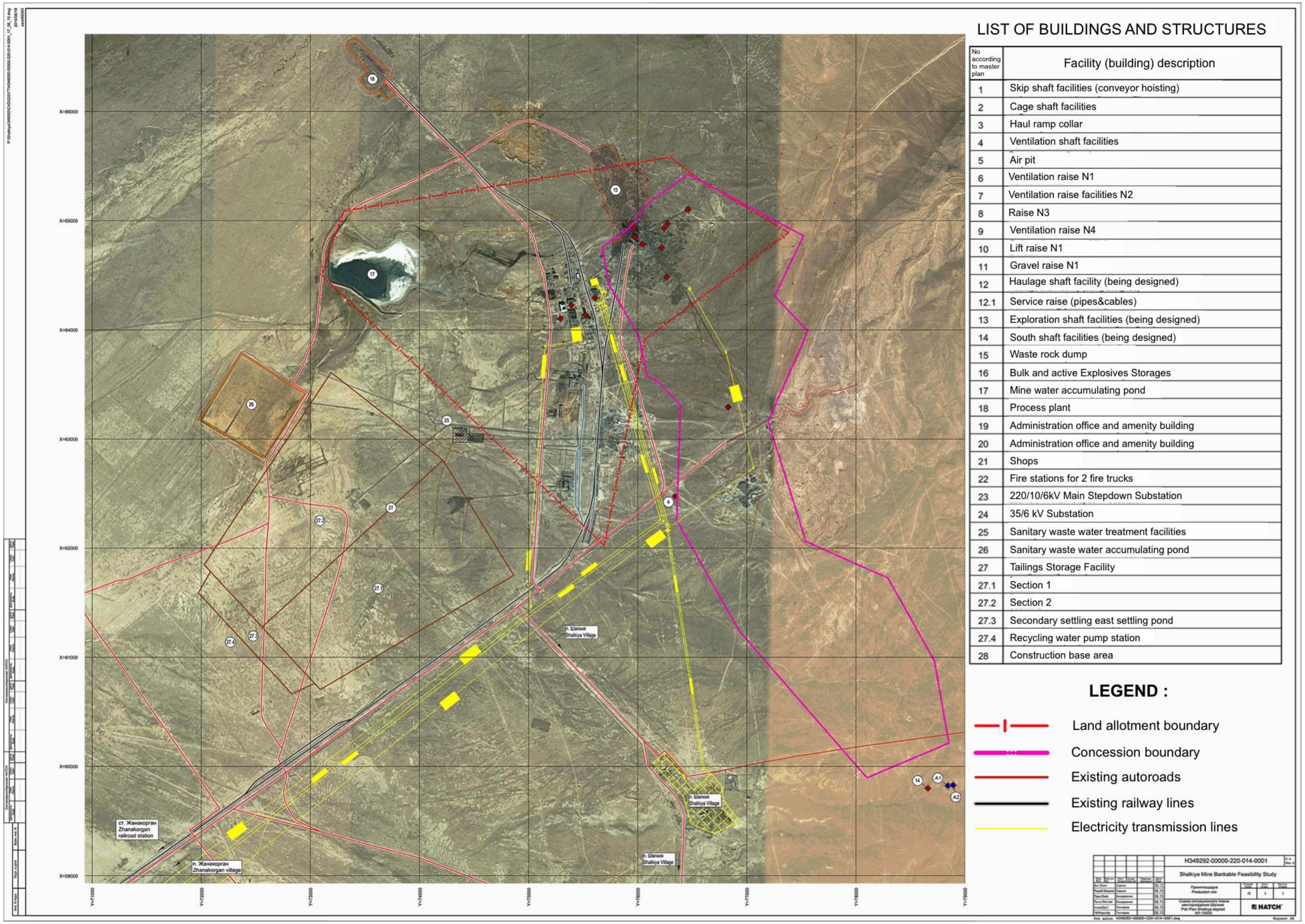


Figure 2: Location of the ore body, the current mine infrastructure, proposed Tailing Storage Facility (TSF), and the waste rock stockpiles

2.3. Historical Context

The Shalkiya Mine has operated intermittently since mining commenced in 1982. Mine infrastructure was established including shafts, underground mine workings, railway and highways, a power transmission line and a 220 kW substation and a residential village. The mine operated for a total of 12 years before being closed in 1994 for economic reasons but mining was started again in 2004 and operated until 2008 when the mining works were suspended with the competent authority approval. Access to the underground mine is through a decline from the surface via a portal and various shafts. Additionally, ventilation raises have been excavated that connect to the underground workings. The initial development of the mine infrastructure consisted of two vertical shafts, a mine settling pond for retaining and potentially treating pumped mine water, administration buildings and several other buildings that were never completed, such as the partially completed sewage treatment plant that is located to the southwest of the main mine operation.

During the periods when the mine was operating, the entire run-of-mine ore was transported by rail from the mine to the Kentau Processing Plant located in Kentau town of South-Kazakhstan Region (Oblast), 165 km away from the Shalkiya Mine. No ore processing was carried out at the site and there are accordingly no tailings facilities. The overburden and waste rock dumps that existed previously were eliminated through processing of rocks for building materials. The exception is a small existing waste rock stockpile north east of the site, near the services shaft. When the mine ceased operations in 2008, a care-and-maintenance programme was initiated to maintain the facilities. Some of the existing infrastructure is shown in **Figure 2**.

2.4. Mining Operations

The mine is planned to continue as a conventional hard rock underground mining operation. Traditional mining methods would be used to develop and extract the ore, utilizing the standard drill-blast-haul-hoist cycle. The planned mine activities include development of mine infrastructure, production area access and ore production. The underground operations would be accessed via the existing ramp and vertical shafts. The mining rate is currently planned at 4.0 Mtpa, with an estimated 105 million tonnes of zinc-lead ore to be mined during the life-of-mine (LOM). Specific (LOM) tonnages would be determined as the mine design progresses. The mining would progress in a south-easterly direction becoming progressively deeper to follow the ore body.

2.5. Underground Infrastructure and Facilities

In support of the mining activities described above it would be necessary to upgrade existing underground facilities (**Figure 3**) as well as developing a variety of additional underground facilities to support the mining activities. Underground facilities include primary crushing, water management systems, power distribution systems, ventilation, equipment maintenance, storage and support, and other underground utilities as necessary. The selected underground facilities would require new underground excavations.

2.5.1. Primary Crushing

It is intended to crush rock underground, before it is moved to the surface. This would see the establishment of an ore and waste rock handling system including the use of primary underground crushers. The crushers would crush run-of-mine stockpiled ore to a product size of approximately 50-60 mm, which would then be transferred by a series of conveyors to surface. At the surface the crushed ore would be conveyed to a coarse ore bin with the final design criteria and requirements still to be confirmed.

Waste rock generated underground would be handled in a similar manner during initial Project ramp up. A portion of the waste rock generated from the mine development would be brought to surface during the first two (2) to three (3) years of operation. However, once the Project is in full operation, the intent is to keep the waste rock underground and use it to fill mine openings or voids.

Figure 3: Photograph showing the existing mine infrastructure. The headframe on the forefront (a complex of the Main shaft facility) would be used for hoisting of ore from underground workings using a vertical conveyor

2.5.2. Planned Underground Water Management

Mine Water Drainage

The existing underground water collection and dewatering system would be re-established, and new drainage facilities constructed in new areas and horizons. A conditionally clean (limited solids component) water pumping system for dewatering the mine, which includes the establishment of mine water collection sumps throughout the mine feeding into the main mine dewatering system, would be used. Underground water would be re-used and re-cycled to support mining operations, such as irrigation of faces and dust removal in crushing blasting operations, irrigation of the underground rock during loading and unloading, and dedusting of air at work places. A slimes removal system would be included as part of the mine dewatering system if needed.

Mine water planned to be reused/recycled in the production process will be stored in the existing / upgraded mine water pond. Remaining excess underground water would be pumped to the existing surface mining water holding pond (**Figure 5**).

As the project moves to further stages of the design process, it is important to make sure that storing untreated mine water in the mine water pond without seepage control is still acceptable in the context of national and international regulations.

Currently, the groundwater inflow to the underground mine is 133 m^3/hour. As the scale of mine development and mining activities increases, the groundwater inflow is expected to grow significantly to some 480 m^3/hour.

The proposed mine water management strategy will involve regular engineering monitoring to serve to:

- Review and predict further changes in hydrogeological conditions and risk of water inflow in new mine openings (permanent openings, development workings and stope areas);
- Monitor the efficiency of adopted mine water control measures.

The engineering monitoring will include the following monitoring activities:

- Monitor the development of depression cone;
- Monitor the rate, temperature and chemical composition of water inflows in the underground mine workings;
- Monitor the daily flow discharge rates of mine water pumped by the mine dewatering plant and estimate daily inflow rates.

The monitoring of the depression cone includes measuring the groundwater table in the monitoring wells drilled into the exogenous weathering zone within the Famennian/Tournaisian carbonate rocks. The design as proposed involves the development of 27 observation wells located around existing mine workings and those to be developed at the first stage of the Project[6]. The proposed well locations take into account the layout of potential impermeable beds, groundwater flow direction, mining advance direction and location of the Kuttykozha domestic and drinking water intake. The location of 27 monitoring wells (Nos. 1n–27n) is schematically illustrated in the hydrogeological map (Figure 4). The average depth of monitoring wells is 140 m with a total drilling length of 3780 m.

As the development of mine workings progresses to increase the area of exposed carbonate rock face and existing hydrodynamic depression cone grows, the need and locations of additional monitoring wells would be assessed using

[6] Volume 2, Book 2. Technological Solutions (Mining and Mechanical) Section of the Design Documentation for the Shalkiya Mine Development Project. KazGiproTsvetMet LLC, 2016.

available monitoring data. If monitoring results show that the hydrodynamic depression cone expands toward the Kuttykozha water intake, additional monitoring wells (28n–31n) are recommended to be established (Figure 4).

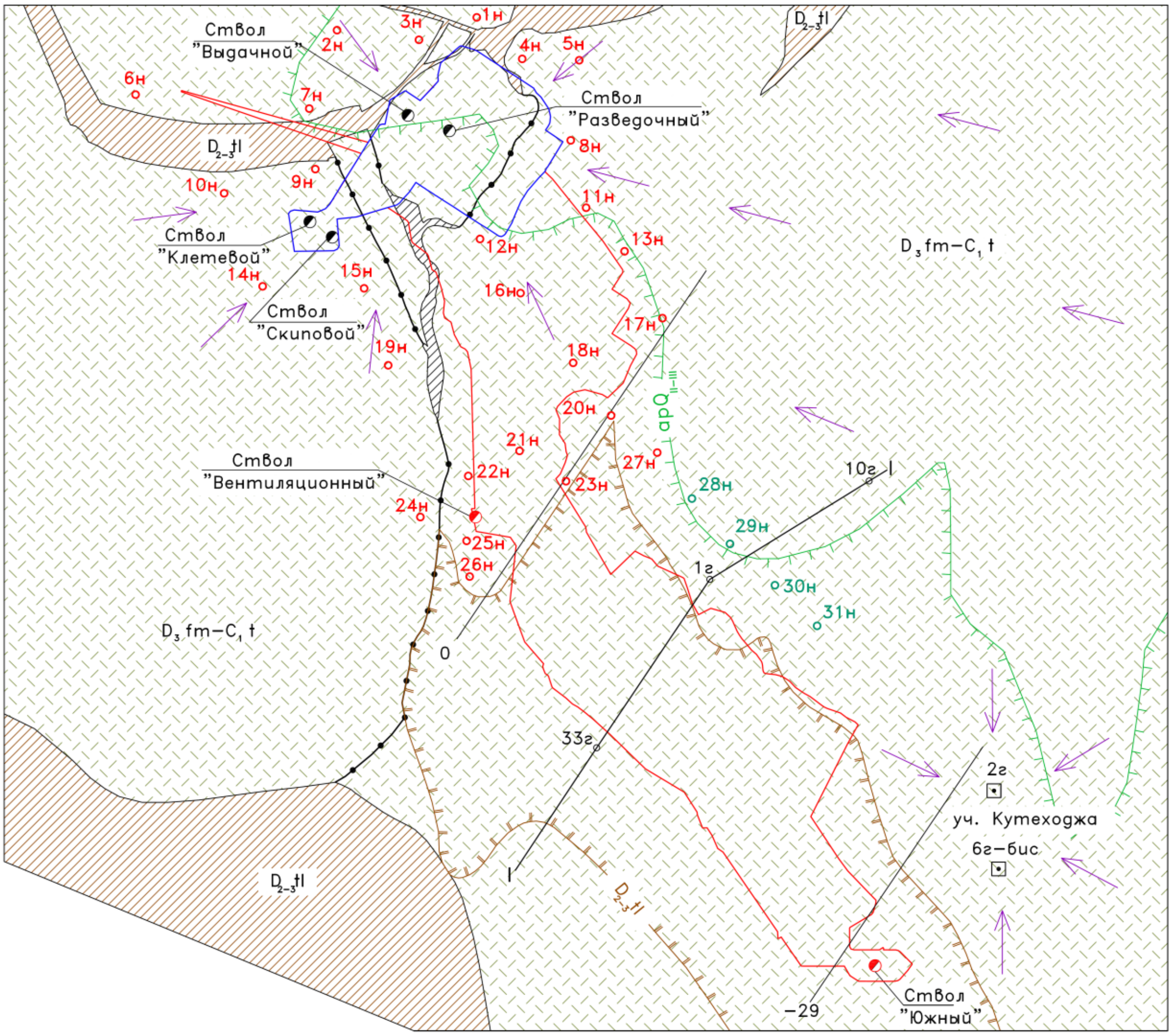


Figure 4. Location 27 of projects' monitoring wells (numbers of red font present the planned wells, while green ones – recommended; legend for the map is presented in the figure 28)

Considering the complicated hydrogeology of the Shalkiya deposit, it is considered feasible to establish a continuously running 3D computer model simulating groundwater filtration processes based on the MODFLOW or GEOWS software. The model should developed upon the completion of the observation well drilling; to be continuously refined throughout the life of the mine to take account of new data on the spatial alignment of completed mine workings, exploration and mine dewatering wells, and on changes in the locations and flow rates of all water inflows in the underground mine areas. The multipath prediction on the basis of the hydrogeological model will help streamline the justification of the most feasible design decisions pertaining to the number, locations and lengths of dewatering wells every time a new mine section is to be developed.

To facilitate engineering observations required to produce data ensuring the efficiency of groundwater inflow control measures taken, it is recommended to set up a hydrogeological group within the Chief Geologist team, to be led by an experienced and qualified mining engineer/hydrogeologist.

Figure 5: Mine water that is pumped from the mine being discharged into a channel (the top photo) from where it leads into the mine water storage dam (the bottom photo)

2.5.3. Underground Power Distribution

The underground power distribution system would be expanded to supply power to the new underground mine works. Power would be supplied from the surface distribution grid, via the haulage or service shaft to the underground power distribution grid.

2.5.4. Underground Ventilation

The current shafts and ventilation raises would be used as part of the initial ventilation system for the intake of fresh air and exhaust of the mine air. As the mine develops, additional raises would be required. Intake air would be heated as required during winter, utilizing electrical direct-fired heating systems.

2.5.5. Underground Maintenance, Storage and Support

Mobile maintenance, repairing and rebuilding facilities would also be established underground (one of such mobile bays is illustrated in **Figure 6**). The maintenance facilities would provide for the servicing of all the underground mobile and fixed mine equipment. Additional storage for fuel and lubricants, explosives, tires, and other mine consumables would be developed as needed. For the mine expansion, additional facilities as required by legislation would also be included, such as refuge stations, to be used in the event of a mine emergency, an alternative escapeway/egress (exit) system, latrine facilities and areas where workers can be briefed during underground operations and refreshment breaks. The exact number and position of these facilities would be determined as a function of the detailed design of the mine.

Figure 6: A mobile facility for maintaining and repairing the mobile machinery

2.5.6. Other Underground Utilities

The underground operation of the Project would also include the development of compressed air, communication and process control systems as necessary.

2.6. Surface Infrastructure and Facilities

In addition to the development of underground infrastructure and facilities described above, surface infrastructure and facilities would also be required. Surface infrastructure and facilities include the ore processing plant for lead and zinc concentrate recovery, tailings storage, water management facilities including water supply and sewer lines, waste management and the development of support infrastructure as required to support these activities (maintenance and repair facilities, equipment and material storages, power and natural gas distribution, and accommodation and administration buildings).

In the longer term, constructing a hydrometallurgical plant to produce zinc metal and lead cake from concentrates is considered as a possibility.

2.6.1. Processing of Ore

Shalkiya lead and zinc ore processing will take place at the Shalkiya mine site. Pb and Zn concentrates will be produced in the concentrator via conventional flotation process. Ore will be primary crushed in underground mine prior to hoisting to surface. Conveyor system will deliver ore to a coarse ore stockpile, from where it is conveyed into secondary crushing plant of the Processing Plant. Annual planned ore processing capacity is 4 Mtpa Pb-Zn ore. The description below starts from the secondary crushing plant.

The Processing Plant is shown conceptually in **Figure 7**.. The ore processing process characteristics are summarized in Table 1[7].

Table 1. Ore Processing Process Characteristics

Product name	Output, %	Content, %		Recovery, %	
		Pb	Zn	Pb	Zn
Lead concentrate	1,7	43,0	2,0	49,0	1,0
Zinc concentrate	5,1	1,8	55,0	6,0	70,0
Middlings zinc concentrate	2,0	1,5	20,0	2,0	10,0
Tailings	91,2	0,7	0,8	43,0	19,0
Ore	100,0	1,5	4,0	100,0	100,0

Based on the Mechanobr Report, 105 million tonnes of ore will be processed over the 32-year Mine life.

2.6.2. Crushing

Primary crushed underground ore would be further crushed in the secondary crushing facility of the fine crushing plant. After hoisting, underground ore would be conveyed into the surge bin of the fine crushing plant, from where the ore feed

[7] Data provided by JSC ShalkiyaZinc LTD

to the secondary feeders would control crushing. The secondary crushing circuit would comprise a cone crusher preceded by a screen. Secondary crushed ore would further be reduced in the tertiary crushing circuit down to the final size of P80 of 12 mm. It will comprise two tertiary cone crushers in the closed circuit with two screens. Fines from all screens are the final product of the crushing plant and will be conveyed into the concentrator fine ore bins.

The plant will have a stand-by secondary crusher, which can be used also as a tertiary crusher during the maintenance of any other crusher. The modification from secondary to tertiary crusher will be made by changing the crushing chamber components. All equipment except belt conveyors will be installed in the crushing plant building. The plant will be equipped with an overhead crane for maintenance and a centralized dedusting system. Dust from all equipment and ore transfer points will be removed by under pressure means and dusty air will be cleaned by a dust filter. Blowers and the filter will be located adjacent to the crusher building.

The process will be controlled by an automatic control system with field instruments, equipment PLCs, computers and a process control station. The control station will be located in the crushing plant control room. The plant will be operated 7 days a week and 24 hours a day.

2.6.3. Grinding

Shalkiya ore requires fine grinding due to its texture and therefore grinding is performed in 4 stages, namely primary and secondary grinding in ball mills (down to P80 of 53 microns), tertiary grinding in IsaMills (to P80 of 30 microns) and Pb and Zn concentrate regrinding in IsaMills (to P80 of 20microns). The primary ball mill is in closed circuit with a spiral classifier, which returns extra coarse material back to primary mill. Cyclones are used as classifiers in other grinding duties. Energy consumption in the grinding process is high being approximately 46 kwh/t ore.

2.6.4. Flotation

Flotation is based on selective flotation of Pb and Zn minerals. The abundance of quartz reduces the selectivity of flotation. Also organic carbon may impact on the selectivity of flotation and on the consumption of reagents. Pb flotation consists of rougher and scavenging stages. Pb rougher concentrate will be reground in IsaMill. Rougher flotation tailing is then separated in a classifier and the coarse fraction goes into IsaMills for tertiary grinding Pb rougher concentrate will be cleaned in 4 consecutive stages, where cleaner tails are returned into preceding flotation stage. The 1st Pb cleaner tail after cleaner scavenger flotation will be combined with Pb scavenger flotation tailing. Reagents in Pb flotation are lime, xanthates, Na_2S, liquid glass, $ZnSO_4$, sodium cyanide and frother .

Flotation reagents will be received, stored and prepared for use in a separate building located close to the PP main building. The flotation solutions will be then pumped from storage tanks to day tanks located along the flotation line. Reagents will be added automatically using the Proscon system. The preparation of thickening flocculants will be conducted in the same place where the lead and zinc concentrate thickeners are prepared.

Flotation is generally the same in flow sheet design, but Zn flotation includes 5 cleaning stages. Zn 1st cleaner tailings will be imparted to main flotation.

Reagents in Zn flotation are xanthates, CuSO4, liquid glass, lime and frother. The Zn concentrate produced in the aforementioned circuit is still of low-grade quality and may not be readily saleable to Zn concentrate downstream processors. Therefore a Zn upgrade circuit has been added to produce high grade Zn concentrate at minimum SiO_2 content. The upgrade circuit consists of the following:

- 5th Zn cleaner concentrate will be classified in hydro cyclones into fine and coarse products;
- fine product contains liberated sphalerite and only small quantities of quartz and is a high grade Zn product; coarse product on the contrary has high content of the quartz particles and composite quartz-sphalerite particles and therefore needs regrind (P80=15 microns) to liberate sphalerite;
- after regrinding follows flotation (roughing and two cleaning stages);
- float product will be combined with hydro cyclone overflow as a high grade Zn concentrate (55%Zn, <5%SiO2, 70% Zn recovery); and
- the tailing product from the flotation forms a low-grade Zn concentrate (20%Zn, >30% SiO2 at 10% Zn recovery).
- Chemical composition of concentrates is characterized in Table 2

Table 2 Chemical Composition of Concentrates

Components and Compounds	**Content, %**		**Components and Compounds**	**Content, %**	
	Pb concentrate	**Zn concentrate**		**Pb concentrate**	**Zn concentrate**
Pb	45,0	4,0	MgO	1,5	1,3
Zn	2,0	55,0	$BaSO_4$	n/d	n/d
Fe_{total}	4,2	1,8	Al_2O_3	2,1	1,9
Cu	0,05	0,1	Mn	0,02	0,02
Cd	0,009	0,035	Ni	0,006	0,004
$S_{tota}l$	14,2	29,6	As	0,03	0,02
SiO_2	17,4	5,0	Se	0,003	0,002
CaO	1,4	1,1	Au, g/t	0,2	0,2
K+Na	0,35	0,20	Ag, g/t	45	15

- Lead and zinc are contained in concentrates as halenite (PbS) and sphalerite (ZnS).
- Data on the grain-size composition of concentrates and tailings is presented in Table 3.

Table 3. Grain-Size Composition of Products

Grain-size fraction, mm	Output, %		
	Pb concentrate	**Zn concentrate**	**Tailings**
+0,074	3,0	1,1	5,0
-0,074+0,044	6,3	4,4	10,2
-0,044+0,02	14,6	16,2	28,6
-0,02+0,01	46,2	55,8	25,4
-0,01+0,005	18,1	9,6	13,2
-0,005	11,8	13,3	17,6
Total	100,0	100,0	100,0

Lead concentrate and high grade Zinc would be thickened, filtered and then stored in the stockpile at the Mine site. The zinc upgrade circuit flotation forms a low-grade middlings zinc concentrate, which is also thickened, filtered and stored in the separate storage area at the Mine site.

As zinc and lead concentrate production is a wet process and these materials contain moisture during shipment, they are not likely to generate dust. Product overdrying should be avoided during storage and bagging. In any case, bagging equipment is required to have efficient ventilation system based, for example, on bag filters. Centralized and local ventilation should be also available in all areas where lead and zinc concentrate handling occurs. Workers are required to use PPE and respiratory system protection means. All workplaces should be certified and risks of occupational exposure to lead dust properly identified.

Lead concentrate and high grade zinc concentrate would be bagged and transported in covered rail cars to a smelting facility for further processing.

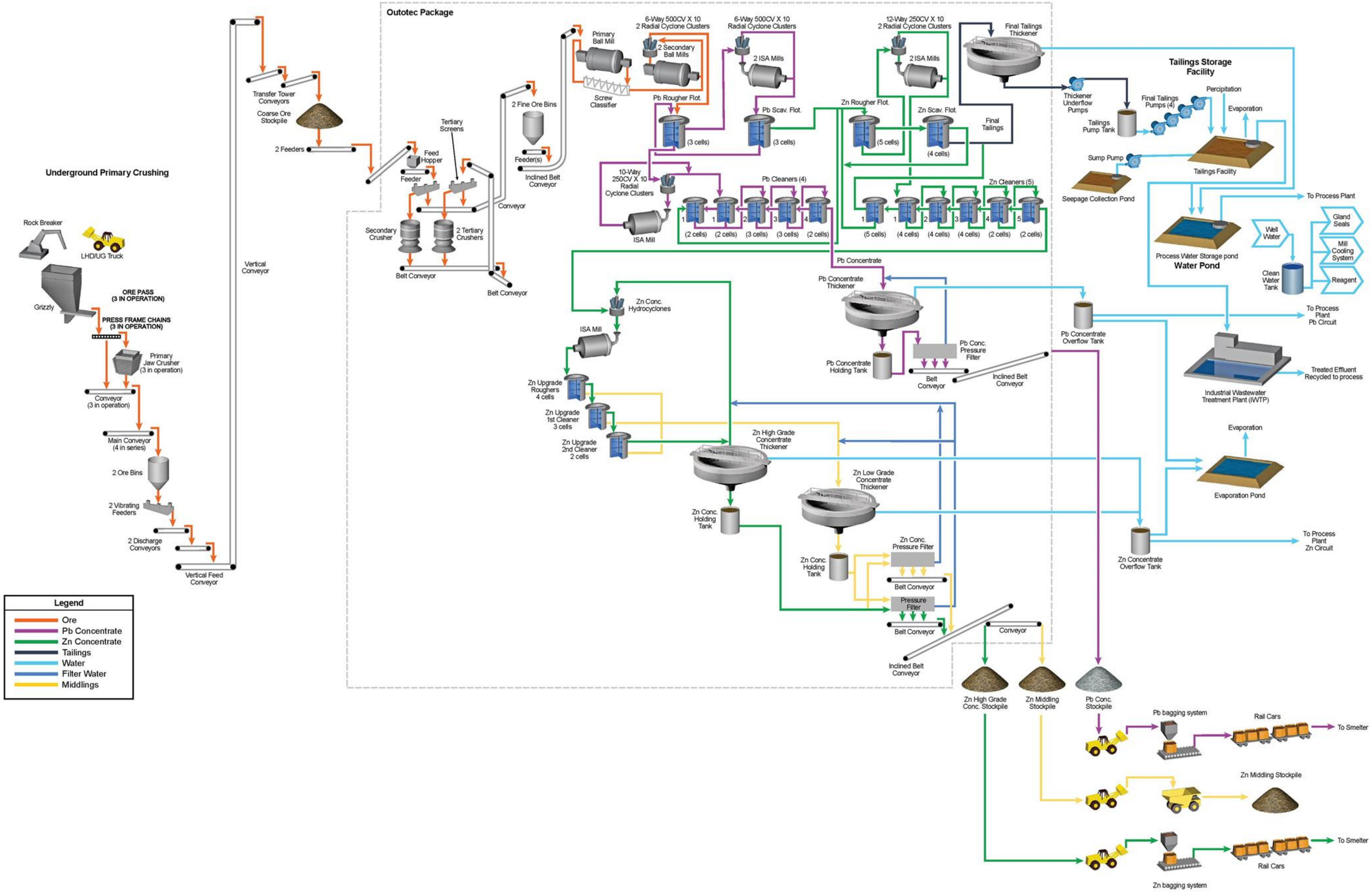


Figure 7: Schematised representation of the process plant that would be established at the mine to separate out the lead and zinc concentrate

2.6.5. Tailings Storage Facility (TSF)

The TSF would be designed and constructed for the permanent surface storage of the tailings generated by the processing plant. The tailings are the waste by-products of the milling and concentrating process at the processing plant and consist of finely ground ore processing particles. The tailings would be released together with process water from the processing plant and transported as slurry to the TSF.

According to the Outotec estimates, about 9% of concentrate would be produced from ore, which means that the remaining 91% of processed ore would turn into tailings. The annual tailings generation of tailings would be 3,646,500 t/a assuming the PP operates at full capacity.

Tailings will be transported from the tailings thickening system at the PP to the TSF dam crest via the surface pipeline.

Physical characteristics of tailings based on the Outotec Report are summarized below:

- Grain size composition of tailings P80 = 30 microns;
- Specific solid fraction weight is 2.77 t/m^3;
- Solid fraction of tailings mainly contains quartz, dolomite and certain quantities of valuable sulphide minerals (halenite and sphalerite). Pyrite (non-ore sulphide mineral) is also present is small quantities. Sulphur content in tailings is about 1.7%;
- Based on information from similar facilities, the average density of settled dry tailings is estimated to be about 1.53 t/m^3. At the next design stage, once the representative tailings samples become available after laboratory tests, assumptions pertaining to the geotechnical and rheological characteristics of tailings would need to be confirmed under laboratory test conditions.
- The estimated tailings deposition slope will range from 0.5% for the exposed sections of the tailings beach to 3% for tailings deposited underwater.

The TSF would be located on surface in an undeveloped new area southwest of the processing plant. The current view of the area is shown in **Figure 8.** The TSF would be developed in a single cell through the staged construction of perimeter containment dams with the starter cell sized to contain the first two years of tailings production. Containment dams would be built above the existing ground level using material from a local borrow or inert mine waste rock and progressively raised as the tailings are filled in until end of operation and thus arriving at the ultimate layout and height of the TSF.

The proposed design of the tailings storage facility includes the following components:

1. Perimeter dams.
2. Drainage system and leachate collection pond.
3. Interception drains.
4. Submersible pumps for reclaim water, diesel generators and pipelines.
5. Slurry pumps at the processing plant.

6. Slurry pipeline and associated valves and fittings.
7. Clarifying pond.
8. Reclaim water system.
9. Reclaim water pump and pipeline and associated valves and fittings.

Figure 8: The area where the TSF is planned to be established

The agreed tailings management option features conventional wet tailings disposal at the tailings storage facility. Prior to disposal, tailings are thickened to a solid to liquid ratio of 1:3 with the solids content being about 60%[8]. The Mine considers using tailings as backfill in the underground workings but this option is being assessed to decide whether the detailed feasibility study would be required or it should be rejected. The proposed solution is a conventional tailings solution at 55% solids. The tailings would be transported in the form of slurry via pumps and pipeline from the processing plant to the TSF. The slurry would be discharged into the operating cell by a network of spigots distributed on the perimeter dam crest. The operation of discharge spigots and distribution pipes would be in accordance with a tailings deposition plan. Excess decant water from the TSF would either be recycled back to the process plant or sent the Industrial Water Treatment Plant via the reclaim water pump and pipeline. The TSF would have adequate freeboard to contain the ‘environmental design flood’ resulting from a 1 in 100 year rainfall plus snowmelt event above typical operating levels. An ‘inflow design flood’ resulting from an extreme flood event would be allowed to safely discharge via an emergency spillway to prevent over topping and safe guard the containment dams.

The design and construction of the TSF should be performed according to the requirements of the national legislation of the RK[9] and IFIs[10], as well as best

[8] Data provided by JSC ShalkiyaZinc LTD

[9] Industrial safety requirements pertaining to the operation of tailings and sludge facilities of mining and non-mining companies, waterworks with liquid industrial waste. Approved by the Decree of the Minister for

available techniques [11] [12]. Available findings of the engineering and geological investigations conducted in 2007 are limited and not sufficient to determine the permeability of underlying soil and identify a suitable quarry material for the TSF dam. The materials of the 2016 engineering and geological investigations have not been available at the time of the design preparation. Onsite geology is described as one that comprises clayey soil with loam and silt bands overlying the dolomite and aleurolite bedrock occurring at depths ranging from 7 to 10 m from the surface.

Tailings are known to contain carbonate materials that are able to neutralize acid product generated through the oxidation of sulphide minerals. This may result in the toxic metal leaching which may also occur in the neutral environment of fluid tailings and result in the elevated toxic metal concentrations and presence of hazardous compounds like sodium cyanide in the liquid fraction of tailings.

It is therefore required to include provision for impermeable lining in the tailings storage design. The design of the TSF will include the construction of an impervious geo-synthetic liner with a clay layer, leachate collection system (consisting of a system of internal drains, perimeter ditches and pond around the perimeter of the tailings dam, at its toe), which will capture any potential seepage and pump it back into the impoundment. The TSF design will provide diversion channels on the western and eastern perimeters of the TSF for diverting clean surface runoff from the catchment area.

Tailings Composition and Characteristics

Data from the Kentau Processing Plant, provided by JSC ShalkiyaZinc LTD, should be used to inform predictions on the composition of solid and liquid fractions of tailings in the planned tailings storage facility. This Plant used to to process ore from the Shalkiya Mine using similar technology. It is therefore considered that data on tailings characteristics available from the Kentau PP could be useful in technological and environmental terms. For example, the results of water samples presented in Table 4 indicate that ore metal levels are relatively high both in the liquid fraction of tailings slurry and in the treated wastewater discharged down the slope after biological treatment. Lead concentrations in the treated wastewater can be as high as 0.21 mg/m^3 , which is significantly higher than relevant guidelines. Ity is unfortunate that there is no information on the metrological characteristics of the techniques employed and the margin of analytical error is not able to be assessed. This also applies to data indicating that slurry and tailings disposed of at the TSF do not contain residual cyanides. This notwithstanding, the data provided indicate that providing the impermeable lining of the TSF bottom and walls is an absolute necessity to prevent groundwater pollution. Accidents involving the TSF dam failure

Emergency Situations of the RK dated October 29, 2008 №189 (as amended by the Decree of the Minister for Emergency Situations of the RK dated 21.10.2009 №244, 29.11.2011 of №479).

[10] IFC, 2007. Environmental, Health and Safety Guidelines for Mining.

[11] European Commission. Integrated Pollution Prevention and Control. Reference Document on Best Available Techniques for Management of Tailings and Waste-Rock in Mining Activities. January 2009.

[12] Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries.

also pose a serious risk in terms of potential topsoil and groundwater contamination by metals.

Table 4. Water and Tailings Sample Test Results from the Kentau PP (2005-2008)

Sample No.	**Concentration, mg/l**							
	Pb	**Zn**	**Cu**	**CN**	**Fe total**	**Suspended solids**	**pH**	**Dry residue**
Tailings pump sump (liquid fraction of slurry)	0,06-0,09	0,04-0,26	n/d	n/d	n/d	8,0-16,6	9,24	526-994
Water collection sump No. 2 (wastewater after mechanical treatment and settlement of liquid tailings in the TSF	0,05-0,15	0,10-0,57	n/d	n/d	n/d	4,8-15,5		909-1392
Biological treatment pond No. 4 (wastewater after biological treatment in a system of ponds at the wastewater discharge down the slope)	0,035-0,21	0,12-0,57	n/d	n/d	n/d	0,8-15,5	7,70	739-1720

The technical studies were undertaken by Mechanobr Engineering, Outotec and Engineering Dobersek to examine the chemical composition of tailings generated through the direct selective flotation of ore. The study results indicate that tailings generated using various technology options have similar composition (Table 5). It should be noted that these study results differ from the tailings chemistry data available from the Kentau PP (Annex 23) where zinc and lead content is at 2.5% and 2%, respectively.

Table 5. Chemical Composition of Tailings

Components and Compounds	**Content, %**	**Components and Compounds**	**Content, %**
Pb	0,5	SiO_2	47 – 50
Zn	0,7-0,8	Al_2O_3	3,5
Fe	1,5	CaO	14,3
C	No data	MgO	8,7
S	1,6	Ag, g/t	1,3
As	0,009	Cd, g/t	40,0

A detailed characterization of the tailings geochemistry, rheology, and geotechnical conditions at the TSF would be completed prior to the next phase of engineering. The technical control and environmental monitoring programme will be implemented as part of TSF operation to monitor the level and quality of groundwater seepage from the TSF.

In designing the TSF, it is necessary to assess the risks of dumping the process water in the TSF containing high concentrations of hazardous substances that would be used as a flotation reagent, and toxic metals leached from the ore (lead, zinc, and cadmium). If these risks are significant, measures should be proposed to reduce the concentrations of toxic components in the discharged slurry and deterrent devices should be installed to protect birds during their spring and autumn mass migration when migrating birds may use the TSF's water for recreation and watering.

At closure, all piping and mechanical elements of the TSF operation will be dismantled and removed as per the site reclamation plan. The perimeter embankments constructed using the hydraulic fill method will be progressively restored. Exposed tailings beach at end of operation will be covered with inert soil to promote vegetation growth, prevent dusting, and minimize infiltration and erosion. The central decant pond within the tailings basin will be minimized by upgrading the emergency spillway to a permanent overflow spillway capable of safely conveying extreme storm event up to the probable maximum precipitation event.

2.6.6. Waste Rock Management and Storage

Waste rock dumps from the previous mining activities have mostly been eliminated through their transfer to the third parties for the production of building materials. A new waste rock storage area would be developed on new sites. The existing dump will be expanded, and the new site will be organized by the rock dump to the host rock. Arrangements for treating empty host rocks and waste rock dump design should take into account the requirements of the national legislation of the RK[13], IFC's Guidelines and the recommended BAT[14],[15].

The mine is set to produce a minimal waste rock estimated around 7.04Mt of waste rock over its entire life, which is considered insignificant when compared to the 4Mtpa mining of ore capacity. It is targeted to have none of the waste rock on the surface. Waste rock will be brought to surface to complete the mining operation. It is planned to use waste rock to fill operated-off voids.

One of the requirements for the design of waste dumps is to determine acid and / or leaching potential in the host rocks. These studies are needed to assess the risk of formation of acid drainage water with high leaching potential with respect to ore metals (lead, zinc, cadmium, etc.) during the interaction of rocks with precipitation and condensation water. As static geochemical tests indicate (Section 6.6.2), ores and rocks present at the mine site are not potentially acid generating due to the high carbonate content. Consequently, , the risks of formation of acid drainage water with high metal contents are low. However, according to the requirements of the legislation of Kazakhstan and requirements of IFIs, the waste dump sites should have a reinforced bottom with a waterproofing clay layer, drainage ditches, diverting filtration drains, ditches, diverting flood waters (melt and rain), and a system of background and observation wells for groundwater contamination control.

Depending on the geochemical characteristics of waste rock and projected composition of drainage water formed in the waste rock body, the drainage water - after the sediment is removed - can be transported to surface water bodies. To this end, a system for the collection and disposal of drainage water would be envisioned. Detailed characteristics of the geochemical properties of the waste rock and

[13] Common safety rules for the open mining of mineral deposits. Astana, 2008.

[14] European Commission. Integrated Pollution Prevention and Control. Reference Document on Best Available Techniques for Management of Tailings and Waste-Rock in Mining Activities. January 2009.

[15] Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries.

geotechnical conditions of the waste rock dump site will be prepared before the start of the next design stage when the design of waste rock storage would be finalized.

In accordance with the design decisions waste rock will be brought to the surface constantly to a complete mining operations. In prospect it is planned to use parts of waste rock to fill underground mine openings and voids.

Waste rock would be stored in an engineered waste rock stockpile and depending on their geochemistry, may be used as construction material.

Depending on the geochemistry of the waste rock, and expected water quality of seepage from the stockpile, the seepage after sediment control may be suitable for direct release into the environment; otherwise a seepage containment and collection system would be provided for sending impacted water through the Industrial Wastewater Treatment Plant prior to release into the environment. A detailed characterisation of the waste rock geochemistry and subsurface conditions at the stockpile area would be undertaken prior to the next phase to complete the design.

2.6.7. Water Resource Management and Water Resource Balance

Water Management Strategy

The strategy for water management on site will change as the Project develops and the processing plant capacity increases from 500 thousand tonnes per annum during 1st Year, 2 million tonnes - during 2nd Year,, 3 million tonnes per annum during Year 3rd and 4th onward – the projected capacity of 4 million tonnes per year[16] . In general, mine inflow water (groundwater) from the underground mine will be used as make-up to the concentrator. This water will supplement the recycled process water as make-up for the water that is lost to concentrate, tailings, and evaporation. Water for reagents/filtration, mill cooling, and power plant cooling will be a combination of filtered mine water, treated water from the industrial wastewater treatment plant (IWTP), and water from the water intake facilities, situated in Zhanakorgan (Shalkiya deposit of underground water). Water requirements for potable/fire water and for use in the underground mine will be met using well water from both the water intakes Kuttykozha and Zhanakorgan, and treated water from the IWTP. Storm water and waste rock stockpile run-off will be collected, and recycled/treated as required.

During development of the water management strategy for the Project site, a few key assumptions were made which are as follows:

- All water used will be recycled with no wastewater (raw or treated) being discharged to the environment. In order to meet this criterion, re-use of water from various sources on site has been maximized in order to minimize the need for fresh water from the well fields.
- Increased concentrations of constituents such as calcium sulphate in the process water as a result of water recirculation, reagent addition, and evaporation will have no negative effect on the metal recovery and grade of

[16] For calculations of water balance for 1-3 years of operation, the average productivity for PP equal 2 million tons/year has been used

the concentrator outputs. This assumption will need to be further validated through process-specific test work.

- Increased concentrations of constituents such as calcium sulphate in the process water as a result of water recirculation, reagent addition, and evaporation can lead to precipitation.
- Water used for all underground mining equipment and firefighting is required to be of potable water quality as per Kazakhstan standards.

Water Sources

The mine is situated in a region that is arid with no nearby permanent surface water available for the industrial and potable water requirements of the mine operations.

As such current planning would see water being drawn from the following four separate sources namely:

- Mine water drainage from the mine itself (mine water generation is 133 m^3/h)
- A group of wells at the Kuttykozha water intake (Shalkiya groundwater basin) for domestic and potable use (the uptake limit is 1,999 m^3/day or 83 m^3/hour; estimated use is at 17m^3/h); and,
- A group of wells at the Zhanakorgan water intake (Shalkiya groundwater basin) used to provide water for technical needs at the processing plant (usable groundwater reserves of 20,700 m^3/day; estimated water consumption rates would vary depending upon the processing plant's operating capacity);
- Rainfall precipitation falling at the Mine site and collected for further treatment and/or use in the closed-loop water supply system.

Information on groundwater sources used to provide water for the Mine is summarized in Table 6.

Table 6. Groundwater Sources Used to Provide Water for the Shalkiya Mine

Underground Water	Uptake/Discharge	Quantity (for 4Mtpa)	Comment
Kuttykozha intake (well) at the Shalkiya underground water deposit	Uptake	17 m^3/h	Permit for special water use No. 6-17 / 1052 series ARA / Syr Darya from July 9, 2013 issued for the extraction of groundwater for drinking water supply of the mine. (Permit allowance 1999 m^3/d)
Zhanakorgan intake (well) at the Shalkiya underground water deposit	Uptake	As the life of mine progresses, more mine water is available for recycle	Contract for subsoil use No. 3483 from 14 December 2009 (appendix 2) issued to conduct uptake of water from the Shalkiya groundwater deposit for meeting industrial water needs of the processing plant (Permit allowance 20,736

Underground Water	Uptake/Discharge	Quantity (for 4Mtpa)	Comment
			m^3/d)
Mine water	Uptake	Currently, the hourly mine water inflow rate is 133 m^3/hour. This rate has been used to estimate the water management balance for the Project implementation and mine expansion phase	Special water use permit Series YuTU No. 400128 of 07 June 2002 issued to pump mine water out to decrease the groundwater table during the ore mining activity at the Shalkiya Mine (Permit allowance 6793 m^3/d).

Projected water inflows to the Shalkiya Mine site estimated using the hydrogeological analogy method (the Karatau Geological Exploration Team Report, 1994) are as follows:

- Wet year: 144 dm^3/s (518 m^3/hour);
- Average year: 114 dm^3/s (410 m^3/hour).

Based on these estimates, the Feasibility Study[17] used 480 m^3/hour as an estimated mine water inflow. The Mine specialists updated their mine water inflow predictions in June 2016[18], which indicate that the currently recorded rate of mine water inflow (133 m^3/hour) should be used to estimate water management balance for all phases of the Project). This rate is used in the water management balance estimates presented in this Report.

Such a significant change in the mine water inflow predictions stems from the analysis of actual mine water drainage monitoring data available for 2004-2016. This data indicates that the average mine water pumping volume in the recent years (2006-2015) remained stable at 133 m^3/hour. In 2004-2005, the mine water pumping volumes varied in the range from 122.4 to 172.6 m^3/h. Mean annual groundwater flow rates in this period were 166.9 m^3/h in 2004 and 146.1 m^3/h in 2005.

The view expressed by the Mine Chief Geologist (Annex 24), with the Shalkiya deposit being located in an isolated setting surrounded by tectonic disturbances from all sides, there is risk that estimated mine water drainage rates would not increase as compared to the current levels as the Mine expands its mining operations.

However, considering a complex hydrogeology of the Mine site , the next stages of the processing plant design are required to involve the preparation of more detailed estimates using specialized consultants to underpin a robust justification of the current mine water inflow estimate suggested to be used throughout the Project life

[17] Shalkiya Project Feasibility Study. HATCH, 2016 г.

[18] Explanatory Note by Yu. Pirmakahnov to the PP water management balance of 22.06.2016 (Annex 24)

or adjust this estimates to take account changes to take account of changes that may occur at various stages of the PP operation.

The Mine is also conceptually considering the possibility of using water from the Syr Darya as a backup source of water supply for the Processing Plant at a rate of 30,000 m^3/day. If the option of using the river water as a backup water supply source during the first years of the PP operation goes ahead, this would imply the construction of a 17 km water supply line. As the final decision has not been made yet, this source is not reflected in the current water management balance.

Kuttykozha Water Intake

Water for domestic and drinking purposes comes to the Mine site from the Kuttykozha water intake located 6 km south east of the Mine site boundaries. This water intake includes two operational wells with a total production capacity of about 4500 m^3/day; this water is only allowed to be used for drinking purposes.

Water supplied from the Kuttykozha water intake is chlorinated to meet the current drinking water guidelines and stored onsite. This source would continue to be used to meet onsite domestic and drinking water needs including potable use, cooking, cleaning, water supply required for repair shops and emergency/rescue equipment (emergency showers and eye wash stations).

The Kuttykozha water intake is also currently used as a source of drinking water supply to the Shalkiya village. But according to the RK Public Water Supply Improvement Programme, Shalkiya village in 2017 will be connected to the Talap groundwater intake via a centralized water supply line. This means that the Kuttykozha water intake will be only used to provide drinking water to the Mine site.

Zhanakorgan Water Intake

Water from the Zhanakorgan water intake will be used for technical purposes. The water intake includes 8 wells, two of which are operational while the remaining six wells require repair. Water to the Mine site is supplied via the existing water supply system comprising pump stations and also requiring repair.

Process water requirements in the process plant would be met using a combination of discharge water from the mine, fresh well water and reclaim water from the TSF. Some treatment of the process water would likely be required to provide adequate water quality to optimise the process plant operation. Process water would be recycled in order to minimize the quantity of make-up water required from the well fields.

Based on the design solutions proposed by KazGiproTsvetMet Institute[19], the technical needs of the underground mining processes will be met using the potable quality water supplied from the Zhanakorgan water intake, which is in line with the Mineral Resource Use Contract.

[19] Проект «Промышленная разработка полиметаллических руд месторождения «Шалкия» подземным способом». Казгипроцветмет, 2016 г.

Storm Water Management

All storm water from the Mine site will be collected in storm water drains and routed to the process water storage pond for recycling. As required, excess storm water will be sent to the industrial waste water treatment plant for treatment and reuse. Another option could be to use treated storm water for the road surface watering.

No accurate precipitation estimate has been made to date; this issue will be considered at later stages of the design process. A tentative estimate of precipitation provided in the Feasibility Study (2016) suggests that it is in the range from 600 to 773 thousand m^3/a.

Surface Streamflow Management

In 2016, the Mine completed the diversion of the Shalkiyasai and Kelte streams away from the mine water pond in order to avoid potential pond overfilling during the extreme rainfall events and spring floods. In addition, these streams provide flow for a newly established water reservoir outside the boundaries of the Mine’s land allotment to meet water needs of local communities for livestock watering and farmland irrigation.

Domestic Wastewater

Existing Sewage Treatment Facilities

The existing sewage treatment infrastructure on site consists of a sewage treatment plant (STP) that has never been completed and is not able to be revived and the sanitary wastewater pond.

New Sewage Treatment Facilities

Domestic sewage from the surface facilities including administrative buildings, accommodations, kitchens, laboratories, and emergency showers will report to a new domestic sewage treatment plant (STP). The domestic STP will also treat domestic sewage from the underground mine which will be transported by sewage truck to the equalization tank upstream of the domestic STP.

Sewage will be treated to meet the Project Adopted Limits for sewage discharge according to the RK legislation and IFC Standards.

The domestic STP will consist of the following:

- Sewage collection system.
- Equalization tank.
- Biological treatment plant including anoxic and aerobic treatment to reduce the biological oxygen demand (BOD) of the sewage, and an aerated membrane system to further oxidize the sewage stream and provide ultrafiltration to remove suspended solids.
- Ultraviolet (UV) light disinfection system.
- Chemical addition and dosing system.
- Sludge handling system.

Treated sewage from the domestic STP will be conveyed to the existing sanitary wastewater pond for evaporation. Wastewater treatment sludge produced in the sewage treatment plant would be dewatered and collected by third party waste management company to taken and handled offsite at a designated landfill.

Water Consumption and Water Management Balance

The major proportion of technical water demand for the Project is accounted for by the Processing Plant. According to estimates produced by the Mine specialists in June 2016 (Table 7 and Table 8) , the Processing Plant, once fully operational, is expected to consume technical water for the following purposes:

- Reagent solution preparation and mill cooling (water from the Zhanakorgan water intake): 8,548 m^3/day
- Water used in the production process in closed-loop systems: 49,975 m^3/day;

The estimated evaporation from the tailings storage facility is 20-21.5% (depending upon the specific TSF surface area).

The total daily water demand of the Plant once it reaches its design capacity is 69,740.6 m^3 (Table 8) including:

- Mine water: 4,58%,
- Fresh technical water: 23.25 %
- Domestic and drinking water: 0,51%
- Recycled technical water: 71,66%

Evaporation losses are estimated at 19,765.8 m^3 or 28.3%. The mine water to fresh technical water (Zhanakorgan water intake) ratio is 16.44% to 83.56%.

The PP design is recommended to include the provision for:

- Domestic and drinking water supply system
- Hot water supply system
- Fresh water supply system for technical purposes (from the natural sources)
- Recycled water supply system
- Cooling water system
- Closed-loop air cooling system

The Mine water consumption estimates are based on the assumption that PP water consumption rates do not change as the level of production goes up because it is anticipated that all mining equipment will remain in operation throughout the entire operation life of the Mine. It is also assumed that all surface infrastructure will be put in place at the initial stages of the Project and water demands of the PP and other Mine facilities will remain the same during the Mine life.

The water management balance has been estimated for various Project stages and takes account of the expanded mining operations and Processing Plant operating at full capacity. The water management balance for the initial stage when the PP is being brought to the design capacity is provided in ***Table 7*** while the next table (Table 8) shows water management balance estimate for the full-scale operation phase (4 million tonnes of ore per annum).

Table 7. Water Management Balance for the Shalkiya Project, Years 1-3 of the Processing Plant Operation (2 million tonnes of ore per annum[20])

Water Inputs, m^3/day			Water Outputs, m^3/day	
Water Source and Consumption Purpose	**Estimate**	**Description**	**Losses**	**Estimate**
Shalkiya mine water and technical wastewater from the mine	**3 192,00**	Daily groundwater inflow to the mine is assumed to be at 133 m^3/hour (based on the explanatory note by Chief Geologist Yu. Pirmakhanov of 22.06.2016)	With concentrates	**54,5**
Water from the Zhanakorgan water intake (Shalkiya groundwater basin)	**6 360,4**	20 736 m^3 is a daily well output (as per a water use contract)e)	Evaporation and losses from TSF including water used for TSF beach watering	**6 246,0** 20% of the total PP consumption. 5,7x2,0 million t of ore : 365 x0,2
Including:				
- Makeup water for the mine water pond	267,82	Estimated	Evaporation from mine water pond	**3251,90** 8,39% of water volume contained in the mine water pond
- reagent solution preparation and mill cooling at the PP	4 274,0	According to Outotec data, specific consumption is 0,78 m3/t of ore		
Technical needs of the mine	2 354,16	KGTsM design estimate: 98,09 m^3/hour	To the sewer system	**360,0**

[20] For calculations of water balance for 1-3 years of operation, the average productivity for PP equal 2 million tons/year has been used

			From TSF to the closed-loop water supply system	**29 205,5** (estimated)
Water from the Kuttykozha water intake, including	**360,0**	1 997,7 m3 is the daily output of water intake		
- for domestic purposes	360,0 (assuming 1800 persons. x 0,2 m3/day)			
Recycled water from TSF	**29 205,5**			
TOTAL	**39 117,90**		**TOTAL**	**39 117,9**
Zhanakorgan water intake: daily fresh water consumption for technical purposes	**6 360,4**	20 736 is a daily well output		
Kuttykozha water intake: daily water consumption	**360,0**	1 997,7 is a daily water intake output		

***Table 8. Shalkiya Mine Project Water Management Balance for the Full-Scale Production Phase (4 million tonnes of ore per annum, Year 4 and onward)*[1]**

Water Inputs, m^3/day			Water Outputs, m^3/day	
Water Supply Source and Intended Use	**Value**	**Description**	**Losses**	**Value**
Shalkiya mine water	**3 192,00**	Assumed daily mine water inflow is 133 m3/hour (based on the memorandum by the Chief Geologist Yu. Pirmakhanov of 03.06.2016)	With concentrates	**109,00**
Water from the Zhanakorgan water intake (Shalkiya groundwater basin):	**16 213,8**	20 736 is a daily well output (as per a water use contract)	Evaporation and losses from TSF including water used for TSF beach watering	**13 449,0** 21,5% of the total water consumption at the PP site. 5,7x4,0 million t of ore : 365 x0,215 Higher evaporation losses due to larger surface area of the TSF as compared to the Operation Years 1-3
Including:				
- Makeup water for the mine water pond	5 311,64	(estimated)	Evaporation from the mine water pond	**5 847,8** (10% of water volume in the mine water pond)
- reagent solution preparation and mill cooling at the PP	**8 548,0**	According to Outotec data, specific consumption is 0,78 m3/t of ore		
Technical needs of the mine	2 354,16	KGTsM Design estimate	To a sewer system	**360,0**
			Recycled from TSF	**49 974,8** (estimated)

Water from the Kuttykozha water intake, including	**360,0**	1 997,7 –daily output of water intake		
- for domestic purposes	360,0 (based on 1800 persons × 0,2 m3/day)			
Recycled water from TSF	**49 974,8**			
TOTAL:	**69 740,6**		**TOTAL:**	**69 740,6**
Zhanakorgan water intake: daily fresh water consumption for technical purposes	**16 213,8**	20 736 is a daily well output		
Kuttykozha water intake: daily water consumption	**360,0**	1 997,7 is a daily water intake output		

Total daily water demand is 69 740,6 m^3, including:
- mine water – 4,58%,
- fresh water for technical purposes – 23,25 %
- water for drinking and domestic purposes – 0,51%
- recycled process water – 71,66%

Water losses: 19 765,8 m^3 or 28,3%.

Mine water to fresh technical water ratio: 16,44 %:83,56%

Recycled water to fresh water used in processes ratio: 90,3: 9,7 (estimate used in the Mekhanobr specification: 90:10)

[1] All flows are based on average (24 h/d, 365 d/y) conditions

2.6.8. Waste Management

Throughout project development, solid waste would be generated from the mining and processing operations, maintenance shops, wastewater treatment plant, accommodation camps, laboratory and medical facilities and various other infrastructure/activities. The solid waste management strategy would focus on the implementation of a sound waste minimization program that would focus upon the principles of Reduction/Recovery/Reuse/Recycling.

The Mine has the 2014-2020 Waste Management Programme, approved by the Kyzylorda Oblast Department of Environment.[21] According to this Programme, 14 waste types will be generated during the Mine construction and operation. Major solid waste streams likely to be generated on site include (pursuant to the international classification):

- Mining and process waste (i.e., overburden, host rock, tailings);
- Domestic waste;
- Organic/putrescible waste;
- Inert construction waste;
- Hazardous waste; and
- Biomedical waste.

Table 9 provides a summary of estimated waste quanities per a waste class (according to the RK waste classification) to be generated.

Table 9. Description of Industrial and Household Waste Streams to be Generated

Waste Source	**Waste Name**	**Disposal Method**	Waste Type Hazard Level (under the RK classification)	**Waste Quantity to be Generated per Annum, t/a (m^3/a)**
Food cooking, staff accommodation in dormitories, office and other activities	Municipal solid waste (MSW)	Segregated waste collection in containers, temporary storage and transportation to a designated landfill site	Green	81,70227
Vehicle, equipment and machinery maintenance and repair	Oily rags, filters	Segregated waste collection and temporary storage in special containers, handover of materials to specialized contractors for recycling	Amber	0,2
Vehicle, equipment and machinery maintenance and repair	Spent oil	Segregated waste collection and temporary storage in special containers,	Amber	41,881

[21] ShalkiyaZinc LTD 2014-2020 Waste Management Programme for the Shalkiya Mine

		handover of materials to specialized contractors for recycling		
Lighting systems in workshops, offices and staff accommodation facilities	Spent luminescent lamps	Collection and storage in special sealed containers, transportation to a designated landfill for mercury removal	Amber	0,01072
Vehicle, equipment and machinery maintenance and repair	Spent storage batteries	Temporary storage in the designated areas, handover to specialized waste management contractors for recycling	Amber	2,31
Vehicle, equipment and machinery maintenance and repair	Spent tyres	Temporary storage in the designated areas, handover to specialized waste management contractors for recycling	Green	6,3789
Vehicle, equipment and machinery maintenance and repair	Electrode stubs	Temporary storage in the designated areas, handover to specialized waste management contractors for recycling	Green	0,352
Wood works	Sawdust	Temporary storage in the designated areas and handover to individuals for recycling	Green	2,3
Production activities	Metal scrap	Temporary storage in the designated areas, handover to specialized waste management contractors for recycling	Green	25,842
Production activities	Metal chips	Temporary storage in the	Green	

		designated areas, handover to specialized waste management contractors for recycling		
	Wastewater treatment sludge	After drying at the sludge field, handover to agricultural companies for use as a fertilizer	Green	(833)
Construction activities	Construction waste	Temporary storage at a waste rock dump. Once it has accumulated, construction waste will be transported to a designated landfill facility	Green	400
Ore mining	Waste rock	Disposal at a waste rock dump and completed underground workings	Not classified into any category under the RK Environmental Code	
2014				55487,7(20551)
2015				497834,1(184383)
2016				645 516(239080)
2017				480988,8(178144)
2018				248616(92080)
2019				113302,8(41946)
2020				49950(18500)
Ore processing	Tailings	Disposal in the tailings storage facility and use as backfill in the completed underground workings	Amber	To be determined at a later design stage

The table does not reflect biomedical waste. At the present time, the Mine has a contract with a specialized waste management contractor to ensure safe disposal. The list of specialized waste management organisations providing waste management services for various waste types and classes is provided in Annex 19. It is required to monitor compliance with relevant environmental legislation requirements among these organisations when they provide their waste recycling and disposal services.

Waste management programme will be finalized after the positive opinion of environmental expertise on EIA for projects, mine expansion, construction of a processing plant and tailing dump.

Residual waste remaining after the waste minimization and recycling/reuse requirements have been met would be managed in a practical and environmentally responsible manner utilizing methods appropriate to each waste type generated. The following methods would be applied at the production sites as appropriate:

- Implementation of a waste minimization program;
- Waste sorting at all generation points;
- Disposal of waste rock and tailings at the designated and properly arranged sites, namely: waste rock dump sites and TSF (refer to Sections 2.6.5.and 2.6.6);
- Landfilling the municipal solid waste at a municipal solid waste landfill, and
- Transfer of hazardous and biomedical waste materials to certified companies for their further landfilling.

2.6.9. Other Infrastructure

A range of other infrastructure would be required for operation, including:

- Roads between the plant facilities – these exist partially currently but some new roads would be required to access new facilities;
- The existing railway would be used to ship product off site and bring in freights, including oversized;
- Plant facilities not directly related to mining and processing such as administration offices, maintenance facilities, clinics, change rooms and so forth;
- Facilities for temporary and permanent accommodation of the plant and mine personnel including some recreational facilities; and,
- Power and utilities (gas, electricity, water supply line from the Zhanakorgan water intake, compressed air, heating).

Some of this infrastructure, such as the roads, railways, water supply lines, accommodation, maintenance facilities and the like already exists but in most instances would need to be upgraded. Other infrastructure, such as accommodation facilities, would need to be constructed (for the list of infrastructure facilities alongside their status refer to Annex 2).

Maintenance and Repair Facilities

Maintenance and repair facilities would be developed as required for, vehicle and machinery repair, fabrication and repair of civil and process steelwork and shut-off valves, repair and preparation of conveyer belts, repair of cable conduits and bus ducts, utilities networks and water supply and sewerage networks.

Material and Equipment Storage

An outdoor metal, materials and equipment storage would be developed, as required, for storing bulky goods, containers, steelwork and other materials and equipment, whose storage requirements allow an open-air storage. Indoor storage would also be required for mine consumables, spare parts, electrical, sanitary products; tools; and various materials, which require secure, indoor and temperate storage. Fuels, lubricants, paints and chemicals would also require safe storage commensurate with the hazard risk of the materials, e.g., for storage of toxic sodium cyanide.

The vehicle refuelling facility will be refurbished including the associated storage tanks for petrol and diesel and this facility would need to conform to all safety and environmental requirements such as:

- Provision of secondary containment for above ground tanks together with installation of oil water separators for the treatment of accumulated rainfall;
- Fire fighting equipment;
- Mechanical integrity such as double skinned tanks if underground;
- Emergency shutdown systems, and,
- Safe distances from other facilities.

Power Distribution

Electricity supply to the mine is currently provided from the regional grid and the Yanykurgan substation (35/6 kV) via two 18.5 km long 220 kV overland autonomous distribution lines from Kyzylorda and Shymkent. The autonomous operation of two lines helps reduce risk of power outages.

The existing mine substation would be upgraded, as required to provide power from the regional grid to site. Additional substation(s) may need to be added to provide power to new facilities. Power is supplied within the mine site via 6 kV and 0.4 kV overhead power transmission and cable lines.

The underground mine is classified as the Electricity Supply Reliability Category 1 facility, and diesel generators will be therefore used as backup or emergency power source. A diesel power plant will be used as an emergency electricity supply source for the processing plant.

An option involving the construction the Combined Cycle Gas Turbine (CCGT) to generate electricity and hot water for space heating is considered conceptually. Its environmental impacts including ambient air emissions will be assessed at later stages in the design process. The CCGT's estimated water demand is taken account of in the Mine's long-term watewr management balance.

2.6.10. Administration and Accommodation

The existing 5-storey administration building on site would be modernized to provide offices for administrative staff, a canteen for 300 people, a medical station and a laundry. There will be created following facilities for the temporary workers accommodation: dormitory with 240 beds, dormitory with 160 beds, dormitory with 80 beds, dormitory for ITR with 28 beds, dormitory for VGSCh with 15 beds, hotel with 12 beds, a residential area in the village of Shalkiya with 11 single houses for the employees of the company. All the accomodation is for 546 beds.

2.6.11. Accommodation

Shift Accommodation

Estimated number of employees of JSC ShalkiyaZink is 1,488 persons who mainly reside permanently in the adjacent settlements but during their shifts are temporarily accommodated onsite. Accommodation will be provided for 600 people available in the existing buildings on site that have the capacity to meet this number.

Food will be prepared in the existing administration and amenities building with a canteen for 300 seats, the working area of which and kitchen equipment capacity allow providing hot meals for the whole personnel of the Mine. The employees will take meals in the canteens added to the dormitory buildings. Rooms for the food final preparation and heating will be provided within the canteens.

The employees will be provided with medical service at the medical station, located in the existing administration and amenities building.

Laundry room, covering the needs of the production facility and personnel, is located in the same place.

Two hotels will be provided for guests and visiting specialists as temporary accommodation. The hotels are located in Shalkiya settlement.

Sports complex

Swimming pool

Administrative complex

Figure 9: Administrative and sports facilities

Table 10. Mobilisation of personnel in 2016-2021

№	Indicators	2016	2017	2018	2019	2020	2021
1	**Mine (“Kazdyrotsvetment” project)**						
	Average payroll staff number	500	500	922	968	1060	1123
	Average payroll staff number ratio	1,5	1,5	1,5	1,5	1,5	1,5
	Actual staff number	333	333	615	645	707	749
	Of that, non-residents 44%	147	147	270	284	311	329
2	**Processing plant (“Mechanobr Engeneering”)**						
	Average payroll staff number				210	210	210
	Average payroll staff number ratio				1,5	1,5	1,5
	Actual staff number				140	140	140
	Of that, non-residents 82%				115	115	115
3	**Contractors:**						
	PP construction average payroll staff number		350	350	350	350	350
	Average payroll staff number ratio		1,5	1,5	1,5	1,5	1,5
	Actual staff number		233	233	233	233	233
	Of that, non-residents 70%		163	163	163	163	163
4	LLC «Energoservice» average payroll staff number	45	45	45	45	45	45
	Average payroll staff number ratio	1,5	1,5	1,5	1,5	1,5	1,5
	Actual staff number	30	30	30	30	30	30
	Of that, non-residents 30%	9	9	9	9	9	9
5	Canteen average payroll staff number	15	30	30	30	30	30

	Average payroll staff number ratio	1,5	1,5	1,5	1,5	1,5	1,5
	Actual staff number	10	20	20	20	20	20
	Of that, non-residents 50%	5	10	10	10	10	10
6	«Beybars Security KZ» average payroll staff number	32	32	32	32	32	32
	Average payroll staff number ratio	1,5	1,5	1,5	1,5	1,5	1,5
	Actual staff number	21	21	21	21	21	21
	Of that, non-residents 10%	2	2	2	2	2	2
7	Capital mining operations Average payroll staff number	100	100	100	100	100	100
	Average payroll staff number ratio	1,5	1,5	1,5	1,5	1,5	1,5
	Actual staff number	67	67	67	67	67	67
	Of that, non-residents 80%	53	53	53	53	53	53
8	Atlas-Kopko average payroll staff number	6	6	6	6	6	6
	Average payroll staff number ratio	1,5	1,5	1,5	1,5	1,5	1,5
	Actual staff number	4	4	4	4	4	4
	Of that, non-residents 100%	4	4	4	4	4	4
9	VGSCh average payroll staff number	26	26	52	52	52	52
	Average payroll staff number ratio	1,5	1,5	1,5	1,5	1,5	1,5
	Actual staff number	17	17	35	35	35	35
	Of that, non-residents 38%	7	7	13	13	13	13
10	**Total actual number of non-resident workers, including:**	**227**	**395**	**525**	**645**	**681**	**699**
	Rotation Crew 1	**113**	**197**	**263**	**327**	**340**	**350**

	Rotation Crew 2	**113**	**197**	**263**	**327**	**340**	**350**
11	**Ready-to-use dormitories**						
	dormitories with 80 beds	80	80	80	80	80	80
	dormitories with 160 beds	160	160	160	160	160	160
	dormitories with 240 beds	240	240	240	240	240	240
	dormitories with 28 beds	28	28	28	28	28	28
	residential houses 11	11	11	11	11	11	11
	Hotel with 12 beds	12	12	12	12	12	12
	Dormitory for VGSCh	15	15	15	15	15	15
	Total number of beds for non-resident workers	**546**	**546**	**546**	**546**	**546**	**546**
12	**Workers provided accommodation in dormitories**	**129**	**129**	**129**	**129**	**129**	**129**
13	**Remaining number of beds in dormitories**	**417**	**417**	**417**	**417**	**417**	**417**
14	**Workers awaiting accommodation in dormitories**	**0**	**83**	**149**	**213**	**226**	**236**
15	**Remaining number of beds after all workers have been accommodated in dormitories**	**417**	**334**	**268**	**204**	**191**	**181**

2.6.12. Mine Rescue and Fire Service

A modern fire protection system would be provided across the mine site including selection of suitable materials, products and environment for fire prevention or restriction; fire detectors and alarm; fire extinguishing; fire containment and means of evacuating workers from buildings. The existing mine rescue brigade building would be modernised and the functionality improved, and the existing 2-tender fire station would also be upgraded. Two tanks (300m³ each) and a fire water pump station would be provided for fire-fighting with a looped pipeline system with fire hydrants.

Training of and preparation of the schedule for the mine rescue service will be accomplished as per the adopted rules.

2.6.13. Explosives Storage

The mine's existing explosive storage facility (**Figure 10**) will not be further developed.. The required volume of explosive materials will also be stored underground.

2.6.14. Reagent Storage

The mine's existing reagent storage warehouse will store the reagents used for the process. Reagent storage for the processing plant will be constructed next to the main body of PP. The list of reagents required is provided in Table 2. All of these reagents will be transported, housed and stored in an appropriate manner in accordance to their MSDS sheets with proper handling and care in use. Appropriate safety training will be provided to those handing the chemical. In particular, sodium cyanide will be used in the process, however the quantities required are not significant (280 tonnes/year) and requires no cyanide destruction after use in the process and prior to the discharge of tailings to TSF.

Manufacturers certified by the International Cyanide Management Institute (ICMI) are required to be contracted to supply sodium cyanide. These manufacturers are recognised as responsible companies committed to minimising environmental and staff health effects during the manufacture of sodium cyanide. Such certified manufacturers should be sought and identified, for example, in Russia.

The use of safe and reliable packaging and specialized transportation companies to deliver sodium cyanide will help ensure that the local communities and environment are protected during cyanide transport.

2.7. <u>Construction Activities</u>

Given that the mine already exists and underground mine restoration activities are underway, much of the construction activities would be upgrading of existing infrastructure but a range of new facilities would be constructed.

These new surface facilities include the processing plant, tailings storage facility, sewage treatment plant and electrical substation.

New underground facilities supporting the mining activities include workshops, explosive magazines, etc. The kind of activities that would be required for this construction include bulk earthworks and excavations for construction of buildings, concrete batching, structural steel erection and cladding and electrical and mechanical installations. The construction would also see pre-commissioning and commissioning of the new equipment. The underground facilities would require new areas to be excavated in order to house the support facilities.

Figure 10: The existing explosives store at the mine

2.8. Project Environmental and Social Aspects

For each of the identified activities it is necessary to list the associated environmental and social aspects. Environmental and social aspects are defined as 'an element of an organisation's activities, products or services that can interact with the environment', and it is the identification and quantification of the aspects that provides the key to assessing impacts. The environmental and social aspects of the proposed Shalkiya mine expansion for projected stage of PP operation 4 Mtpa are presented in table below.

Table 11. Listing of environmental and social aspects associated with the activities that would be conducted on the proposed Shalkiya mine expansion, 4 Mtpa

Category	Aspect		Quantity	Units	Source/comment
Resource use	Water	Industrial	7,083,117	m^3/annum	Base on the water demand figures provided by Shalkiya mine (Potable water required = ~15 m^3/h; Well water for industrial use = -16213,8 m^3/h; Mine water for industrial use 133 m^3/h or 3,192 m^3/h).
		Potable	131,400	m^3/annum	
	Energy	Mining	75,061	MWh/annum	Hatch – includes underground mining and surface related mining
		Process Plant	257,453	MWh/annum	Electricity use for process plant (Outotec, 2008)
		Infrastructure	47,958.9	MWh/annum	Hatch – Buildings and workshops
		Tailings	16,368.5	MWh/annum	Hatch – pump for final tailings, waste water treatment, seepage pump, and reclaim water pump

Category	Aspect		Quantity	Units	Source/comment
		Balance of Plant	3,544	MWh/annum	Hatch – surface material handling (balance of plant)
		Liquid fuels	3447,30	m^3/annum	Diesel for surface (1078.1m3/a) and underground (2369.2m3/a) mobile equipment fleet
	Land		ha	ca. 1,100	Land required for the Project
			m^2	7,237,300	Total site area based on fence line.
	Raw materials	Explosives	3.762	tonnes /annum	Tentative high-end estimate.
		Lime	15	tonnes/ annum	Outotec 2008 report for process plant figures.
		Xanthate	2	tonnes/ annum	
		Aerophine /Aerofloat	200	tonnes/ annum	
		Na_2S	1.2	tonnes/ annum	
		$ZnSO_4$	2.4	tonnes/ annum	
		$CuSO_4$	3.76	tonnes/ annum	
		NaCN	280	tonnes/ annum	
		Frother	440	tonnes/ annum	
		Flocculent	279	tonnes/ annum	
		Lubricants	101.325	L/annum	Lubricants for surface and underground mobile equipment fleet.
Outputs	Products	Zinc	204	tpa	Information based on Outotec 2008 report.
		Lead	69.5	tpa	
		Middlings (low grade zinc)	80	tpa	
	Atmospheric emissions	PM	TBD*	tpa	Information will be available after the completion of the development of OVOS reports for the mine and Processing Plant
		NO_x	TBD*	tpa	
		SO_2	TBD*	tpa	
		Greenhouse gasses	TBD*	tpa CO_2 eq	
	Effluent	Mine water	15,768	Mm^3/annum	Based on treated effluent discharge from Hatch Water Balance
		Impacted stormwater	333	m^3/annum	Hatch
		Sewage	87,600	m^3/annum	Based on treated sewage discharge from Hatch Water Balance
	Waste	Waste rock	115,000	tpa	Hatch
		Industrial waste	TBD	tpa	
		Tailings	3,646,500	tpa	Data Based on Hatch's Tailings Design Criteria which references 2008 Outotec Report.
		Municipal	1020	tpa	Using the Average of 2kg/pp/day

Category	Aspect		Quantity	Units	Source/comment
		waste			
		Waste oil	101,325	L/annum	Assumed to be the same as lubricant use. Includes waste coolants and solvents.
	Energy emitted	Noise	54-79	dBA	Levels at sources. The measurement was conducted by EmanExpert Company in September 2015.
		Vibration	55-95	dB	
Socio-Economic	Jobs		1401		Number of jobs directly supplied as part of project based on Hatch staffing plan.
	Spending	Total Operating Costs	TBD**	USDm	** To be made available upon the feasibility study completion
		Total Capital Expenditure	TBD**	USDm	

2.9. Mine Closure

A Conceptual (Preliminary) Mine Closure Plan was prepared by HATCH during the feasibility stage of the project and is part of the FS documentation package. The Preliminary Mine Closure Plan outlines the key provisions for the technical requirements for closure and provides a reference to the financial provision for that closure. The plan was drafted based on the IFC Performance Standards. The further mine closure planning must ensure:

- Future public health and safety are not compromised;
- The post mining use of the site is beneficial and sustainable to the affected communities in the long term;
- Adverse socio-economic impacts are minimized and socioeconomic benefits are maximized.

The Preliminary Mine Closure Plan outlines the mine closure measures per facilities and covers the maintenance of the facility and continued monitoring of the site, pollutant emissions, and related potential impacts for a duration of additional three years once the Mine has closed. Planning also includes progressive restoration during mining to minimise the rehabilitation requirements at the end of the mine life. Enusring required physical and chemical conditions for ecosystems to function in a sustainable manner at the industrial sites and within their area of direct impact are considered during the planning. Structures would remain stable so as not to present a hazard to public health and safety as a result of physical failure or physical deterioration and this is particularly true of tailings structures. It is assumed that evaporation from the tailings storage facility and gradual releases of clarified water to an adjacent site to promote evaporation would help minimize environmental risks during the TSF restoration. The dried up tailings should be covered with a compacted soil layer to prevent the particulate matter generation due to Aeolian processes.

Chemical integrity refers to ensuring that there is no long-term deterioration in groundwater quality especially in groundwater aquifers tapped by the Kuttykozha water intake wells and ecosystems sustainability refers to the recovery of habitat that may have been affected by the mine. The assessment of the impacts that may be associated with the implementation of the Mine Closure Plan is incorporated in Chapter 9 (Section 9.13) of this ESIA.

3. REGULATORY AND INTERNATIONAL LENDER REQUIREMENTS

The following requirements apply to the Project:

- Requirements of the RK legislation;
- Requirements of the International Finance Corporation (IFC);
- Requirements of the European Bank for Reconstruction and Development (EBRD); and
- The Equator Principles.

The principles and approaches of the global good practice are also to be followed. The list of the regulatory references is incorporated in Annex 12.

3.1. Legislative Requirements of the Republic of Kazakhstan

The Environmental Code adopted in January 2007 is the RK's key environmental legal document (refer to Annex 12, A). The Code has summarized, systematized and legislated environmental protection thereby raising the status of the environmental requirements and regulations to the level of a legislative act of direct action. The Code has also served to drive the implementation of international standards in environmental protection. The Code was also used as the basis for development and/or revision of the regulatory legal acts in the field of environmental regulation, environmental impact assessment, environmental audits and other important sections of environmental legislation. Only the most general requirements for the environmental assessment of the projects and current activities of the enterprises are considered in this section.

3.1.1. Environmental Assessment

The RK system of environmental assessment of economic activity projects involves environmental impact assessment (OVOS) and environmental review. The OVOS should be developed by the project proponent and it is a part of preplanning, predesign and design documentation. The documentation developed (including OVOS materials) should be submitted to the state environmental review (SER) conducted by the authorized body. It is prohibited to carry out economic activities without a positive SER opinion.

Environmental Impact Assessment

OVOS or impact assessment should be carried out for the projects that may have a significant impact on the environment, public health and social sphere. The Instruction on OVOS (Annex 12, B) sets the OVOS procedure.

Pursuant to the Instruction, activities are divided into four categories, depending on the extent and significance of the environmental impact. The 1st category includes, *inter alia*, exploration and production of minerals, except for commonly occurring ones. Thus, the Shalkiya Mine Development Project falls within the 1st category.

The OVOS procedure is carried out at all stages of preparation of preplanning, planning, predesign and design documentation, and includes the following stages:

1. Preliminary environmental impact assessment (Pre-OVOS) should be developed within the preplanning (pre-investment) documentation, as well as within the main predesign document "Justification of Investments". Pre-OVOS involves assessment of alternatives, including on comparable options, it should be discussed with the public and submitted to the state environmental review (SER);
2. The OVOS is carried out at the stage of detailed design and involves a comprehensive impact assessment of the preferred alternative;
3. The "Environmental Protection" section forms part of the working design, which contains the technical solutions on prevention of adverse environmental impacts.

Environmental emission standards should be developed at stages 2 and 3

State Environmental Review (SER)

State Environmental Review (SER) in the Republic of Kazakhstan is conducted by the authorized body and public environmental review voluntarily conducted by public associations. SER is mandatory at all stages of preparation of predesign and design documentation.

3.1.2. Air Protection

The Environmental Code, and associated bylaws, regulates allowable industrial atmospheric emissions. The legislation establishes the industrial liability for air pollution and specifies the particular requirements that must be met by the applicant. These requirements include that they must manage their impact on the atmosphere reducing air pollution and providing compensation for environmental damage that may occur. In order to obtain an emissions permit, it is necessary to provide the protocols of public hearings held to discuss an Environmental Management Plan and OVOS report. Maximum permissible emission (MPE) targets must be approved by the authorized body according to the SER procedure.

3.1.3. Water Protection

The Environmental Code (2007) and the Water Code (2003) (Annex 12, C), and associated bylaws regulate water use and protection. Water resource use and protection are based on limitation of the pollutants at discharge points, with comprehensive regulation of water-related activities of all organizations within the relevant basin.

3.1.4. Waste Management

The Environmental Code (2007) and associated bylaws regulate waste management. There are three waste hazard levels established according to the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal: green – G index; amber – A index; red – R index.

The company must develop waste disposal standards, including a waste management program, and get approval from the authorized body.

Specific requirements are applied to hazardous waste management. According to the Environmental Code, hazardous waste passports shall be prepared for hazardous waste. The company must take action to eliminate or reduce the generation and/or hazard level, and ensure marking of the packages with hazardous wastes with indication of hazardous properties. It is also prohibited to mix hazardous wastes with non-hazardous ones, as well as various types of hazardous wastes with one another during their production, transportation and storage, except for cases of application of non-hazardous waste for filling and compaction during waste disposal. Hazardous waste disposal is permitted in the specially equipped sites and in accordance with the conditions provided by environmental permits.

3.1.5. Land Conservation and Use

The Environmental Code (2007) and Land Code (2003, Annex 12, J) regulate land conservation and use. The basic environmental requirements for optimal land use are: scientific justification and forecasting of the effects of proposed land transformations and land redistribution; justification and implementation of a unified state policy in the planning and organization of rational use and protection of all land categories; ensuring targeted land use and preservation of the valuable land in the agricultural industry.

3.1.6. Environmental Requirements for Subsoil Use

The Environmental Code (2007) and the Law of the RK “On subsoil and subsoil use” (2010) (Annex 12, K) determine the environmental requirements for subsoil use. There are the following, among others, general environmental requirements for subsoil use: preservation of soil surface through the use of special mining methods; prevention of technogenic desertification; application of preventive measures against acts of dangerous industrial processes during the exploration, extraction, as well as construction and operation of underground facilities not related to exploration and extraction; reduction of areas of disturbed and alienated land through the rational road construction prior to the work commencement, as well as use of other methods, including in-cluster well construction, application of the internal dumping technology, use of wastes from extraction and processing of mineral raw materials; prevention of soil wind erosion, overburden rock and production waste dumps, their oxidation and spontaneous combustion. The subsoil user should:

- choose the most effective work methods and technologies based on the internationally accepted standards; and
- comply with the process flow sheets and method statements ensuring rational subsoil use, and safety of the workers, public and environment.

3.1.7. Energy Efficiency

The Law of the RK “On Energy Conservation and Efficiency” (Annex 12, D) regulates energy efficiency and conservation. The Law regulates the public relations and determines the legal, economic and organizational basis for energy conservation and efficiency activities and obliges all entities operating in RK and consuming more than 1500 tonnes of fuel oil equivalent introduce an international standard on energy management – ISO 50001.

3.1.8. Occupational Health and Safety

The main OHS requirements are contained in the Code of the RK on the “People’s Health and Health System” (2009) (Annex 12, E) and the Law of the RK “On Civil Protection” (2014) (Annex 12, F). According to the latter, a ‘Declaration of Industrial Safety of Hazardous Production Facility’ should be prepared for hazardous industrial facilities.

The Labour Code (2015) (Annex 12, G) and applicable by-laws regulate labour relations and occupational health and safety activities.

3.1.9. Access to Environmental Information and Public Participation

According to the RK Environmental Code, the public and non-governmental organizations have the right to access environmental information in the OVOS and decision-making process. The procedure for granting access is determined by a specialized body dealing with environmental protection and acting in accordance with the following regulatory acts:

- Rules on Access to the Environmental Information Related to the OVOS Procedure and Decision Making Process (Annex 12, H); and
- Rules for Public Hearings (Annex 12, I).

The SER bodies should disclose the information to the concerned authorities and communities. The application for SER, as well as the SER decision should be published in the media, and the SER initiator should arrange and finance public hearings with provision of the relevant information during such hearings.

Pursuant to the RK Instruction on OVOS (Annex 12, B), the information on public opinion, comments and concerns should be collected and considered during OVOS and before the SER. The RK Environmental Code provides that all concerned parties and public organizations may express their opinions in the course of the SER, as well as after decision making on the SER. The design documentation and OVOS materials should reflect how the public opinion was taken into account, and the minutes of public hearings, the list of participants and the register of the proposals / comments should be attached thereto.

The RK legislation considers the stakeholder engagement mainly in the context of the OVOS process; the legislative requirements do not define a clear procedure for identifying and engaging with stakeholders or a grievance mechanism.

3.2. Requirements of the International Finance Corporation

The International Finance Corporation (IFC) is a part of the World Bank Group, but has its own policies and standards. For the first time the IFC adopted an independent Policy on Environmental and Social Sustainability and Performance Standards (PSs) in 2006. The IFC periodically evaluates the effectiveness of the Policy and PSs and revises them. The current version of the Policy and PSs was adopted in 2012.

Policies Ensuring Environmental and Social Sustainability

The Policy defines the IFC principles and approaches to the organization of the investment activities. *Inter alia*, the Policy defines the IFC functions and responsibilities:

- The IFC conducts a Preliminary Examination of the environmental and social aspects;
- The project is categorised as a function of environmental and social risks according to the following categories:
    - Category A: activity areas with potentially significant environmental and/or social risks and/or adverse impacts that are diverse, irreversible, and/or unprecedented;

- Category B: activity areas with potentially limited environmental and/or social risks and/or adverse impacts that are not numerous, mostly affecting only the immediate project area and mostly reversible, that can be readily addressed through mitigation measures;
- Category C: activity areas with minimal environmental and/or social risks and/or adverse impacts or even without thereof;
- Category FI: projects including investments in the Financial Intermediaries or through the mechanisms including the financial intermediary.

- The IFC monitors the investment and consulting activities as a part of the surveillance program.

The IFC clients should comply with the IFC Performance Standards within the framework of the IFC-financed projects. A Guidance Note presents details and explanations of different aspects of the performance standards.

PS 1: Assessment and Management of Environmental and Social Risks and Impacts

The client should conduct an environmental and social assessment and establish and maintain an environmental and social management system, including the following elements:

- policy;
- identification of risks and impacts;
- management program;
- organizational capacity and competency;
- emergency preparedness and response;
- stakeholder engagement; and
- monitoring and review

The client must establish a dialogue with stakeholders and maintain it during the entire project life cycle, including:

- stakeholder analysis and planning;
- information disclosure
- consultation
- implementation of informed consultation and participation (ICP) for projects with potentially significant environmental impacts, and more in-depth consultation.
- external communications and grievance mechanism.
- ongoing reporting to the local communities.

PS 2: Labour and Working Conditions

The bank's client should ensure safe and non-discriminatory conditions based on the equal opportunity principle, both for company personnel and for temporary workers. The bank does not support the use of forced or child labour. Occupational safety and labour conditions specified in the policy apply to all workers in the supply chain (contractors, subcontractors and etc.).

PS 3: Resource Efficiency and Pollution Prevention

Pollution prevention and resource efficiency are the basic principles on which the client's activities should be built. Environmental, Health and Safety Guidelines, including both general and industry specific (sectoral) guidelines support this performance standard. The Environmental, Health and Safety Guidelines for Mining apply to the given project. Some of the parameters to be taken into account are given in Annex 3.

It should be noted that the technical details of norm setting in the field of the environmental protection (including calculation models, as well as concentration determination methods used by the IFC (which are oriented towards the methods of the US Environmental Protection Agency (US EPA)) differ from the methods adopted in Kazakhstan that may lead to the significant differences in the results for the number of parameters. The Guidelines also contain the requirements for the hazardous materials handling.

PS 4: Community Health, Safety, and Security

The Standard contains the requirements for public health, safety and security protection, including risks of water-related and vector-borne diseases.

The industrial safety and facilities protection requirements are also considered. The requirements match the RK legislative requirements to a large degree.

PS 5: Land Acquisition and Involuntary Resettlement

The Standard formulates the detailed requirements for involuntary resettlement. Both physical and economic displacements are considered. The given Standard is not considered in detail as it is not applicable to the Project (as discussed below).

PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

Objectives of the Standard are as follows:

- To protect and conserve biodiversity;
- To maintain the benefits from ecosystem services; and
- To promote the use of living natural resources on the sustainable development principles

The requirements of PS6 comply with the requirements of the Convention on Biological Diversity.

PS 7: Indigenous Peoples

The Standard concerns indigenous people leading a traditional lifestyle. Only very limited groups of people are recognized by the IFC as indigenous peoples and these do not include the people living in and around the mine area. The Standard is not applicable to the Project.

PS 8: Cultural Heritage

The Standard is designated to ensure the preservation of the cultural heritage of both tangible and intangible forms. During Project development it is necessary to conduct studies that ensure identification of the cultural heritage objects in the Project impact area. If they are identified, a Cultural Heritage Preservation Plan should be developed.

3.3. Equator Principles

The Equator Principles have been developed as an IFC initiative and were adopted by a number of leading financial institutions to ensure a uniform approach and the minimum requirements for the identification, assessment and management of environmental and social risks in project financing. The Principles are periodically updated based on the analysis of contemporary practice. The third official version of the Equator Principles III was approved in 2013. As of October 2015, 81 financial institutions had adopted the Principles. They apply to all new projects with a cost exceeding US$10 million that may have significant environmental and social effects.

The Principles involve categorization and environmental assessment of the projects (Principles 1 and 2). For category A projects, the Project, it is required to conduct a full impact assessment, develop and implement an Environmental and Social Action Plan (ESAP) (Principle 4) and a Stakeholder Engagement Plan (Principle 5). In addition, within the category A funded projects it is necessary to establish and maintain an Environmental and Social Management System (ESMS), as well as a mechanism to prevent and resolve conflicts and grievance mechanism) (Principle 6).

The Equator Principles require project adherence to the applicable IFC policies, performance standards and guidelines (Principle 3).

3.4. Requirements of the European Bank for Reconstruction and Development

The Environmental and Social Policy (ESP) and the Performance Requirements (PRs) adopted in 2014 outline the EBRD’s requirements:

- Environmental and Social Policy
- PR 1: Environmental and Social Appraisal and Management
- PR 2: Labour and Working Conditions
- PR 3: Pollution Prevention and Abatement
- PR 4: Community Health, Safety and Security
- PR 5: Land Acquisition, Involuntary Resettlement and Economic Displacement
- PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- PR 7: Indigenous Peoples
- PR 8: Cultural Heritage
- PR 9: Financial Intermediaries
- PR 10: Information Disclosure and Stakeholder Engagement

The EBRD’s PRs are based on the EU legislation. In particular, PR3 is based on the EU Pollution Prevention and Reduction Directive. According to the PR3, the best available technology assessment (BAT assessment) should be conducted. Other EBRD PRs are mainly similar to the IFC PSs.

4. METHODOLOGY

Limitations and assumptions as well as the approach to the assessment of impact significance, and general approaches to the analysis of environmental and social baseline are presented in this Chapter.

4.1. Data availability, assumptions and limitations

Because ESIAs are predictive processes undertaken before a detailed design of the project is available and/or in parallel with the design process there is always data uncertainty related to data availability. Furthermore, it is intrinsic to any ESIA studies that a fully comprehensive suite of environmental and social information is seldom available. Data that is available is often outdated. For this and other reasons, assumptions and estimates need to be made. Where such estimates are used, they are clearly indicated as estimates, and if the data uncertainty presents a risk of not being able to assess an impact with confidence, this is so stated in this report.

4.2. Environmental and Social Baseline Analysis Methods

4.2.1. Environmental Baseline Analysis

For the purpose of the ESIA, the Owner provided a set of information on the current state of environmental features located at the Project site and in the adjacent areas, as well as the 2007 and 2012 EIA reports previously developed to assess the impacts of the proposed mine expansion. The detailed design of the process plant has not yet been started.

Most of the baseline information on the current state of the environment on the Mine site, within the borders of the SPZ and in the village of Shalkiya (only to limited extent) was obtained within the framework of the Industrial Environmental Monitoring Programme. The monitoring results of this programme were used in preparing the ESIA report. Other necessary information was obtained from available sources, including Internet information resources. Some information obtained was collection via consultations with the authorities of Kyzylorda Region.

In August 2015, the ESIA team conducted field observations during a site visit to the Project area in order to assess the extent of anthropogenic transformation of environmental features, to observe the areas adjacent to the Mine and to identify the possible recipients of impacts that might be adversely affected by the Project

4.2.2. Social Baseline Analysis

A social baseline was determined at four levels as follows:

- National level – The Republic of Kazakhstan;
- Regional (Oblast) level – Kyzylorda Region;
- District level – Zhanakorgan District; and
- Local level – Shalkiya village and possible other nearby located settlements such as Kuttykozha.

A dedicated method was developed to conduct the social study (refer to Annex 13). When assessing the social baseline data, use was made of statistical information available on official websites, as well as qualitative and semi-qualitative information collected via meetings, focus-groups, household survey, and other types of field studies. The summary of these meetings is given in Annex 14. The results of the household survey are presented in Annex 17.

4.3. Assessment Methods

Impact significance is determined as a function of a receptor's sensitivity (environmental or social value) and the magnitude (extent of change to the natural or social environment) of the impact and the probability of that magnitude of impact occurring.

This section sets out the approach to determining impact significance through:

- Assigning receptor sensitivity (environmental or social value);
- Assigning impact magnitude;
- Assigning significance; and,
- Determining cumulative impacts.

4.3.1. Assigning Receptor Sensitivity

The descriptors and criteria for the sensitivity of a receptor are given below (**Table 12**).

Table 12. Description of criteria for assessing receptor sensitivity

Sensitivity	Criteria Descriptors
Very high	Very high importance and rarity, international scale and very limited to no potential for substitution
High	High importance and rarity, national scale and limited potential for substitution
Medium	Medium importance and rarity, regional scale, limited potential for substitution
Low	Low importance and rarity, local scale
Negligible	Very low importance and rarity, local scale

4.3.2. Assigning Impact Magnitude

The descriptors and criteria that are used to define the impact magnitude are presented in **Table 13**. The probability of an impact is considered as one of the constituents of the impact magnitude.

Table 13. Description of criteria for assessing impact magnitude

Magnitude	Criteria Descriptors
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse). The possibility of the impact occurring is high (the impact is definite or highly likely/probable).
	Large scale or major improvement of resource; extensive restoration or enhancement, major improvement of attribute quality (Beneficial). The possibility of the impact occurring is high (the impact is definite or highly likely/probable).
Moderate	Loss of resource, but not affecting integrity, partial loss of/damage to key characteristics, features or elements (Adverse). The possibility of the impact occurring is moderate (the impact is likely/probable).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial). The possibility of the impact occurring is moderate (the impact is likely/probable).
Minor	Some measurable change in attributes, quality or vulnerability, minor loss of or alteration to one (possibly more) key characteristics, features or elements (Adverse). Unlikely but possible. The possibility of the impact occurring is low (an unlikely, but probable impact).
	Minor benefit to, or addition of, one (possibly more) key characteristics, features or elements, some beneficial impact on attribute or a reduced risk of a negative impact occurring (Beneficial). The possibility of the impact occurring is low (an unlikely, but probable impact).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). The possibility of the impact occurring is unlikely.
	Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial). The possibility of the impact occurring is unlikely.
No change	No loss or alteration of characteristics, features or elements, no observable impact in either direction. The possibility of the impact occurring is highly unlikely.

Note that impact magnitude is presented as an inherent risk viz. what could happen whereas the final significance ascription must be presented as the residual risk viz. what is likely to happen. As such if the inherent risk has major impact magnitude but is unlikely, the residual risk will be reduced to negligible. It should also be noted that a lower likelihood serves to reduce impact magnitude but a higher likelihood does not increase impact magnitude.

4.3.3. Assigning Impact Significance

Assigning impact significance relies on reasoned argument, professional judgement and consideration of the views and advice of appropriate organisations. Some topics may have their predicted impacts assessed using quantitative thresholds and scales in the determination of significance. The determination of impact significance is shown below (**Table 14**).

Table 14. Impact Significance Matrix

		Impact magnitude				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Receptor sensitivity	**Very high**	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

Assigning each impact to one of five significance categories enables different topic issues to be placed within the same scale to allow a direct comparison. The five significance categories are as given in **Table 15**.

Table 15. Description of Significance Categories

Significance category	Typical Criteria Descriptors
Very Large	Adverse and positive impacts are assigned this level of significance, and represents key factors in decision-making process. These impacts are generally but not exclusively associated with sites or features of International, National or Regional importance that are likely to suffer a most damaging impact and loss of integrity. A major change in a site or feature of local importance may also enter this category.
Large	These beneficial or adverse impacts are considered to be very important considerations. They are likely to be pertinent in the decision-making process.
Moderate	These beneficial or adverse impacts may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse impact on a particular resource or receptor.
Slight	These beneficial or adverse impacts may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Neutral	No impacts of those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

It is important to note that significance categories are required to be determined for both positive (beneficial) and negative (adverse) impacts.

The greater the receptor sensitivity and the greater the impact magnitude, the more significant the impact. The consequence of a highly sensitive receptor suffering a major detrimental impact would be a very large significant adverse impact.

4.3.4. Mitigation Measures

Mitigation of negative impacts associated with a project involves a combination of three approaches:

- Prevention – Prevention of negative effect at source – e.g. alignment in a cutting to prevent any visual impact from surrounding receptors;
- Reduction – Reduction of negative impacts that cannot be eliminated by prevention, e.g. environmental barriers in the form of mounds, fencing or tree planting to reduce the noise/visual impacts to acceptable levels; and,
- Offsetting – The provision of alternative or compensatory measures where appropriate and feasible, e.g. the creation of new habitats to compensate for loss of habitat as a result of the proposed alignment. The assignment of significance should be undertaken before and after consideration of the effectiveness of the design and committed mitigation measures. This will allow the case for and the effectiveness of mitigation to be described.

In almost all circumstances the mitigation prescribed will be formulated in compliance with the IFC's EHS General (April 30, 2007) and sector specific guidelines - in this case obviously Mining (December 10, 2007). There are several reasons for this approach of which the most important is that the EHS Guidelines have been developed in a broadly consultative process, based on the experience obtained from multiple similar projects conducted all over the world. As such, the EHS guidelines represent pragmatic good practice recommendations that are sensible and logical. The second reason is that as the Project will seek financing from lenders the due diligence process will be based on the IFC PSs or the EBRD PRs. Both are well served by the IFC EHS Guidelines.

4.3.5. Determination of Cumulative Impact Significance

When an impact on the receptor is assessed in isolation, the impact may not be significant, however when individual impacts are considered in combination, the resulting cumulative impact may be significant. The cumulative impact significance should be determined by the degree to which impacts can be accommodated by the receptor. The following factors should be considered when determining cumulative impact significance.

- Which receptors are affected?
- How will receptor condition be affected?
- What is the probability of the impact occurring?
- The ability of the receptor to absorb impacts before change becomes irreversible.

The five categories of cumulative impact significance can be standardised as shown below (**Table 16**).

Table 16. Categories of Cumulative Impact Significance

Significance	Impact
Severe	Receptor is irretrievably compromised. Decision maker must take into account.
Major	May become key decision making issue.
Moderate	Unlikely to become issues on design selection, but may require improvement of performance.
Minor	Locally significant.
Not significant	Beyond current forecasting ability or within receptor ability to absorb change.

4.4. <u>The Organisation of the ESIA Process</u>

Classic approach to conducting a bankable ESIA for the projects classified as Category A similarly to the present Project features a stepwise ESIA comprising the following stages:

- Initial screening or scoping;
- Full-scale assessment.

Ideally, conducting the national OVOS and bankable ESIA in parallel would be preferable. However, this is difficult to realize in this specific case due to differences in how the national and bankable project development processes are organized and uncertainties associated with the OVOS preparation schedule.

As was already mentioned (Sections 4.1.1 and 4.1.9), the RK legislation requires that the impact assessment process for the Category I projects (as the case is with the present Project) be organized in three stages, to include: (1) Preliminary OVOS as part of the Investment Project Feasibility Study, (2) OVOS as part of the design development, and (3) Environmental Protection Component of the Detailed Design.

This Project has a long history. The impact assessments were conducted in 2007 and 2012[22]. The Project design is now being updated and this means that it is not the first time that the OVOS process is conducted for the Project. Even though no Preliminary OVOS (as required by the national legislation) was conducted, it can be argued that the preliminary assessment stage is now the past and the current status of the Project is one of being at the full scale impact assessment stage.

For these reasons and considering the current Project development stage (design and OVOS preparation), and further considering an extremely tight ESIA timaframe (three months), the decision was made to skip the scoping stage and focus on the full-scale ESIA. Coordinating the OVOS and ESIA processes has been a challenge from the practical perspective. That said, the ESIA preparation has drawn on the OVOS materials while the ongoing OVOS preparation as of the updated design stage has been enhanced and, if and where needed, brought in line with the national legislation through the use of new information from the ESIA.

[22] There is no information on whether the Preliminary OVOS was undertaken; any relevant documentation was not provided to the ESIA team.

4.5. Stakeholder Engagement

Stakeholder engagement is a key element of the environmental and social assessment that is integrated in each stage of the assessment process. Stakeholder engagement is an underlying component and core value of ESIA that helps identify expectations and concerns of various stakeholder parties and reduce Project-related risks. The stakeholder consultations ultimately help the Project sponsor establish a basis for long-term dialogue and cooperation with local communities and other stakeholders. In addition, the stakeholder consultations are seen as a useful ESIA tool that helps collect the local-level information required to assess Project impacts and more accurately assess the significance of predicted impacts for various stakeholder groups.

For the consultation process to be organized and managed efficiently, it is crucial to ensure that the results of public consultations held as part of the national OVOS are taken into account as much as possible.

In the case of this Project, the following steps have been taken to maximize the efficiency of the stakeholder enagement process:

- The Company’s experience in maintaining dialogue with the public in the previous years has been reviwed, including the outcomes of the public hearings conducted in 2012, 2014 and 2015[23];
- A special stakeholder survey has been conducted (including focus groups and a household survey) to support the identification of stakeholder concerns and expectations;
- Based on the results of the review and survey mentioned above, the Stakeholder Engagement Plan (SEP) has been prepared to ensure a more accurate assessment of potential impacts of the Project and their significance and also facilitate a broader dialogue with stakeholders.

5. THE EXISTING EHS MANAGEMENT HUMAN RESOURCES AND WORKING CONDITIONS

5.1. EHS management

5.1.1. Permissions

The EHS Management System at JSC ShalkiyaZinc LTD is ongoing continues to be developed, aligned with the requirements of the RK legislation and aims achieving the national compliance.

JSC "ShalkiyaZinc" receives permits and approvals for ongoing activities and is also responsible for obtaining the necessary permits and approvals for the Project. At the time of the ESIA implementation, the company had the required permissions for the implementation of ongoing activities.

The company is designing the national-style project and developing the OVOS according to the requirements of national legislation and will obtain approval as soon as documents will be available.

[23] Please see Section 11 for a more detailed review of the experience.

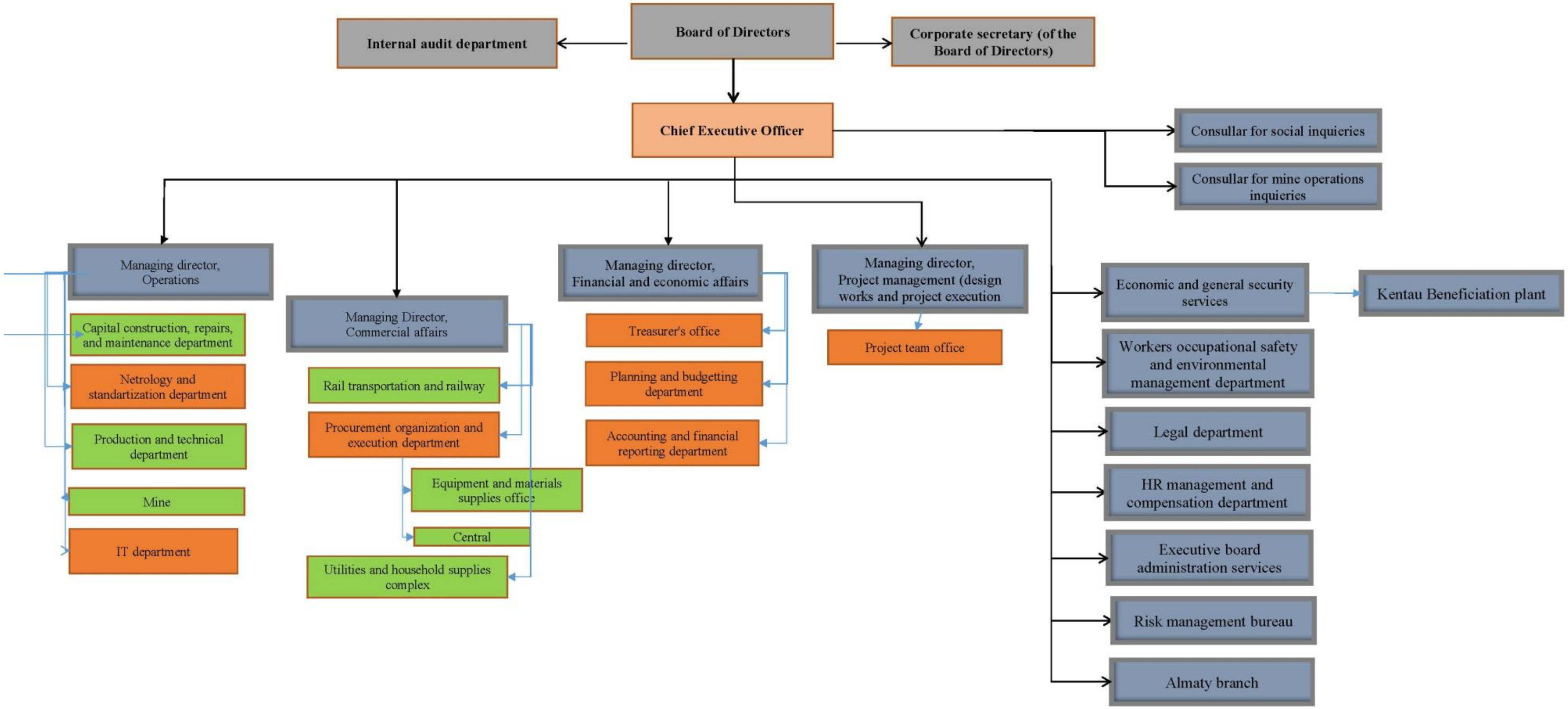
5.1.2. EHS Organizational Structure, staffing and interaction with the managing company

From 2008 to 2014, the OHS management was within the scope of direct responsibility of the Mine Director. The Environmental, Occupational Health and Safety (EHS) Division has been established when operations at the Shalkiya Mine resumed in 2014. At the time of ESIA starting (August 2015), the Head of Division was accountable to the Mining Operations Managing Director. Now (June, 2016) the new organisational structure has been developed (**Figure 11**). The Head of EHS division will be sub-ordinated directly to the Chief Executive Officer.

The Department has an environmental specialist in its staff. The environmental protection and management activities are organized by the Chief Environmental Specialist, who works on the basis of individual contract and is not part of the Company staff.

The occupational health and safety management activities are organized by the Head of Division. There are two occupational health and safety engineer positions that are currently vacant.

This situation is only partially compliant with the national legislation. To meet the lender requirements and enable the effective implementation of the integrated EHS management system, the Company's human resource capacity needs to be enhanced.



Общая штатная численность:	545 ед.
Administrative and management persor	64 ед.
Mine administration	454 ед.
Kentau Concentrator (Beneficiation plai	27 ед.

Figure 11: JSC ShalkiyaZinc LTD Management Structure

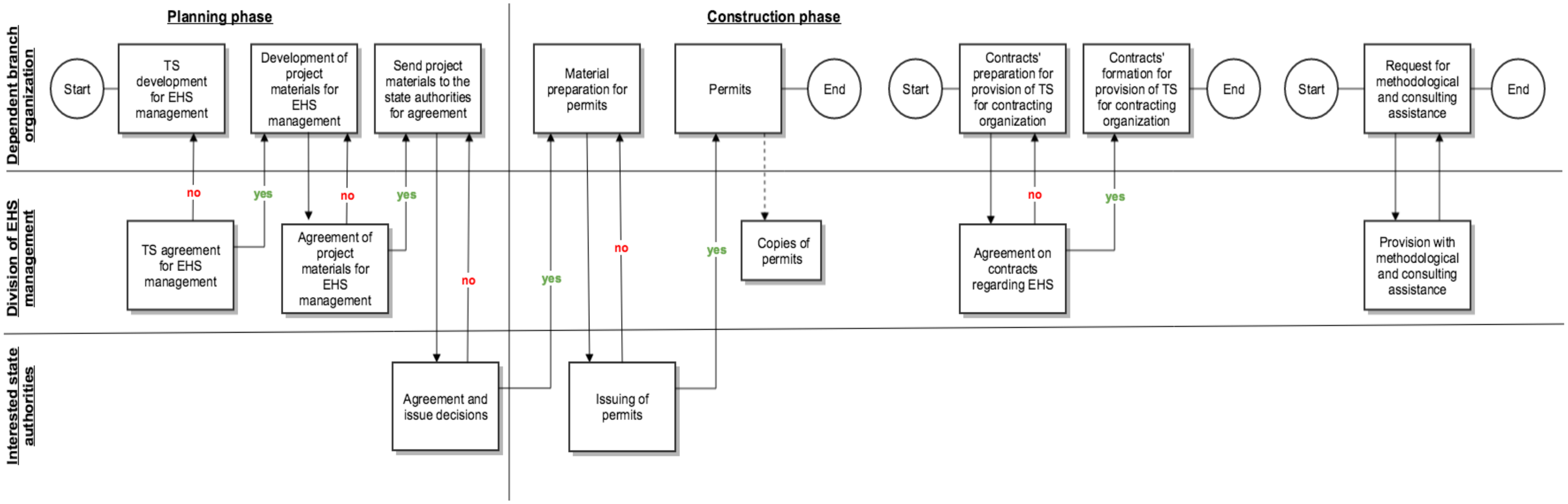


Figure 12: Interaction of JSC ShalkiyaZinc LTD with the Managing Company

5.1.3. Interaction with the managing company

The JSC "Shalkiya Zink" is responcible for the EHS management and performance. Managing Company Tau Ken Samruk (TKS) is providing guidance/methodological support and monitor the activities of Shalkiya Zink; the also approve the principal decisions according to the scheme presented at Fiure 10. But they do not interfere to the day-to-day "Shalkiya Zink" activities. Interactions between TKS and subsidories are governed by the JSC "Tau-Ken Samruk" Procedure Regulating Interactions with the Subsidiary Companies (SC) in EHS Matters and maintained at all stages (**Figure 12**).

According to interview, the final responcibilities on ESAP, SEP, ESMPs implementation will come to Shalkiya Zink. The TKS will provide the methodological support/guidance, etc.

5.1.4. EHS management system and human capacity

The TKS is young company established 7 years ago. The TKS doesn't have the full-scale management system but have the stated an approved Environmental Ploicy, and OHS Policy.

On this basis, Shakiya Zink developed and approved their own Environmental and OHS policies (October, 2015). The EHS contractor management procedure is under development. Other documents are planned to be developed.

At the moment, the personnel of Shalkiya Zinc is hardly aware in EHS management system. No education for the key staff in EHS management systems has been provided.

At the same time, some human capacityexists in TKS provides the internal resource that will facilitate the EHS implementation. The Managing Company has outlined the clear commitment to strengthen the capacity of the Subsidory. It's omportant to build the broad human capacity of Shalkiya Zinc at all levels. The quick development of the EHS system documentation with no proper building of the human capacity can compromise the EHS system.

5.1.5. EHS trainings

Newly recruited employees receive induction training on the occupational health and safety issues. A special OHS instruction has been developed. Key staff also receives regular training at specialized institutions. The specialized institutions are also invited to conduct the OHS certification. No training on environmental issues is provided.

Existing staff training arrangements on the occupational health and safety and environmental protection need to be enhanced.

The Mine staff receives OHS training including fire protection, electrical safety, first aid, rules of conduct for individuals in emergency situations at the Mine, occupational health and general environmental protection issues. Specialists and technical managers undertake a 40-hour training programme once in three years, while workers have a 10-hour training programme every year. At the end of the training programme each participant passes an exam and receives a standard certificate. As AO ShalkiyaZinc LTD is currently not certified to conduct training activities, training services are provided by organisations appropriately certified to provide OHS training/refresh training for specialists and workers. To provide required training for workers, a contracted training facility develops the curricula and training programmes on occupational safety, to be approved by their managers. Currently, the preparations are underway to sigg a contract with a training centre to run annual training course on the occupational safety.

Recommended Actions:

- The Shalkiya Zink EHS Division has to be staffed with at least five members including two environmental specialists already at this stage of the Mine development.
- The supposed update of the organisation structure and sub-ordination of the EHS department to Chief Executive Officer seems to be very relevant. This step will help enhance the Division's authority which is important to both ensure the successful implementation of the environmental and social management system and achieve compliance with the lender's requirements.
- Key staff should receive training on current principles and approach underpinning the development of environmental and social management systems (including the environmental, occupational health and safety, and social management). This personel could be trained as trainers for the other company y personnel and contractors The other company personnel can get the internal trainingon EHS through the key personnel (trainers)

5.2. Company Staff, Working Conditions and Labour Relations

At the end of the ESIA process, the Company has a staff of 275 people (**Table 17**) including 231 local residents (Zhanakorgan district) and 41 invited specialists from other regions. These figures graphically illustrate that the Company has adopted the preferential recruitment policy for local communities.

While the majority of the Company employees are part of its staff, there are people hired on the contractual basis; the proportion accounted for by them is 13%. All Company employees are entitled to social benefits specified in the relevant RK legislation.

Table 17. Mine Staff[24]

	Total	Male	Female
Number of employees including:	275	228	47
Average age	39-48	37-49	32-48
-administrative and managerial staff of the Company and Mine:	91	69	22
-workers:	184	157	27
- working underground	117	117	-
- working on the surface	158	131	27

Available information on gender composition indicates that males outnumber females. This seems to be fair considering the specifics of mining operations

[24] Data as of March 2016. Figures include both members of the Company staff and those working on the basis of fixed-term contracts.

(working underground and in difficult conditions). It should be noted that women occupy various management and even top executive positions. In other words, there is no gender discrimination at the Company and its equal opportunity policy only requires to be formalized and documented.

Table 18. Company Staff Education Statistics

	Total	Including Women
- Higher/university education	112	24
- Secondary vocational education	87	9
- Comprehensive school (9 and/or 11 grades)	76	14

The Company staff has a very high education level (**Table 18**). This is attributed to the fact that the Company is only about to start operating its production processes and low (as compared to planned production levels) requirement for blue-collar workers, which can be illustrated by the staff skill and qualification data (**Table 19**). As can be seen from the Table, the proportion of specialists in the Company staff is very high (approximately 37%). High qualification levels should be considered as an advantage.

Table 19. Staff Qualifications

Staff Qualification Category	Total	Executives	Specialists	Workers	Female
Highly skilled workforce	113	19	62	32	15
Semi-skilled workforce	105	-	12	93	13
Unskilled workforce	76	-	-	76	20
Staff requirement by category	58	10	16	32	5

Table 20. Staff Breakdown by Work Experience

Category	Total	Including female
Up to 5 years	180	42
5 to 10 years	18	3
10 to 20 years	21	2
Over 20 years	56	-

The employees work experience is generally not very extensive (up to 5 years). However, there are very experienced workers who have worked in the field for over 20 years.

The Company has never used forced or child's labour.

The employees work experience is generally not very extensive (up to 5 years). However, there are very experienced workers who have worked in the field for over 20 years.

The Company has never used forced or child's labour.

The Company has no formal recruitment policy but existing staff hiring procedure is very transparent. Information on vacancies is published on the Company site http://www.zinc.kz. Candidates are selected through a competitive process with the level of professionalism being one of key criteria. It is worth to note that the Company seeks to use local workforce as much as possible and always prefers to train local candidates to fill its vacancies.

The Company also maintains a reserve pool comprising candidates who have not been selected to fill a position but meet formal eligibility requirements, as well as Company employees based on the employee certification results.

The administrative staff works 8 hours a day / 5 days a week. The mine staff works in two shifts.

The Company's working hours meet the requirements of the RK legislation.

Meals are provided to the Company staff in a staff canteen offering 3 hot meals a day.

The Company has a 24-hour medical station with a staff of 5 including 1 doctor and 4 paramedics to conduct the pre-trip inspection for drivers and pre-shift inspection for miners working underground. The medical station also provides medical aid to those who need it and maintain record of injuries. If necessary, patients are sent to the Central District Hospital.

Generally, the Company's working conditions are in line with the IFI requirements.

Staff Training

The Company has paid significant attention to staff training and skill development. Staff is trained at workplace and, if necessary, workers are sent to vocational education institutions to receive specialized training.

The technical universities in Kyzylorda region do not train specialists for mining sector and the Company has therefore established close cooperative relations with the higher educational institutions in Almaty, Karaganda, and Ust-Kamenogorsk including the Samruk Kazyn Corporate University, K. Satpayev Kazakh National Technical University, Karaganda State Technical University, D. Serikbayev Eastern Kazakhstan State University in Ust-Kamenogorsk, International University of Information Technology in Almaty, and Kazakhstan Nuclear University in Almaty.

The Company offers training and skill development opportunities for its specialists. The following results were achieved in 2015:

- The Company provided financial support to four young people who received training at universities and vocational education institutions (all four of them are local residents including 2 women and 1 young man from a low-income family);
- The skill development courses were completed by 17 specialists (including 5 women, 3 local residents and 1 person from a low-income family);
- The refresher training courses were completed by 35 specialists (including 3 women and 17 persons from low-income families, 33 local residents).

5.3. Occupational Health and Safety Performance[25]

Statistical Indicators

According to interview with the Head of the EHS Unit, no occupational injuries (including minor ones) have been recorded at the Company over the past two years[26] (zero injuries). Any occupational diseases were likewise not recorded in the same period.

Use of Personal Protection Equipment

The Mine workers are provided with the personal protection equipment as required by the relevant OHS regulations: dust mask (Lepestok model), ear plugs, and self-rescue kit SPP-4. Observations made during the site visit indicate that the Mine employees generally use the required PPE (except perhaps ear plugs). It is recommended to consider whether more comfortable PPE models could be used. Warning signs are available everywhere where necessary.

No serious non-compliances were observed during the site visit.

Contractors

To facilitate access to the modern mine development equipment and minimize the loss of time due to repairs, the Company signed a contract with the Atlas Copco Central Asia LTD for the establishment of the mobile equipment maintenance and repair station. In the future, after training and certification, this station will be maintained by the Mine staff.

A brief interview and site inspection conducted during the ESIA mission demonstrated that the contractor maintained high level of compliance with OHS regulations. Required OHS instructions and warning signs were available in the workplace and the station staff had and properly used required PPE.

At the moment, the contractors use the Mine dormitory if/when needed. The social condition looks good,

The Company is committed to achieving and maintaining compliance with the OHS requirements. However, a number of components required for the OHS system to function properly appear to be lacking. For example, there are no formal OHS policy and systematic identification of occupational hazards and risks etc.

To achieve compliance with the EBRD PR2, the Company is recommended to introduce an up-to-date OHS management system based, for example, on the OHSAS 18000 standards.

[25] During the site visit (August 2015), only limited underground works were observed, and the number of staff was significantly lower than the level specified in this section.

[26] Pursuant to the RK legislation, only those occupational injuries are recorded that cause an inability to work, temporary or permanent. Other injuries not causing the loss of ability to work are not recorded.

6. ENVIRONMENTAL BASELINE

6.1. Shalkiya Mine, its Neighbours and Land Use

Depending upon a designated purpose, the RK land resources include the following seven land use categories:

1) agriculture;
2) urban and rural residential settlements;
3) industry, transport, communications, defence and other non-agricultural purposes;
4) protected areas, recreational areas, and historical and cultural sites;
5) forestry;
6) water-related land; and
7) reserve land.

The Shalkiya deposit is located in a well-developed mining area where extensive infrastructure exists. The Mine uses land on the basis of the following arrangements:

- Land ownership;
- Short-term use without charge; and
- Land tenancy (fixed-term use based on payment of rent).

The boundaries of land allotment and mining allotment for the Shalkiya Mine are presented in **Figure 13**.

The previous land allotment for existing mine facilities was 670 ha (including linear infrastructure).

The Mine's industrial site borders 19 land properties owned by legal entities and individuals, including 7 agricultural plots and 12 industrial plots (Annex 15, Figure 13).

Existing neighbouring industrial enterprises are exclusively engaged in quarrying and processing building stone and gravel. The onsite stone processing operations include such dusty stone crushing and screening. These enterprises use stone quarries located to the north east and east of the mine site. A building stone and gravel quarry (Shalkiya building stone deposit with an estimated B+C1 reserve of 118 million m^3) is in operation directly at the Mine site. The existing stone crushing plants are owned/operated by both large national-scale consortia (KazProm LLC) and regional/local companies. These plants employ local residents from Shalkiya village and other adjacent settlements. These plants were booming during the construction of the Western Europe – Western China international highway. The demand for crushed stone has now dropped and some plants can implement staff layoffs and ultimately be closed.

The amended Law on Subsoil Use[27] requires owners of facilities located within the mining allotment boundaries to re-register their land allotment documents. This re-registration is subject to consent by the local executive authority and endorsement by the territorial branch of the relevant subsoil and mineral resource

[27] RK Law of 29.12.14 No. 271-V "On Amending the RK Law on Subsoil Use (Article 113, Clause.1)

management authority that have to confirm that an area in question contains no or little mineral resources. As the deposit to be developed by the Mine is considered to be of the national significance, it seems unlikely that the stone crushing operators would be able to obtain required consent.

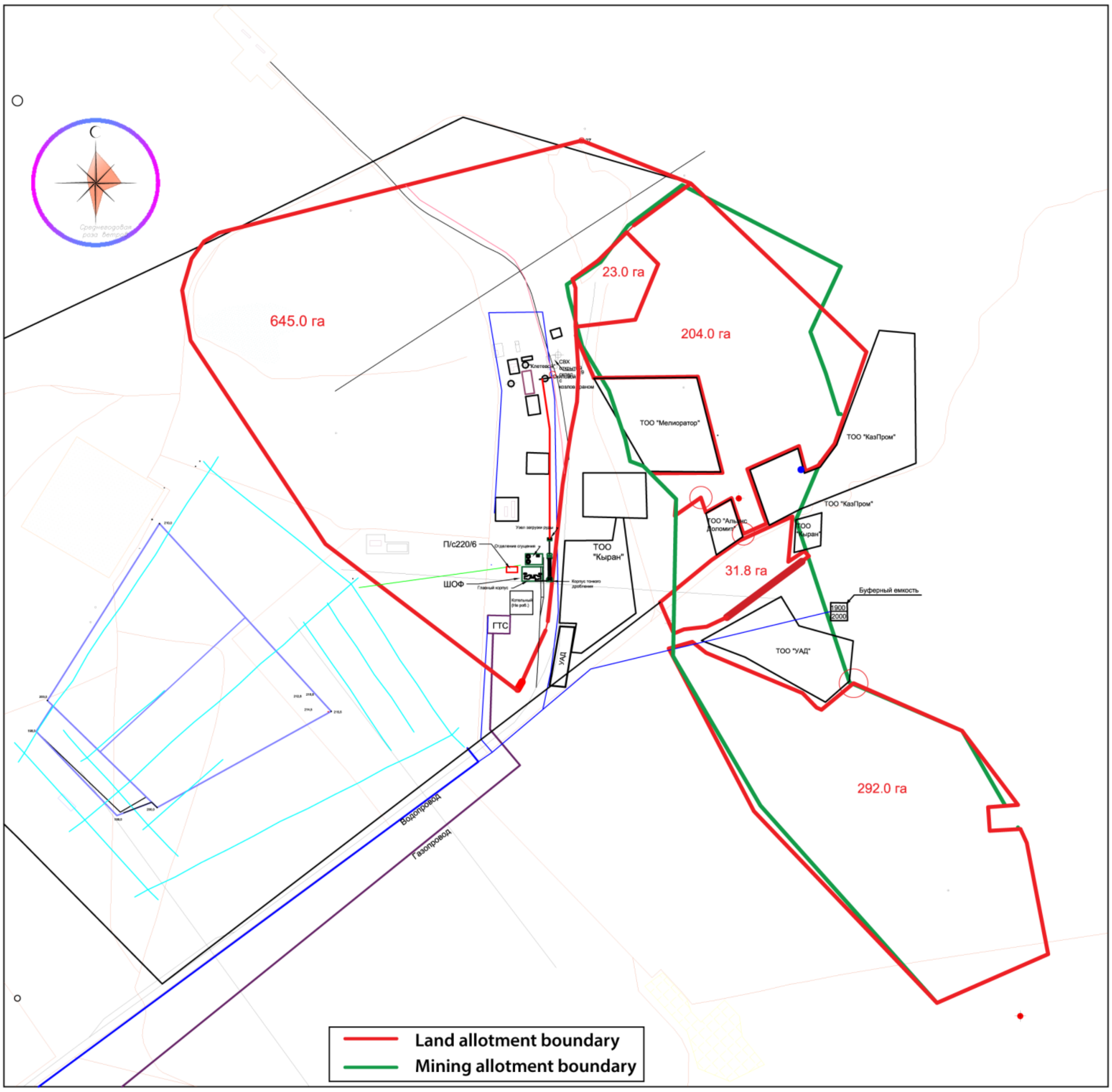


Figure 13: Shalkiya Mine Land and Mining Allotment Boundaries

These plants also are the predominant contributors of dust emissions (see Section 6.3) result, resulting in elevated dust levels in the Project area including the Mine land allotment. It is difficult to assess the environmental performance of these plants including their environmental permitting status within the framework of this assignment. Visual observations indicate that these plants do little to control their dust emissions. It is difficult to judge on the situation with legal compliance and social responsibility at these enterprises.

That said, stone crushing plants currently continue to play an important role as significant employers for local residents living in the adjacent human settlements.

It might be possible that some plant managers consider the Project as an opportunity to improve the position of their business.

Neighbouring agricultural enterprises and private entrepreneurs are mainly engaged in livestock rearing and grazing. Currently, the neighbours located closest to the Mine site are Ai-Takh LTD and Toleuov PE (**Figure 12**). Current activities at the Mine site do not cause significant impact to land occupied by these entities. However, the presence of these neighbours should be taken into account in planning and siting new facilities and their SPZ boundaries. Special consideration should be given to the Ai-Takh LTD land allotment which is literally squeezed between the sites owned by the ShalkiyaZinc JSC and Kyran LTD. Other relatively close neighbours include KazProm LTD, UAD LTD and Meliorator LTD that often conduct their stone crushing and screening operations without required dust suppression systems. Even now when the Mine has not properly started operations, Ai-Takh LTD already experiences significant pressure due to dust emissions generated by those stone crushing plants and their vehicles. At the same time, according to information provided by the Akimat, this allotment has not been used for its designated purpose for several years. It can be suggested that one of reasons could be its unfavourable location.

- The southern tip of the planned land allotment also comprises two land users:
- two years ago, Begzhan LTD leased a land plot to build and operate a concrete plant. The enterprise does not currently use this land plot; and
- Myrzakhanov PE leases land for livestock grazing.

Furthermore, the Mine site is illegally used for livestock (goat, cattle, sheep, horse, camels) grazing and water abstraction from the mine water pond for livestock watering and agricultural irrigation[28]. Illegal livestock grazing at the Mine site may result in animal fatalities[29].Free-range camel grazing causes special concern[30].

At the time of assessment, a continuously operating access road gatehouse with a boom where vehicles are inspected is the only access control point at the Mine site. The Mine facilities should be fenced to prevent unauthorized access. A successful example of how the access control issue can be addressed effectively is preventing access to the mine water pond flow control valve (September 2015).

Farms located in the Project area form a stakeholder group which should be engaged in a dialogue during the Project implementation. Part of livestock grazing in the Project area may be owned by other residents of Shalkiya and Kuttykozha (and, possibly, Jalyima) settlements and these residents should be also engaged in the dialogue.

[28] Unauthorized water withdrawal was terminated in September 2015, following the recommendations of the ESIA Consultant.

[29] A camel was found dead in a manhole at the unfinished wastewater treatment plant site.

[30] Camels are left to graze unattended. The ESIA team has not been able to establish with certainty who owns these camels. It appears from interviews that they are owned by a farmer from Jalyima aul.

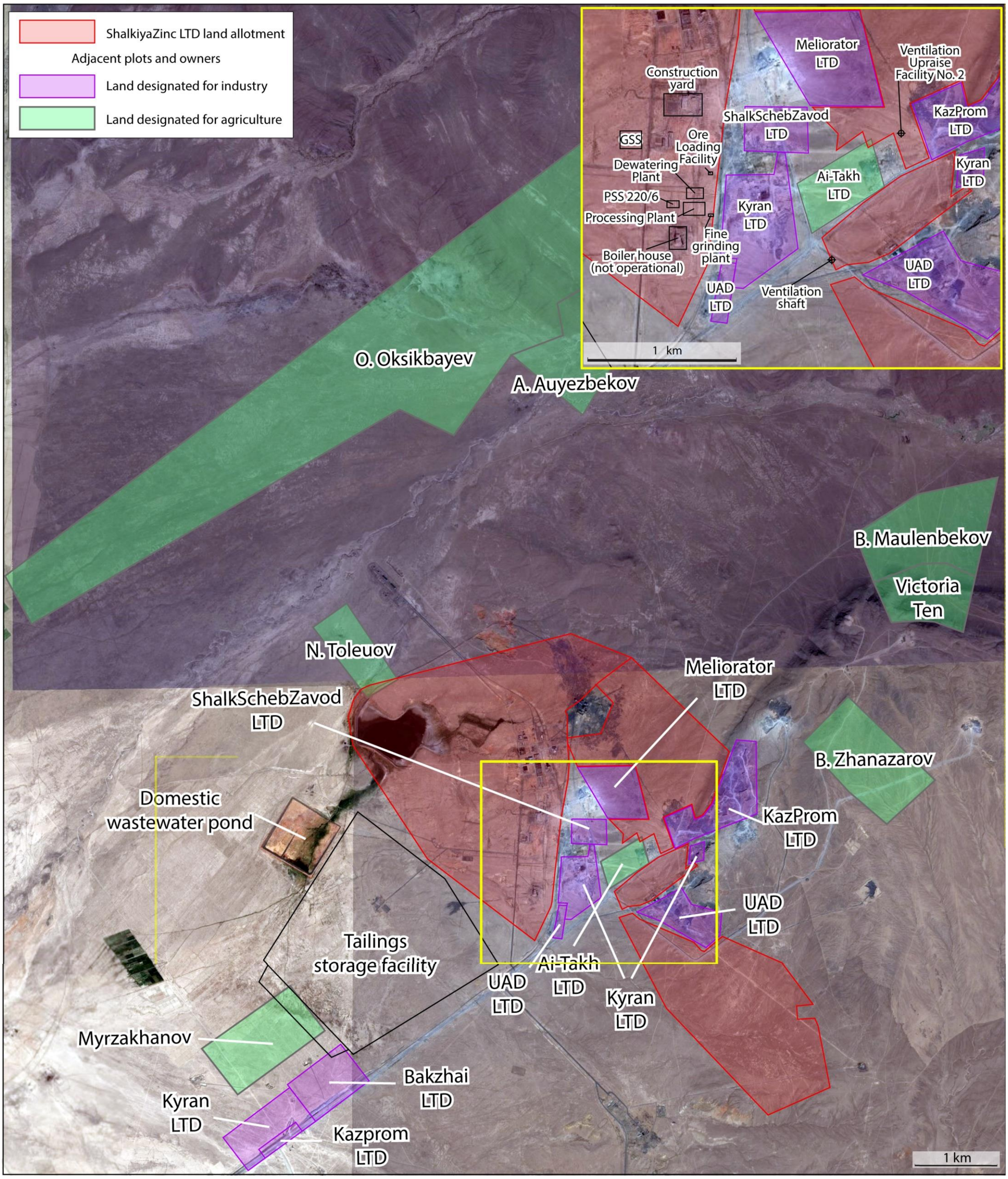


Figure 14. ShalkiyaZinc JSC Facilities and Neighbouring Land Users

Other stakeholders include the stone crushing plants whose operations sometime do not meet technology standards and result in dust emissions polluting the ambient air. They are also required to be engaged in dialogue with the involvement of district regulatory authorities.

Summary

- The Mine is in the process of formalizing its land use planning documentation for the existing land allotment.
- The adjacent areas include industrial land managed by other land users. Two sites owned/managed by other land users are also located within the Shalkiya Mine land allotment boundaries.
- The Shalkiya Mine land allotment shares boundaries with agricultural plots that are mainly used for livestock grazing and also with land occupied by the Shalkiya and Kuttykozha residential settlements.
- Presently, the Mine operations do not affect neighbouring land users. On the contrary, some neighbouring industrial operations adversely affect the Mine performance, health of its staff and adjacent farms.
- Illegal livestock grazing is a separate issue that primarily poses a threat to owners of these animals. However, this may become an issue for the Mine itself as the Project proceeds.

6.2. Climate and Meteorological Conditions

6.2.1. Climatic Conditions: Overview

The Shalkiya Mine Project Area is located in a sharply continental climatic zone characterized by significant daily and annual temperature fluctuations, moderately cold winters with strong winds and long hot summers. Precipitation is low, especially in summer. Snow cover is also low and unpredictable. Low humidity, intensive evaporation processes and high solar radiation throughout the entire spring-summer season characterize the area.

Climatic conditions are characterized based on the records of two meteorological stations located in Kyzylorda and Akkum of Zhanakorgan District. According to the Kazakhstani Construction Norms and Rules СНиП РК 2.04-01-2001 [SNiP PK 2.04-01-2010] ‘Building Climatology’, both meteorological stations have conducted long-term meteorological observation for more than 40 years.

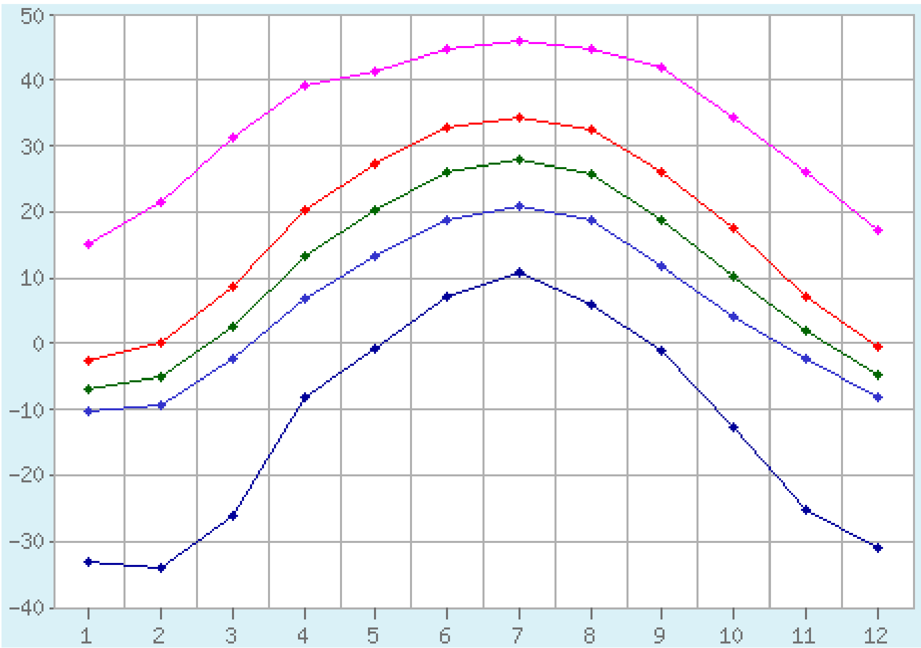
The Kyzylorda and Akkum meteorological stations are located at a distance of 180 and 35 km respectively from the mine site. That being said, the Akkum station is closer to the site in terms of both distance and the geomorphological characteristics of the area. It is located about 7 km away from the Syr Darya River. The more remote Kyzylorda meteorological station keeps observation records on a wider range of meteorological parameters as compared to the Akkum meteorological station that is closest to the site. In this light, the climatic conditions are characterized taking into account the records of both stations. Analysing the microclimate of the Project Area, especially the intensity and directions of winds in different climatic seasons drawing on the data of the mentioned stations is considered to be impossible due to their remoteness from the mine site. However, macroclimatic conditions can be quite reliably represented on the basis of the records of the two meteorological stations specified.

6.2.2. Kyzylorda Meteorological Station[31]

The coldest month of a year on average is January with a minimum temperature of –33.0°C and average month temperature of –6.8°C (**Table 21, Figure 15)**. The hottest month is July with maximum and average temperatures of 46 and 27.8°C, respectively. In winter, soil freezes to a depth of 1.5 m. The lowest humidity is observed in summer (34-35%), and the highest – in winter (65-78%).

Table 21. Air temperature according to the Kyzylorda meteorological station

Month	Absolute minimum	Mean minimum	Average	Mean maximum	Absolute maximum
January	-33.0 (1977)	-10.3	-6.8	-2.5	15.2 (2007)
February	-33.9 (1969)	-9.2	-5.0	0.2	21.4 (1999)
March	-26.0 (1974)	-2.2	2.7	8.8	31.3 (2014)
April	-8.0 (1979)	6.9	13.3	20.3	39.3 (2006)
May	-0.8 (1993)	13.2	20.3	27.2	41.4 (1999)
June	7.2 (1971)	18.8	26.1	32.9	44.6 (1988)
July	10.9 (1987)	20.8	27.8	34.3	46.0 (1975)
August	6.0 (1980)	18.6	25.7	32.6	44.7 (2002)
September	-1.0 (1989)	11.7	18.6	26.1	42.0 (1998)
October	-12.6 (1987)	4.0	10.2	17.4	34.3 (1997)
November	-25.1 (1998)	-2.4	1.9	7.2	26.0 (1979)
December	-31.0 (1976)	-8.2	-4.7	-0.4	17.2 (1985)
Annual	-33.9 (1969)	5.1	10.8	17.0	46.0 (1975)



[31] According to the official data given at: http://www.pogodaiklimat.ru/weather.php?id=38062.

Figure 15: Air temperature curves according to the Kyzylorda meteorological station

Average annual precipitation (for more than the 80-year observation period) is 151 mm Average snow cover is approximately 15-20 cm. There is typically permanent snow cover from December to March. (Table 22,Figure 15). Precipitation mainly occurs in March-April.

Table 22. Precipitation characteristics according to the Kyzylorda meteorological station

Month	Norm	Monthly minimum	Monthly maximum	Daily maximum
January	19	0.0 (1969)	40 (1989)	20 (2004)
February	15	0.2 (1974)	48 (2003)	20 (2003)
March	17	3 (1944)	59 (1984)	18 (1964)
April	16	0.0 (1936)	64 (1974)	27 (1969)
May	16	0.0 (1942)	64 (1972)	34 (2002)
June	10	0.0 (1939)	69 (1981)	21 (1981)
July	6	0.0 (1936)	30 (1999)	20 (1953)
August	4	0.0 (1937)	23 (1949)	12 (1949)
September	4	0.0 (1944)	25 (1940)	17 (1940)
October	10	0.0 (1974)	42 (1969)	19 (1965)
November	17	0.0 (1952)	49 (1993)	24 (1991)
December	17	0.6 (1965)	50 (2013)	17 (1940)
Annual	151	44 (1936)	306 (1981)	34 (2002)

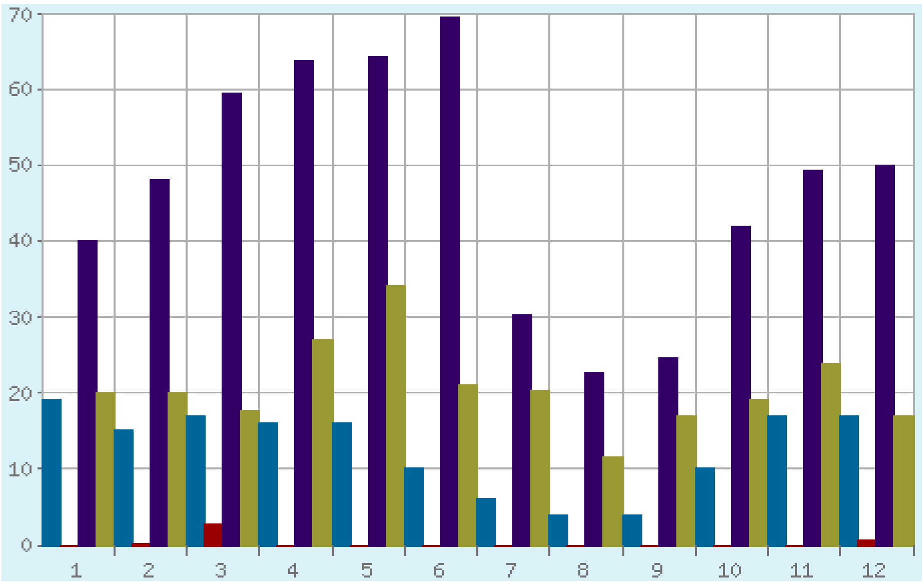


Figure 16: Precipitation according to the Kyzylorda meteorological station

Prevailing wind directions in the cold season (December-February) are northeast, north, and east. In the warm season (May-August) north and northeast winds are typical. No-wind conditions prevail during the cold season (Table 23**, Figure 17**). The highest average wind speed (2.5-3.4 m/s) is typical for the cold season (Table 24). Strong winds (15-20 m/s) are rarely observed.

Table 23. Frequency of various wind directions, %, according to the Kyzylorda meteorological station

Direction	January	February	March	April	May	June	July	August	September	October	November	December	Annual
N	15	16	21	16	18	23	25	28	27	22	17	14	**20**
NE	27	27	26	27	22	22	18	24	28	25	28	28	**25**
E	15	17	16	19	15	10	6	8	10	11	14	17	**13**
SE	6	5	4	3	4	2	1	2	1	3	4	6	**4**
S	14	10	8	7	6	4	3	2	3	7	9	12	**7**
SW	11	11	9	9	9	8	8	5	6	11	12	10	**9**
W	9	9	10	12	17	19	23	18	13	14	10	8	**14**
NW	3	5	6	7	9	12	16	13	12	7	6	5	**8**
No wind	26	21	17	17	20	22	24	23	25	30	29	27	**23**

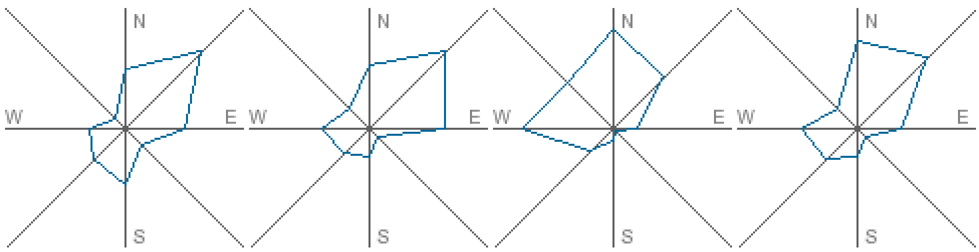


Figure 17: Wind rose in different seasons according to the Kyzylorda meteorological station

Table 24. Average wind speed, m/s, according to the Kyzylorda meteorological station

January	February	March	April	May	June	July	August	September	October	November	December	Annual
2.3	2.8	3.2	3.4	2.9	2.6	.4	2.5	2.5	2.2	2.3	2.3	2.6

Table 25 shows the number of days with various weather phenomena.

Table 25. Number of days with various weather phenomena, as measured at the Kyzylorda meteorological station

Phenomenon	January	February	March	April	May	June	July	August	September	October	November	December	Annual
rain	4	4	6	6	6	4	3	2	2	5	6	5	**53**
snow	12	9	4	0.2	0.03	0	0	0	0	0.4	3	9	**38**
fog	5	4	2	0.2	0.1	0.1	0.03	0.03	0.1	0.3	2	5	**19**
mist	0.1	0.04	0.1	0.3	0	0	0.03	0.1	0.2	0.4	0.4	0.1	**2**
thunderstorm	0.1	0.04	0.1	1	2	1	1	1	0.1	0.2	0.03	0.03	**7**
snow storm	0.4	1	0.1	0.03	0	0	0	0	0	0	0.03	0.4	**2**
dust storm	0.2	1	2	5	4	2	2	3	3	2	1	0.3	**26**
black ice	2	1	0	0	0	0	0	0	0	0	0.4	1	**4**
rime	2	1	0.3	0	0	0	0	0	0	0	0	2	**5**
wet snow sticking	0.1	0	0	0	0	0	0	0	0	0	0	0	**0.1**
complex deposits	0.1	0	0	0	0	0	0	0	0	0	0	0.1	**0.2**

6.2.3. Akkum Meteorological Station

Meteorological observations recorded during the last three years at the Akkum meteorological station located 35 km away from the site (**Table 26**, Annex 4) show that, in general, they correspond to the mean values of long-term observations at the Kyzylorda meteorological station (which is located 180 km away from the Mine site). Significant differences are observed in the prevailing wind directions. Thus, over the last three years south, north and east winds are steadily recorded by the Akkum meteorological station as the largely prevailing ones (**Figure 18**). According to the Kyzylorda meteorological station, the prevailing directions (over the year) are north, northeast and west. Meteorological observations also differ in the number of calms – 23 and 37-40% as per the Kyzylorda and Akkum meteorological stations, respectively.

Table 26. Meteorological data of the Akkum meteorological station[32]

Meteorological data	2012	2013	2014
Maximum temperature (average), t°C	August +36.7	July +36.2	June +36.0
Minimum temperature (average), t°C	February -14.8	January -7.0	February -15.7
Precipitation per year, mm	148	217	188
Humidity per year, %	44	45	45
Wind speed per year, m/s	1	1	1
Wind rose per year, %			
N	20	20	21
NE	12	12	14
E	16	10	17
SE	8	8	7
S	23	25	22

32 Statement of the Branch Office of the State Regional Meteorological Body ‘Kazgidromet’, Kyzylorda Region, 2015 (Annex 4).

SW	6	8	6
W	5	7	5
NW	10	10	8
No wind	39	40	37
Wind speed, frequency of exceeding of which (according to the long-term average data) is over 5 %, U*, m/s over 2012-2014 period	6		

Figure 18: Wind rose according to the Akkum meteorological station, 2012-2014

Considering significant differences in values of those meteorological parameters that are critical to the pollution dispersion estimates, it is required to conduct the microclimate observations at or near the Mine site in order to be able to verify the pollution dispersion estimates and effects of emissions on the adjacent communities and Mine staff. The unfavourable weather conditions influencing the pollution dispersion pattern in the Project area include the wind direction towards Shalkiya or Kuttykozha settlements or no-wind conditions that may contribute to the negative impact on the residents of neighbouring residential areas or mine personnel.

Summary

The data of the Kyzylorda and Akkum meteorological stations (located 180 km and 35 km away from the site, correspondingly) can be used to generally characterize the macroclimatic conditions of the Shalkiya Mine area. To determine the microclimatic characteristics and, particularly, to assess wind velocity, prevailing wind directions and no-wind conditions with a view to refining the pollution dispersion and air quality predictions for the adjacent settlements, it is advised to install an automatic meteorological station. The station would be equipped to measure meteorological parameters with the required degree of accuracy as per both the national requirements and international good practice. The need for this information would be even more urgent when the processing plant is put into operation.

6.3. Ambient Air

The territory of the RK is divided into five zones that have different air pollution potentials (APP) and capacities of the atmosphere to disperse and dilute emissions depending upon the meteorological conditions[33] (**Figure 19).**

Figure 19: The Air Pollution Potential Values for Different Regions of Kazakhstan[34]

The APP depends upon the prevailing meteorological conditions that affect the capacity of the atmosphere to disperse pollutants emitted from various sources and shape the concentrations of pollutants in the near-ground layer. The area where the Shalkiya Mine is located is classified as Zone IV with a high APP; this means that the area’s capacity to disperse pollutants is unfavourable.

Ambient air quality is a function of the combined effect of pollutants emitted from point and fugitive emission sources. Currently, the major air pollution sources at the Mine site and in the surrounding areas include the Shalkiya Mine processes and facilities and the three adjacent stone crushing plants. There are no other significant stack emission sources within 30-40 km around the Mine site.

Other dust generation and air pollution sources include unpaved access roads and temporary onsite roads. In addition, stronger winds may contribute to increased dust levels due to soil erosion and transport/redeposition of dust from the areas disturbed by mining and agricultural activities. This factor becomes particularly significant during dust storms.

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[33] The zoning exercise was conducted by the Kazakh Scientific Research Hydrometeorological Institute.

[34] Zone I – low APP (meteorological conditions are conducive for dispersing pollutants); Zone II – moderate APP; Zone III – elevated APP; Zone IV – high APP; and Zone V – very high APP (extremely unfavourable conditions).

6.3.1. Emission Sources at the Shalkiya Mine Site

Currently, air emissions are generated by the following major point sources at the Mine site:

- Boiler house;
- Mechanical repair shop;
- Forging shop;
- Storage battery shop;
- Mine ventilation outlets;
- Filling station and fuel storage area;
- Exhaust emissions from vehicles and mobile plant.

During the Project implementation, emissions of air pollutants will be generated in the following mining processes and operations:

- Blasting operations;
- Drilling operations;
- Ore production works;
- Loading and unloading operations;
- Ore grinding operations;
- Operations involving the use of underground mobile equipment operation;
- Welding operations;
- Vehicle traffic and mobile equipment movements;
- Metal processing machines;
- Wet dust collectors[35] to trap dust from:
    - Bin loading areas;
    - Ore unloading areas;
    - Covered belt conveyor;
    - Feeder compartment.

Major pollutants released to the ambient air from ore mining operations include inorganic dust containing 20–70% of silicon dioxide, nitrogen dioxide, carbon oxide, sulphur dioxide, acryl aldehyde, formaldehyde, iron oxide, manganese compounds, hydrogen fluoride, and suspended matter[36].

6.3.2. Emission Sources Associated with the Stone Crushing Enterprises

Three stone crushing plants are located near the Shalkiya Mine's main site (**Figure 20**). Two of them are located in the immediate vicinity of the Mine site and one plant is within the boundaries of the mining allotment of the Mine.

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[35] Wet dust collectors with a sludge overflow system designed to remove fine to medium-size dust from the extracted air (particle size groups III and IV).

[36] OVOS of 2012.

The use of crushing and screening equipment at the plants causes the generation of large quantities of dust. As the plant owners tend to avoid/minimize the use of water for dust control, the stone crushing and screening processes continuously generate and release dust in significant quantities. Strong winds exacerbate the situation even further due to large quantities of raw materials, waste and finished products stored onsite. These storage areas are significant sources of particulate matter that is entrained into the atmosphere by wind (**Figure 20**). When the wind blows from the plants toward the Mine site or adjacent human settlements (Shalkiya and Kuttykozha), the Mine staff and local residents may be exposed to adverse effects of elevated dust concentrations in the ambient air[37]. Intensive dust generation also affects the condition of local ecosystems due to the deposition of dust on plants that may force animals to move away, at least temporarily, from the polluted areas.

Figure 20: Stone Crushing Plant

In 2016, the crushed stone outputs appear to show a declining trend as the idea that the plants could be closed is being discussed (see Section 6.1). It can be expected that their closure would result in improved air quality even before the start of construction activity at the Mine site.

6.3.3. Air Quality

The ambient air quality survey at the Mine site and in the surrounding areas was for the first time conducted in 2005-2007 (**Figure 21**). In 2015, as part of the Industrial Environmental Monitoring Program of the Shalkya Mine for 2015-2017, the measurements continued to be undertaken for both ambient air quality and at the emission sources. The measurements are conducted quarterly in line with the regulatory requirements (maintaining the required temperature, moisture, and wind speed). Considering that the sampling and averaging interval is 20 min, the measured concentrations represent the results of a one-time measurement and are not directly comparable with the national air quality guidelines prescribed as

[37] While local residents, working at the stone crushing plants, want the plants to remain operational, part of community members complain about their dust emissions and non-compliance with environmental requirements. Information about these stone crushing operations is available at: http://www.kzvesti.kz/29-iyulya-2014/3483-vremya-sobirat-i-drobit-kamni.html

the maximum one-time concentrations of various pollutants and relevant WHO guidelines (**Table 27**).

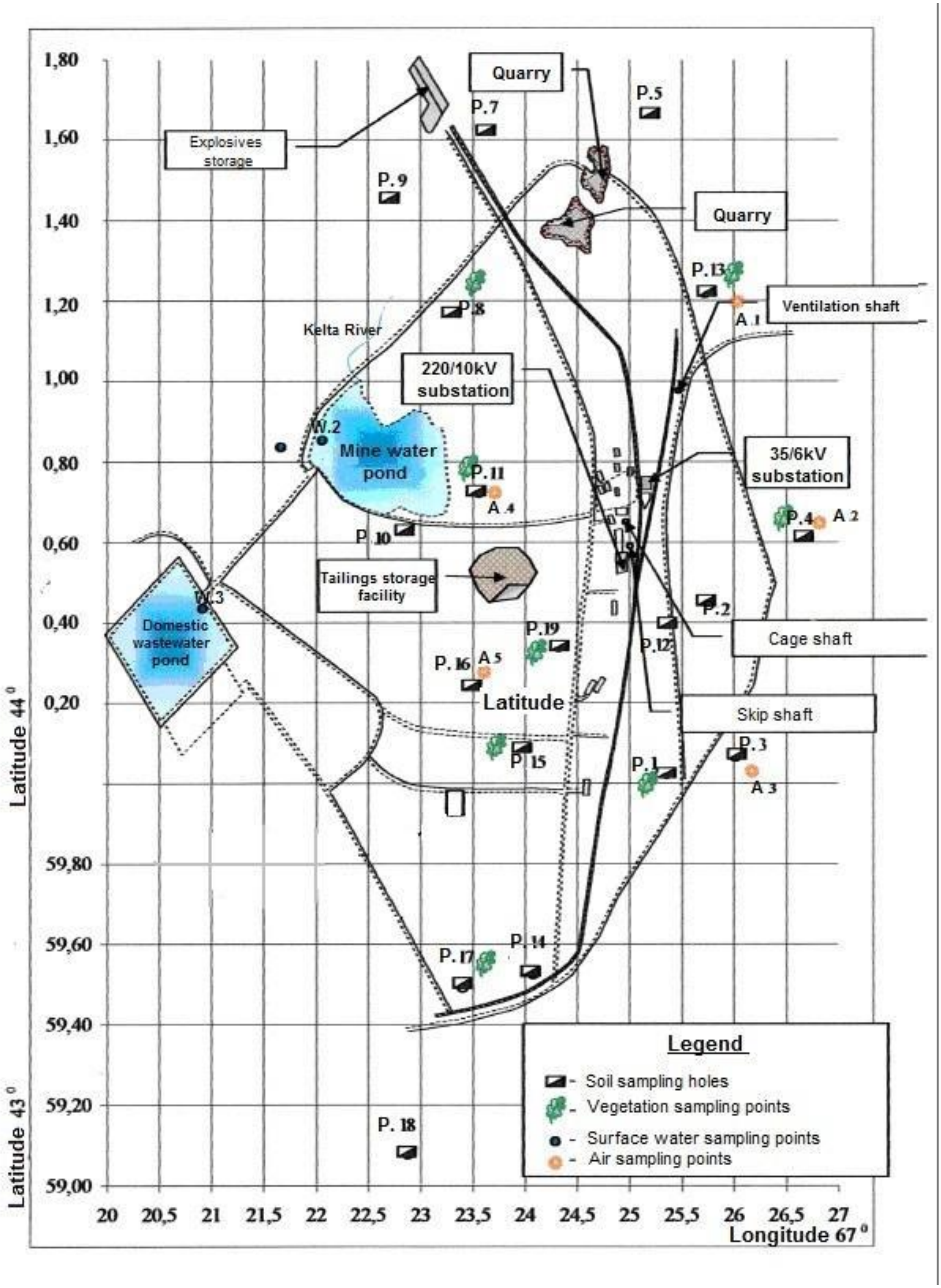

Figure 21: Sampling Locations for Soil, Vegetation Cover, Surface Waters and Air

Table 27. Ambient Air Quality Measurement Results (19.04.2007 and 29.05.2015)

Sampling location	Concentration^3, mg/m^3						Pressure, mmHg	Moisture, %	Temperature, ºC	Wind Direction	Wind Speed, m/s
	Dust	BB	SO_2	CO	NO_2	NO					
19.04.2007 (sampling points are shown in Figure 19)											
Point 1		0,0039	0,020	3,7	0,007		738,5	60	+ 25,0	north-east	2,0
Point 2		0,0046	0,021	4,7	0,012		739	58	+ 26,0	north-east	2,0 – 2,5
Point 3		0,0038	0,023	4,4	0,013		740	56	+ 24,2	north-east	2,0 – 3,0
Point 4		0,0064	0,016	5,0	0,011		742	68	+ 25,0	north-east	1,5
Point 5		0,0053	0,001	3,5	0,008		742	73	+ 25,2	north-east	2,0 – 2,5
$C_{av.}$		0,0048	0,0162	4,26	0,0102						
29.05.2015											
20 m apart to north-east from mine shaft “Vydachnaya”	0,009	0,012	0,0117	4,16	0,0410	0,0211	97,9 kPa	25	+ 31,7	west	2,7
20 m apart to south-west from mine shaft “Vydachnaya”	0,008	0,010	0,0104	4,22	0,0399	0.0204	97,9 kPa	25	+ 31,7	south-east	2,7
20 m apart to east from electrical substation	0,006	0,008	0,0109	3,36	0,0125	0,0197	98,2 (kPa)	27	+31,7	north-east	2,7
20 m apart to east from containment pond	0,004	0,007	0,0164	3,47	0,0217	0,0128	98,3 (kPa)	31	+ 30,2	west	2,9
Shalkiya village from the mine side	0,007	0,010	0,0157	4,66	0,0190	0,0118	98,3 (kPa)	41	+ 35,5	south-west	1,5

Sampling location	Concentration[3], mg/m[3]						Pressure, mmHg	Moisture, %	Temperature, ºC	Wind Direction	Wind Speed, m/s
	Dust	BB	SO_2	CO	NO_2	NO					
$MAC_{m.\ onetime.}$[38], mg/m^3 particulate matter 10 and 2.5 micrometres and less in diameter	0,3	0,5 0,3 0,16	0,5	5,0	0,2	0,4					
WHO[39] (1 hour) Particulate matter Less than 10 μm (24 hours) Less than 2,5 μm (24 hours)		0.050 0.025	0,2	3,0	0,2						

[38] Sanitary Rules "Sanitary and Epidemiological Requirements to the Ambient Air Quality in the Urban and Rural Residential Areas, Soil Quality and Safety, Maintenance of Urban and Rural Residential Areas, and Management of Physical Factors Affecting the Humans". Sanitary Rules Approved by the RK Government Resolution of 25.01.2012 No. 168.

[39] World Health Organisation (WHO). 2006. *WHO Air quality guidelines* for *particulate matter*, *ozone*, *nitrogen dioxide and sulphur dioxide*. 2005

The measurement results indicate that the ambient air quality at the Mine site, within its SPZ and at Shalkiya village was satisfactory at the time of sampling and measured concentrations of carbon monoxide, nitrogen oxide, sulphur oxide and dust did not exceed the national guidelines for air pollutants set as maximum one-time concentrations.

It should be noted that the WHO guidelines and national hygienic standards (for air quality) are not comparable because they have different time-averaging intervals (**Table 28**). The direct comparison of maximum concentrations is therefore not possible for all pollutants due to different time-averaging intervals used to express the concentrations of some pollutants. Nonetheless, the 2007 and 2015 measurement results do not exceed those WHO guidelines that are set using similar time-averaging intervals.

It should be also noted that the 2007 measurement results showed lower concentrations of air pollutants in the ambient air at the Mine site and its environs compared to those from 2015. This could be due to the fact that the Mine resumed its mining operations and the stone crushing plants expanded their production activity with associated increased emission levels.

To provide a correct and accurate air quality assessment it is necessary to conduct a baseline air quality survey before the start of the Mine Expansion Project in line with methodology adopted in Kazakhstan and taking into account the WHO and EU guidelines. The survey should cover the warm and cold seasons in order to provide an accurate picture of baseline air quality and take account of unfavourable meteorological conditions affecting the dispersal of pollutants and impacts on the Mine’s employees and local residents. Significant variability in wind directions and speeds was observed during the ambient air quality survey conducted in 2015 when wind speed grew twofold (from 1.5 to 2.9 m/s) and wind direction changed from west to south west, south east and north east (**Table 27**) during the survey. A one-time measurement of pollutant concentrations over a 20-minute interval is not sufficient to provide an adequate picture of pollution levels in the ambient air and only reflects concentrations in which pollutants are present in the ambient air within a short measurement period. For example, the ambient air quality was measured on the Shalkiya village outskirts under the south-western wind direction when emissions generated at the mine site were not expected to manifest themselves. Wind speed and direction variability further justifies the need for measuring the daily concentrations of pollutants in order to ensure a correct assessment of air quality in line with the WHO guidelines.

Table 28. WHO and RK Pollutant Concentration Guidelines

Pollutant	Time Averaging Interval	RK, mg/m^3	WHO, mg/m^3	EU, mg/m3
CO	15 minutes	-	100	-
	30 minutes	5.0	60	-
	1 hour	-	30	-
	8 hours	-	10	10
	24 hours	3.0	-	-
NO_2	30 minutes	0.2	-	-
	1 hour	-	0.2	0.2 Not to be exceeded more than 18 times a year
	24 hours	0.04	-	0.125 Not to be exceeded more than 3 times a year
	Annual mean	-	0.04	0.04
SO_2	10 minutes	-	0.5	-
	30 minutes	0.5	-	-
	1 hour	-	-	0.350 Not to be exceeded more than 24 times a year
	24 hours	0.05	0.125	0.125 Not to be exceeded more than 3 times a year
	Annual mean	-	0.05	0.02
PM_{10}	30 minutes	0.3	-	-
	24 hours	0.06	-	0.05 Not to be exceeded more than 3 times a year
	Annual mean	-	0.05	0,02

Another important point concerns the lack of information about the concentrations of fine dust particles whose size is less than 10 and 2.5 micrometres. This is a key indicator in the air quality guidelines adopted by the WHO and EU because higher concentrations of fine particles may cause respiratory, cancer and cardiovascular problems. Though this indicator was included in the national air quality regulation system in 2012[40], the measurement of the fine particle concentrations has not yet become part of the commonly adopted air quality monitoring and assessment practice at industry level. Accessible and easy-to-use testing techniques for fine particulate matter are lacking and the wide-scale monitoring of this parameter is therefore limited; the particulate matter concentrations are only measured in major cities or at the baseline stations[41].

As the Project moves forward and testing methods and equipment for fine particulate matter become more accessible in the country, the Mine management should include provision for fine particulate matter in the ambient air quality monitoring programme.

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[40] Sanitary Rules “Sanitary and Epidemiological Requirements to the Ambient Air Quality in the Urban and Rural Residential Areas, Soil Quality and Safety, Maintenance of Urban and Rural Residential Areas, and Management of Physical Factors Affecting the Humans”. Sanitary Rules Approved by the RK Government Resolution of 25.01.2012 No. 168.

[41] B.A. Nemenko, A.D. Iliyasova, G.A. Arynova. Assessment of Hazards Arising from Exposure to Fine Particulate Matter. Available at: http://kaznmu.kz/press/2014/10/16/оценка-степени-опасности-мелкодиспе/

Due to the absence of the ambient air quality monitoring stations in Zhanakorgan district, industrial enterprises are not currently able to receive official information about the baseline ambient air quality at the nearest human settlements and in the adjacent areas from the KazGidroMet Department[42]. This official information is required to enable the air pollution dispersion modelling as part of the national environmental impact assessment (OVOS) process. To characterize the baseline air quality in the OVOS assessment of the underground mining component of the Shalkiya Project, this gap could be addressed by using data from the information note issued by KazGidroMet in 2012[43]. However, during the future preparation of the national OVOS for the processing plant component, the Mine should address the issue of obtaining a suite of air quality monitoring data for the Mine site, SPZ and baseline sites to be sufficient for baseline pollutant concentration estimates that should be included in the OVOS Report for the processing plant.

The air pollution dispersion modelling estimates produced for Years 2017 and 2024 as part of the national OVOS for the underground mine expansion project (KazGiproTsvetMet, 2016) indicate that with the contribution of the stone crushing plants taken into account, the air pollution increment contributed by the Shalkiya Mine is estimated to be about 6% on the SPZ boundaries. The estimated exceedances of the MAC limits are as follows: by 10.3 times for the total dust content; by 16.4 times for inorganic dust with the silicon dioxide content ranging from 70 to 20%; and by 1.59 times for inorganic dust with the silicon dioxide content below 20%. The estimates produced indicate that the major contributors to the ambient air pollution are the Motor Road Management Department LLC and KDSM Kyran LLC.

Air pollution dispersion estimates for the SPZ boundary that do not take account of pollution contributed by the existing stone crushing plants indicate that no exceedances of the MAC limits are expected for both individual pollutants and their groups. The estimated source emissions could be used as reference values for setting the maximum admissible emission (MAE) limits.

In the future, the Shalkiya Mine will have to discuss and agree with the existing stone crushing plant operators whether the common SPZ boundary for all industrial facilities should be relocated or established at the Shalkiya Mine site.

Overall, the OVOS describes the Project related air quality impacts in the Project area as moderate.

Summary

The fact that the current information about the baseline air quality in the Project area is lacking justifies the need for conducting a baseline survey in line with the requirements of the Regulatory Guidance RD 52.04.186-89 "Air Pollution Control Guidance"[44] that would provide data that can be used for preparing OVOS documents. Most likely, the SO_2 or NO_2 ambient air quality concentrations will not exceed the set maximum one-time limits during the Project implementation. However, the concentration of particulate matter, especially the respirable fractions (PM_{10} and $PM_{2.5}$) could exceed guideline values under certain

[42] Kyzylorda Region Branch of KazGidroMet Information Note No. 29-05-02/192 of 12.12.2014

[43] This information note was prepared on the basis of historical statistical data available for similar sites

[44] Please see the information base on the RK legislation: http://online.zakon.kz/Document/?doc_id=31239156.

meteorological circumstances, even though the mine itself will not necessarily be the major source. Dust transport from the areas disturbed due to human activities and wind erosion may contribute significantly to ambient air quality, especially during dust storms. However, it is essential to conduct continuous air quality monitoring of at least respirable particulate matter and total dust levels in combination with the meteorological measurements recommended in Section 6.2.

6.4. Topography

6.4.1. Overview

Kazakhstan has a complex and varied topography with about 10% of the country located in the mountainous area and the rest occupied by lowlands, plains, plateaus and uplands. Kyzylorda Region's terrain is one of a low-ridge mountain range joining the steeply-sloping ridges concentrated in the western part of the Syr Darya Karatau Ridge. Part of the Turan Depression that is gently dipping toward the Aral Sea and the Syr Darya River Valley form the Syr Darya Alluvial Plain.

The Syr Darya River is the main water artery in Kyzylorda Region flowing across the Syr Darya Alluvial Plain. The vast sand dunes of the Kizilkum desert extend along the left bank of the river, intersected by the seasonal Zhanadarya and Kuandarya rivers. Uplands (Yegizkara Mountain, 288 m), depressions and sand areas (Aryskum etc.) are located on the right bank. Salt marshes have developed in the shallow depressions. The sand seas of the Karakum and Kizilkum deserts occupy the north western and south western parts of the Kyzylorda Region. The north western spurs of the Karatau Ridge (with an elevation of up to 1,419 m) extend into the south eastern outskirts of Kyzylorda Region.

The area lying between the north western spurs of the Karatau Ridge and the Syr Darya River valley hosts the Shalkiya lead-zinc deposit that is part of the vast Shalkiya-Talap Ore Field estimated to contain over 12 million tonnes of lead and zinc. The project area has a mountain terrain with elevations of up to 400 m and local height variations of up to 100 m in its north eastern section. The south western section is occupied by a gently undulating plain with elevations of up to 250-300 m and local height variations of 5-15 m (**Figure 22**).

Figure 22: Project Site Terrain within the Mining Allotment Boundaries

The terrain of the mining allotment and adjacent areas is one of a typical proluvial plain extending within the sloping foothills composed of weathered sediments brought from the mountain slopes with surface runoff. The material and energy flows are aligned along the predominant slope dipping toward the Syr Darya

River whose tributaries, the Zhidel and Ak-Uuyuk Rivers and the Shalkiya-Sai Stream, intersect the Project area.

The natural topography within the boundaries of the mining allotment of 6.7 km^2 has changed significantly due to mining and other human activities (**Figure 23**). New natural and technical systems have developed featuring various anthropogenic landforms (dams, stockpiles, ditches, embankments etc. These landforms are destroyed and transformed because of local water and wind erosion, both linear and spatial. Existing natural depressions were used to establish two accumulating ponds for pumped mine water and domestic sewage.

Figure 23: Anthropogenic Landforms

6.4.2. Factors Shaping Local Topography

The key factors that currently shape local topography within the boundaries of the mining allotment and in the adjacent areas, including the settlement of Shalkiya, are various activities occurring at the mine site (placement and movement of earth materials during the construction, upgrade and demolition of industrial and residential facilities, roads, utilities, buildings, structures etc.; mining waste disposal at the designated sites[45], placement of previously generated construction waste on unequipped sites, etc.).

[45] All waste rock brought to the surface in the past has now been handed over to the stone crushing plants for recycling

Existing stone crushing operations (Section 6.1) (**Figure 24**) also affect local topography within the Mine's mining allotment and in the adjacent areas. One stone crushing plant is located within the boundaries of the mining allotment quarries and processes gravel and rock. Rock is also extracted from quarries located to the north and north east of the Mine site. Stone crushing operations cause the technogenic transformation of the area through the development of quarries, temporary storage of rock material to be processed and waste rock dumps located at the plant sites.

It should be noted that in the past these plants used to accept overburden materials from the Mine for recycling thus helping reduce the amount of waste rock in stockpiles. For example, all historically accumulated overburden materials have been recycled; the impact of waste rock dumps on local topography has been thereby reduced.

Figure 24: Adjacent Stone Crushing Plant

With the existing human activities taking place in the Project area, natural factors shaping local topography play a secondary role.

Summary

Current technogenic transformation of the natural topography at the Mine site is associated with the development of multiple locations where the natural terrain has been disturbed (water bodies, ditches, excavations, stockpiles, etc.) and contributes to active dust generation and other Aeolian processes. The most sensitive areas at the industrial site are concentrated at elevations of over 250 m above sea level. Generally, the rate of transformation/degradation of the local terrain within the sanitary protection zone (SPZ) is estimated at 30% of the SPZ area.

While the technogenic factors shaping local topography appear to be not very prominent at the Mine site and within the SPZ boundaries, the construction of new facilities (processing plant and TSF) and the waste rock storage area will further increase the proportion of disturbed and transformed areas.

6.5. Soil Cover

The first soil survey at the Mine site was conducted by the EcoLimit Centre in 2005-2007. The survey involved the characterization of soil morphology and contamination levels, and examination of physical/chemical properties and agrochemical indicators[46]. Soil was sampled at different layers using test holes of up to 60 cm made throughout the Mine site and beyond its boundaries (Annex 5 and 6). The soil profile samples were collected on the boundaries of the Sanitary Protection Zones established for stockpiles, pits, and water ponds. Soil sampling locations are schematically shown in **Figure 21**. In 2013-2014 and onwards, the soil and vegetation monitoring is conducted once a year as per the established network of observation points as part of the Shalkiya Mine Industrial Environmental Monitoring Program for 2015-2017 (Annex 7).

The soil development in the study area is influenced by the extremely dry conditions existing in the northern deserts (**Figure 25**). In summer, soil surface is affected by acute temperature fluctuations throughout the day. For example, the soil surface temperature can rise up to +67.5 ºC during the day and drop to +10.7-20 ºC during the night in July. Generally, such abrupt variations in temperature affect the development of vegetation cover and soil fertility.

The following soil types dominate the soil pattern at the Shalkiya Mine site: light grey soil covering the steep and gentle foothills of the Karatau Mountains; common grey soil; and grey-brown soil widespread in the piedmont plains.

Figure 25: Typical Soil and Vegetation Cover in the Project Area

Light grey soil is widely distributed throughout the piedmont plains lying at 165-200 m above sea level. This soil has developed on the Quaternary diluvium/proluvium sediments and occurs in non-saline and saline forms. The mechanical composition of light grey soil comprises light loam changing to light loamy sand along the depth. Pebbles occur throughout the entire depth of the soil profile. The salinated grey soil profile includes the following layers:

0–7 cm. Light grey fine-grained loosely consolidated dry porous loam penetrated by roots. Each soil horizon encountered along the soil profile has a distinct colour.

7–50 cm. Light pale brown unstructured loosely consolidated loam with salt inclusions that are mainly concentrated in the bottom section of the soil profile. The soil is penetrated by roots and has no obvious colour change along the depth of the soil profile.

[46] EcoLimit Centre. Scientific Research Report: Environmental Monitoring at the Shalkiya Mine Waste Storage Area. 2007.

50–124 cm. Grey-brown loose unstructured loamy sand with numerous salt inclusions, penetrated by roots and insect holes. The colour change between soil horizons is distinct.

124–150 cm. Greyish-brown unstructured loose sand with small pebble and rare salt inclusions. Not penetrated by roots.

Light grey soil has a low humus content (less than 1 %), which acutely decreases as one moves down the soil profile. The upper soil horizon is slightly salinated.

Common grey soil occurs on the flat upland areas and gentle slopes (from 400 to 600 m above sea level). Precipitation falling in this part of the mountain area promotes the growth of grass, especially in spring. As a result, local soil receives large amount of plant matter that helps accumulate organic matter. This soil has a very shallow profile comprising the following horizons:

0–21 cm. Brown-grey granulated loosely consolidated silty loam penetrated by plant roots and insect holes. Small crushed stone pieces occur in this layer.

21–42 cm. Brownish cloddy loam containing numerous crushed stone pieces, carbonate inclusions and plant roots.

42–61 cm. Light loam with greenish weathered mother rock residues and brownish carbonate spots.

Common grey soil contains a lot of crushed stone pieces and can be covered with a thin sod layer.

Grey-brown soil is widely distributed in the piedmont plains. It covers the tertiary Cretaceous deposits and occurs at elevations ranging from 130 to 500 m above sea level. The soil profile is relatively shallow. The upper humus horizon is similar to the coarse-pore grey loose cake and has a low humus content (up to 1 %). Loam prevails in the mechanical composition of this soil, which is typically not salinated and mainly used for growing pastures.

The agrochemical test results (Annex 5) characterize local soil as infertile and of low productive potential. The common and light grey soils have a thin humus horizon ranging from 0.82% to 1.13% and low levels of nitrogen, humus and phosphorus available to plants. The soils have a weak to high alkalinity with pH in water extract ranging from 7.75 to 9.47 over the entire depth of the soil profile. The soils have quite a significant amount of potassium in mobile form.

In 2015, a special soil survey was conducted at two sites where the Southern and Ventilation shafts are planned to be constructed, occupying 2.7 and 1.5 ha, respectively[47]. The survey results indicate that a weakly salinized light grey soil with a moderate content of sandy loam and small inclusions of rubble prevails at the Southern shaft site. This soil has a humus content of 0.6-1.6% in the soil horizon A, which gradually decreases with depth to 0.2-1.4% in the soil horizon BC. The carbonate content in the top horizon is 5-7% and increases to 8-10% in the BC or C horizons. Depending upon the salt occurrence depths, soil can be described as deeply lying salinised soil (80-150 cm) and salinised soil (30-80 cm).

[47] Soil Survey Conclusion for the Shalkiya Mine’s Southern and Ventilation Shaft Sites (occupying 2.7 and 1.5 ha, respectively, at the Shalkiya Deposit Area in Zhanakorgan District, Kyzylorda Oblast). Kyzylorda Branch of NPCZem RGP, 2015.

The top layer of this soil has medium sandy loam content with silt and clay content being at 35.25% and a weighted average humus content of 1.48%, which is very low. The bulk phosphorus availability is also low (0.090%) and the bulk nitrogen content is 0.091%. The grain size composition of the soil comprises coarse dust particles (10.48%), fine sand (43.80%) and silt (18.66%). Based on the nature of salts, the soil is characterised as chloride/sulphate and sulphate/chloride. The soil bonitationscore is 19 where the scale ranges from 0 as the lowest to 100 as the highest indicating the poor productivity of the soil.

The Ventilation shaft site has highly salinised grey-brown soil, with a low sandy loam content and small inclusions of rubble. This soil typically develops under the arid climate conditions on the basis of weakly graded rubble and rocky deposits.

This soil has very low weighted average humus content (1.11%) that does not extend deeper than 50 cm. A distinct feature of the grey/brown soil is the presence of a 2-5 cm spongy crust on the surface. According to the chemical testing results, the upper soil layer has low sandy loam content with a silt and clay content being at 27.58%. The bulk nitrogen content is 0.084% with a bulk phosphorus availability being weak (0.080%).

The soil has high carbonate content and its grain size composition comprises coarse dust (18.15%), fine sand (2.64%) and silt (14.86%). Based on the nature of salts, the soil is characterised as chloride/sulphate and sulphate/chloride. The average total salt content is 0.54%; the soil bonitation score is 6, which is extremely poor productivity.

6.5.1. Topsoil Pollution Monitoring

The results of the detailed survey conducted in 2005-2007 and comprising layer-by-layer chemical tests conducted to determine the bulk concentrations of toxic metals (nickel, cobalt, molybdenum and zinc) and their mobile forms in soil (Annex 6) indicate that soil is contaminated by toxic metals at the main site within the SPZ boundaries and within the mine's area of impact. Soil at the baseline sites was also found to contain toxic metals at elevated concentrations.

It can be concluded that the elevated concentrations of toxic metals reflect a natural geochemical abnormality existing in this area while there is no indication of any significant technogenic impact affecting the condition of soils. This conclusion can be confirmed by the fact that metals at elevated concentrations occur throughout the entire depth of the soil profile. In the areas where soil is significantly affected by technogenic impacts, the upper soil horizons would be more considerably contaminated than deeper ones.

The soil samples contain such trace metals as nickel, cobalt, molybdenum and zinc at slightly elevated concentrations compared to maximum allowable concentrations. The concentrations of barium and manganese occasionally exceed the guideline levels.

The following conclusions can be drawn from the review of soil testing results:

- The detected exceedances of guideline maximum admissible concentrations of heavy metals are evenly distributed across all soil profiles at all surveyed sites including the main industrial site and baseline areas. This suggests that the local geochemistry is characterised by elevated background concentrations and naturally higher heavy metal levels. In these circumstances, the technogenic impact on soil only adds to the naturally elevated background concentrations, not causing any significant increase in metal concentrations in soil and vegetation cover near the Mine site;

- According to the RK Sanitary Rules[48], the total levels of pollutants present in soil in various forms and measured through chemical tests are considered to be acceptable. Only zinc was found to have accumulated in soil in small quantities slightly exceeding the guideline levels; no exceedances were detected for other substances[49].

The results of the ongoing soil monitoring (Annex 7), that is performed once a year, also indicate a relatively minor contribution of industrial sources to the soil contamination in the surrounding areas. It is however expected that the level of technogenic impact may increase in the future as ore crushing, grinding and processing equipment will become operational at the processing plant. It is therefore required to continue and maintain the regular monitoring of soil contamination within the SPZ boundaries and at the baseline sites.

6.5.2. Vegetation Cover Monitoring

Starting from 2007, vegetation cover has been monitored within the SPZ boundaries around the mine site and at the baseline site to determine the levels of pollution with key ore compounds. The indicator species (Artemisia terrae-albae) samples are collected at the monitoring locations shown in the map (Figure 26)[50].

The levels of ore compounds in mobile forms (that are considered to be most dangerous for biota) in the vegetation cover samples do not exceed the maximum acceptable limits (MAL) for lead and zinc. However, the MAL levels are exceeded for nickel (2.44 – 3.34 times the MAL level), cobalt (1.76 – 2.20 times the MAL level) and chromium (1.92 – 5.04 times the MAL level) in mobile forms. The fact that there appears to be correlation between these exceedances and elevated levels of these metals in soil suggests the abnormal natural phenomenon in terms of higher levels of nickel, cobalt and chromium in plants.

[48] Sanitary Rules «Sanitary and Epidemiologic Requirements to the Ambient Air in the Urban and Rural Areas, Soil Quality and Safety, Maintenance of Urban and Rural Settlement Areas, and Management of Physical Factors Affecting Human Health» (approved by the RK Government Resolution of 25.01.2012 No. 168).

[49] EcoLimit Centre. Scientific Research Report: Environmental Monitoring at the Shalkiya Mine Waste Storage Area. 2007.

[50] Research Report: Environmental and Industrial Monitoring at the Waste Storage Areas at the Shalkiya Mine Site. EcoLimit Centre, 2007

Table 29 Results of Chemical Tests of Plant Samples Collected in 2007

Sampling location No.	Metal content (mobile form), mg/kg								
	Cu	**Zn**	**Pb**	**Ni**	**Co**	**Cd**	**Cr**	**As**	**Hg**
4	15,54	28,44	3,50	**2,88**	**1,88**	н/о	**5,04**	н/о	н/о
6	12,00	22,00	3,00	**3,00**	**1,80**	н/о	**3,70**	н/о	н/о
8	12,82	26,20	2,74	**3,34**	**1,76**	н/о	**4,16**	н/о	н/о
11	11,20	32,40	2,78	**3,12**	**1,90**	н/о	**4,34**	н/о	н/о
13	11,16	16,30	3,06	**2,44**	**2,00**	н/о	**1,92**	н/о	н/о
14	13,72	15,36	2,90	**2,96**	**2,20**	н/о	**2,24**	н/о	н/о
MAL level	30,00	50,00	5,00	1,00	1,00	н/о	0,50	0,5	0,1
Note. Exceedances above the MAL level are printed in bold									

The recent test results for plant samples (Annex 21) show that there is no significant difference between the metal levels in plant samples collected at the baseline sites and near the mine water pond. While vegetation generally contains metals at elevated concentrations, it should be however noted that the MAL guidelines apply to food products and using them to assess pollution levels in plants growing in the area of direct influence of the mine is not exactly appropriate.

Summary

Soils at the industrial site and in the surrounding areas are poor and of low productivity; partial soil re-deposition has occurred as a result of past industrial activities. The disturbed soil layer in the areas that have undergone profound transformation cannot be restored. Storing the stripped topsoil material is considered to be not practical due to a thinness and poor fertility of the humus layer. Topsoil material after stripping should be used promptly onsite for restoration and landscaping.

There appears to be the abnormal natural phenomenon in terms of elevated concentrations of ore compounds in topsoil and plant samples both at the baseline sites and in the immediate vicinity of the industrial facilities at the mine site. It is therefore considered that the monitoring of vegetation cover would be required as part of the Project.

6.6. Geology

The Shalkiya deposit is located on the southwestern foothills of the Karatau Range and is classified as a stratiform lead-zinc deposit.

The structure of the deposit (**Figure 26**) consists of sandstones and siltstones of the Tulkubash series (Middle-Upper Devonian) and conformable overlying dolomitic siliceous formations of the Upper Devonian Famennian stage[51].

The deposit is composed of a complex characteristic of lead-zinc deposits in carbonate strata. The section of the carbonate formation reaches maximum thicknesses of 1,400 m. Intrusive rocks at the deposit are represented by mica lamprophyre, near-kersantite dikes. The dikes are a maximum of 2-3 m thick.

All mineable stratiform lead-zinc mineralization of the Shalkiya deposit is confined to a single ore-bearing unit in the mid-Upper Famennian (D3fm3b). In contrast to the underlying and overlying sediments represented mainly by limestone, dolomite and quartz predominate over calcite in the producing unit, and iron, aluminium, lead, zinc and organic carbon are persistent in appreciable amounts. Six subunits are identified in the ore-bearing unit (upward):

[51] Freiman G.G., Topoyev A.N., Selifonov S.E., Akhmetov K.S et al. Report on the Estimated Lead and Zinc Ore Reserves in the North Western Property of the Shalkiya Mine (Kyzylorda Region). GeoInCentre LTD, Almaty, 2004. Also, Agafonov V.A., Freiman G.G., Topoyev A.N. et al. Report on the Estimated Lead and Zinc Ore Reserves in the South Eastern Property of the Shalkiya Mine (Kyzylorda Region) as of 01.01.2006. GeoInCentre LTD, Almaty, 2006.

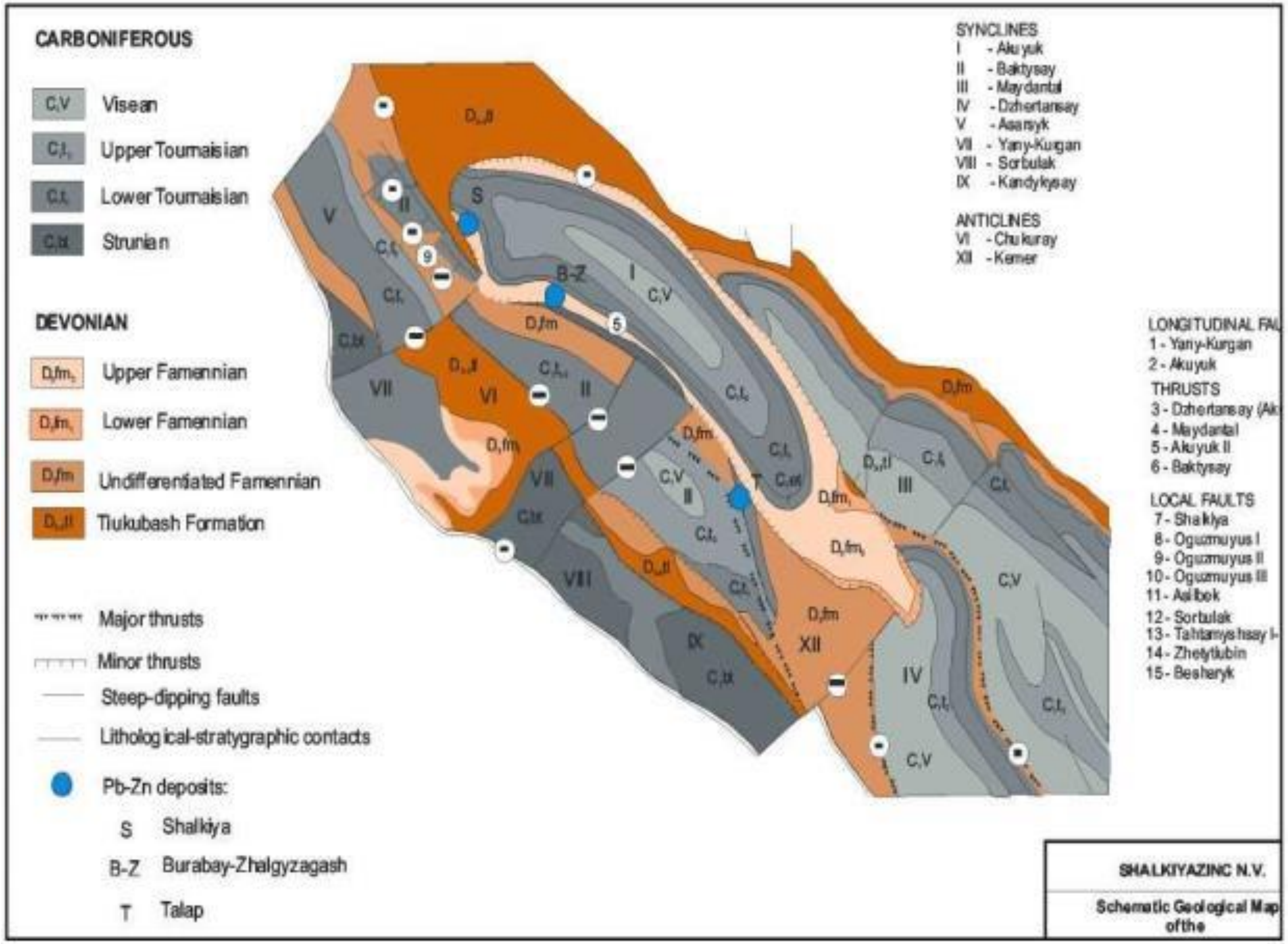

Figure 26: Geologic Structure of the Deposit

- lower pyritic siliceous rhythmites 10-30 m thick
- lower grey dolomites and limestones 5-30 m thick
- middle producing rhythmites 5-20 m thick
- rhythmic dolomitic mottled breccias and dolomites 3-15 m thick
- upper producing rhythmites 5-20 m thick
- upper dark grey and black dolomites 5-30 m thick.

Rhythmites are an important component of the ore-hosting unit, consisting mainly of dolomites with thin- and micro-laminated varieties. The rocks vary in colour from light to dark grey and black due to an admixture of fine carbonaceous and clay and siliceous materials. The dolomites vary in structure from aphanitic and pelitomorphic to microgranular and granular.

Sulphide mineralization (individual rare veinlets, isolated nested clusters and inclusions of sphalerite, galena and pyrite) is identified in nearly all rock types of the ore-hosting unit; commercial mineralization is confined to the third and fifth subunits. The first and sixth subunits have minimal ore saturation.

The ores are considered to be of sedimentary diagenetic origin by many researchers who have studied the deposit. The Shalkiya deposit is a typical example of stratiform deposits in carbonate rocks; i.e., in their genesis and morphological conditions, the ores are allied with the formation of the host rocks.

The deposit is up to 5 km long and up to 1,150 m wide. It has a general SW – NE trend with a dip of 15-20 (to the southeast). Mineralization is traced vertically for more than 800 m.

The deposit is divided into North-Western and South-Eastern sections following one after the other along the strike and at depth; the conventional boundary between the sections runs along the zero profile. The North-Western section is bounded in plan by profile 22 in the northwest and the zero profile in the southeast; the South-Eastern section is bounded in plan by profile minus 29 in the southeast.

The depth of occurrence of the ore bodies from the surface ranges from 40-50 m to 680 m in the North-Western section, and from 530 m to 860 m in the South-Eastern section.

Two primary ore bodies are identified at the deposit: Upper and Lower. Both ore bodies have a tabular shape and are associated with lenses.

An overturned syncline is the common morphological element determining the dimensions and shape of the Upper and Lower ore bodies. The fold is dissected by post-ore faults into several fault blocks.

Dimensions of the ore bodies in the North-Western section: 2,200-2,400 m long northwestward, up to 1,150 m wide northeastward, with average vertical thickness of 12-13.5 m.

The ore bodies in the South-Eastern section are traced for 2,060-3,340 m along the strike and are up to 890 m wide; the average thickness of the ore bodies varies from 7.1 to 10.2 m.

The ores of the deposit are commercial lead-zinc in carbonaceous-siliceous carbonate rocks, with zinc predominating over lead. The lead to zinc ratio varies from 1:2 to 1:20. Average contents in the in-place reserves are 1.28% lead and 4.27% zinc.

Ores with a bedded structure are the most abundant; disseminated, pocket-disseminated and brecciated ores are less represented.

The ores typically have a fairly simple mineral composition. The primary ore minerals are sphalerite, galena and pyrite; accessory minerals are fahlore and arsenopyrite[52]. Rock-forming minerals are represented mainly carbonates (dolomite, and more rarely calcite) and quartz. Micaceous clay aggregates, feldspars and carbonaceous matter have subordinate value.

The mineral composition of the ores in the deposit is given in **Table 30**.

Table 30. Mineral composition of the ores[53]

Ores	Types of minerals	Primary	Accessory	Rarely and very rarely occurring
Source	Ore	Sphalerite Galena Pyrite	Fahlore Arsenopyrite[54]	Chalcopyrite Bournonite Jordanite Marcasite Magnentite Hematite Martite
	Non-metallic	Dolomite Quartz Sericite Carbonaceous matter	Calcite Fluorite Chlorite	Witherite Muscovite Epidote Apatite Potassium feldspar
Hypergene			Anglesite Cerussite Plumbojarosite Smithsonite Goethite Hydrogoethite	Bornite Chalcosine Covellite

The composition of ores and host rocks according to the data of [55] and [56] is given in **Table 31** and **Table 32**.

[52] AMC Consultants Pty Ltd. Assessment of Mineral Resources and Reserves (2007).

[53] AMC Consultants Pty Ltd. Assessment of Mineral Resources and Reserves (2007)

[54] The documents provided show different levels of arsenopyrite content in ore varying from one of minor mineral to below detection limits.

[55] Freiman G.G., Topoev A.N., Selifonov S.E., Akhmetov K.S., et al. “Report with estimation of reserves of lead-zinc ores in the Northwestern section of the Shalkiya deposit (Kyzylorda Region)”. Geoincentre LLP, Almaty, 2004.

[56] Agafonov V.A., Freiman G.G., Topoev A.N., et al. “Report with estimation of reserves in the Southeastern section of the Shalkiya lead-zinc deposit as of January 1, 2006 (Kyzylorda Region)”. Geoincentre LLP, Almaty, 2006.

Table 32Table 31. Chemical composition of the ores

Elements	North-Western section	South-Eastern section
Lead, %	1.0	1.16 – 1.4
Zinc, %	4.03	2.94 – 4.2
Cadmium, %	0.006	0.007
Bismuth, %	0.000006	0.001
Silver, g/t	3.5	2.6 – 4.0
Gold, g/t	0.04	0.4 – 0.6
Cobalt, %	0.002	0.005
Selenium, %	0.0001	0.0004
Germanium, %	0.0007	0.001
Nickel, %	0.0024	0.005

Table 32. Content of chemical elements in ores and host rocks

Elements	Clarke for sedimentary (carbonate) rocks, %	Content in ore-hosting rocks, %	Content in the ore, %
Lead	0.00075	0.006	0.9
Zinc	0.005	0.0035	3.3
Copper	0.002	0.001	0.006
Arsenic	0.00066	0.002	0.003
Cadmium	0.00003	-	0.006
Bismuth	0.000001	-	0.000006
Silver	0.00002	0.00005	0.00035
Gold	0.00000007	-	0.000004
Barium	0.012	0.06	0.02
Cobalt	0.002	0.0003	0.0018
Indium	0.000005	-	0.0001
Thallium	0.0001	-	0.0001
Selenium	000001	-	0.0001
Tellurium	0.000001	-	0.0001
Mercury	0.000003	-	0.00001
Sulphur	0.11	0.31	3.3
Germanium	0.0002	0.0005	0.0007
Antimony	0.0002	-	0.001
Gallium	0.00037	0.00015	0.0005
Molybdenum	0.0002	0.00026	0.0005
Nickel	0.0005	0.0056	0.0024

Silver, cadmium, germanium and sulphide are accompanying elements in the ores. Organic carbon 0.62%, soluble bitumen 0.074% and nitrogen 0.11% are also identified in the ores.

The results of more recent geochemical tests of the main types of ore deposits conducted by Outokumpu Technology as part of the processing plant design and process development[57],[58] are presented in **Table 33** below. As can be seen from

[57] Outokumpu Technology Minerals Oy (Finland). Shalkiya process development project –Mineralogy. Mineralogical characterization of ore samples and grinding products. 2006

[58] Outokumpu Technology (Finland). Shalkiya Concentrator – Basic Engineering Project. 2008

this table, the levels of toxic compounds in various types of ores vary significantly. Sphalerite has an elevated level of cadmium (from 0.09 to 0.32 %). Pyrite has a relatively high arsenic content, the average value being 0.41% As. The arsenic content of pyrite varies from below detection limits (0.14%) up to 1.15% As.

Table 33. Chemical composition of minerals used in quantitative estimations (average grade). Sphalerite, galena and pyrite according to Kylakoski and Sotka, 2006

Mineral	Sphalerite	Galena	Pyrite	Chalcopyrite	Dolomite	Quartz	Gangue
C %					13.03		
O %					52.06	53.26	
Mg %			0.13		13.18		
Si %						46.74	
S %	33.43	13.67	52.30	34.94			
Ca %	0.03				21.73		
Fe %	0.37		47.30	30.43			
Co %			0.00				
Ni %			0.01				
Cu %			0.01	34.63			
Zn %	65.51		0.11				
As %	0.01		0,40				
Se %	0.01		0.00				
Ag %	0.00	0.01	0.02				
Cd %	0.15		0.00				
Sn %			0.01				
Sb%	0.01	0.02	0.01				
Te %			0.00				
Hg %	0.01						
Pb%		85.46					
SG	4,05	7,40	5.01	4.35	2.85	2.65	2.90

The average ore density in the deposit is 2.82 t/m^3. The natural humidity of the ores varies from 0.01 to 0.06%. The density of the ore-hosting rocks varies from 2.54 to 2.83 t/m^3; the average is 2.7 t/m^3.

The rocks and ores of the deposit typically have high free silica content from 38 to 51.2%, and the deposit may be classified as a potential silicosis hazard. The maximum permissible dust concentration in the air of underground mine workings shall not exceed 2 mg/m^3.

The detailed exploration of the Shalkiya deposit undertaken by the Karatau Geological Exploration Team and survey conducted by the GeoCentre LLC showed no indication of fibrous silicate (asbestos) inclusions being present in ores and rocks.

The deposit is not a fire hazard. The ores and rocks are not prone to spontaneous combustion and are not explosive. The ores typically have a low sulphur content (2.65-5.9%).

6.6.1. Deposit Reserves

The Shalkiya deposit was explored successively in two phases: initially in the North-Western section and then in the South-Eastern section.

Prospecting and evaluation work was carried out in the North-Western section in 1963, and reconnaissance, from 1964 to 1968, inclusive. An estimate of category

C_1 and C_2 reserves according to drillhole exploration data confirmed the large scale of the deposit and justified more detailed exploration.

Detailed exploration of the North-Western section was carried out in 1972-1975, and additional exploration, in 1976-1979. Core drilling was the main type of exploration during all exploration stages. A prospecting shaft 108 m deep with a series of underground mine workings at the 163 m level was driven in order to study the morphology of the ore bodies, take pilot samples and analyse selective core grinding in the North-Western section (profile 18).

The commercial categories of the reserves in the North-Western section were approved twice by the State Reserves Committee of the USSR (SRC USSR) – in 1976 and 1979 (minutes No. 7575 of January 30, 1976 and No. 8410 of December 5, 1979). Pilot production was carried out from the underground mine workings of the North-Western section in 1986-1994.

The South-Eastern section of the deposit, which was identified in 1981, is distinguished by deeper occurrence of the ore bodies. Reconnaissance was carried out in 1983-1987 using the same method as for the North-Western section. The positive results that were obtained allowed a move to detailed exploration in 1987 (1987-1994). In contrast to the North-Western section, the South-Eastern section was explored only with core holes.

The package of exploration work performed in both sections of the deposit made it possible to estimate the reserves and obtain approval of their commercial categories from the SRC RK (minutes No. 35 of December 28, 1995).

The SRC RK assigned the Shalkiya deposit to the second group with respect to geological complexity for exploration purposes[59].

In 2003, the license holder of the deposit, JSC ShalkiyaZinc LTD, decided to update the deposit’s earlier mineral reserve base by formulating new commercial conditions and estimating the reserves based on them.

Geoincentre LLP carried out a geologic and economic reappraisal and reserve estimation for the North-Western section of the Shalkiya field to the minus 80 meter mark in 2004 (minutes of the SRC RK No. 351-04-U of December 7, 2004[60]), and for the North-Western section below the minus 80 meter mark and the South-Eastern section in 2006 (minutes of the SRC RK No. 495-06-U of March 28, 2006[61]).

Pilot operations (North-Western section) resumed at the Shalkiya deposit starting in 2004, and continued until 2008.

In-place reserves of the deposit by category as of January 1, 2014 are given in **Table 34** and are characterized by the following ratio:

- category B+C_1 reserves – 87.1%
- category C_2 – 12.9%.

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[59] Classification of solid mineral reserves and inferred resources of deposits. Approved by Order No. 268-P of the Chairman of the Committee of Geology and Subsoil Use of the RK of August 28, 2001.

[60] Minutes of the SRC RK No. 351-04-U of December 7, 2004

[61] Minutes of the SRC RK No. 495-06-U of March 28, 2006

Table 34. Deposit reserve estimates used in the design

Reserves in place			Losses, %	Dilution, %	Commercial reserves[1]		
Ores thousand t	Metals %/ thousand t				Ores, thousand t	Metals %/ thousand t	
	lead	zinc				lead	zinc
North-Western section							
57074,6	1.13 646.0	4.36 2487.2	18.4	11.2	52447	1.01 527.14	3.87 2029.56
South-Eastern section							
70386,9	1.41 992.4	4.20 2957.1	18.4	11.2	64679	1.25 809.78	3.73 2412.98
Total for the deposit							
127461,5	1.29 1638.4	4.27 5444.3			117126	1.14 1336.92	3.79 4442.54

Note: [1] - contents in operational reserves are counted without diluting the content of metal in bulk.

Reserves of associated components are also counted within the in-place reserves: cadmium – 11,267.1 t; germanium – 995.8 t; and silver – 432.3 t.

6.6.2. Assessment of Acid-Base and Metal Leaching Potential of Ore and Rock

The acid rock drainage and metal leaching (ARD/ML) may occur during the development of sulphide bearing mineral deposits located in various climatic zones. When sulphide bearing minerals present in waste rock, tailing waste and cut-off grade ore are exposed to air and water, this may cause the generation of sulphates and acidic drainage and subsequent leaching of metals[62].

One of the compulsory requirements of the IFIs' guidelines on the assessment of environmental impacts of mining[63] is assessing the ARD/ML risk. Mine water contact with the disturbed rock and ore underground should also be assessed for the acid and toxic drainage potential[64].

To prevent and avoid any adverse impact associated with the release of the acidic drainage to the environment (surface water and groundwater), soil, plant life), a mining company is required to assess the ARD/ML risks and take these risks into account in the design and development of waste rock storage sites, tailings storage facilities, mine water discharges and so forth. If the assessment indicates that the ARD/ML risks are likely to be significant, the company is required to develop and maintain the Potentially Acid Generating Waste and Mine Water Management Plan in order to minimize adverse environmental impacts. One of key mechanisms for managing the ARD/ML potential is designing waste rock dumps and disposing of tailings waste in a manner that takes account of the ARD/ML generation projections. The risk of ARD/ML can be countered using waste carbonate rock that can be mixed with the sulphide bearing waste rock or applied as an intermediate cover to neutralize acidic drainage and reduce toxic metal leaching risk.

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[62] International Network for Acid Prevention, the Global Acid Rock Drainage Guide, 2014

[63] IFC, 2007. Environmental, Health and Safety Guidelines for Mining.

[64] Policy for Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia, BC MEM 1998. Available at: www.em.gov.bc.ca/Mining/MinePer/ardpolicy.htm

It is important to ensure that the fact that toxic metal leaching may occur in the neutral or slightly alkaline environment is taken into account in the assessment of the ARD/ML potential[65].

To enable the ARD/ML assessment, a suite of rapid Acid Base Accounting (ABA) tests should be planned and implemented as early as possible starting from the geological exploration and FS stages. The results of the ABA would be used to assess the ARD/ML risks for all types of rock materials that would be mined, disturbed or processed. Longer duration kinetic tests that require several months are conducted if necessary at a later stage. These tests are conducted in humidity cells and attempt to simulate behaviour of ore and rock in the natural environment.

IFC EHS Guidelines for Mining (2007) recommend that both static and kinetic tests are conducted on an ongoing basis, i.e. along with the expansion of exploration or mining activities at the mine site.

Special rapid and long-duration kinetic tests are performed in accordance with internationally recognized techniques to ensure comparability of test results for this deposit with those obtained for similar deposits[66] [67].

The rapid assessment of ARD potential is performed on the basis of the ABA values characterizing the acid (sulphide) producing and acid neutralizing potential of rocks and the AP/NP ratio.

To enable the assessment of Acid Rock Drainage and Metal Leaching potential, the Outotec company in 2006 conducted a suite of static geochemical tests for rock and ore present in the Shalkiya deposit[68]. The test results were used to determine the acid-producing and neutralizing potential, levels of sulphur and oxygen, and both organic and inorganic oxygen **(Table 35).** Overall, 24 ore and 24 bearing rock samples were collected.

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[65] MEND Report 1.20.1. 2009. Prediction Manual for drainage chemistry from sulfide geological materials

[66] Sobek, A.A., Schuller, W.A., Freeman, J.R. Smith, R.M. 1978. Field and Laboratory Methods Applicable to Overburden and Minesoils. EPA 600/2-78-054.

[67] MEND Report 1.20.1. 2009. Prediction Manual for drainage chemistry from sulfide geological materials

[68] Outotec, 2006. Shalkiya Process Development Project – Mineralogy. Mineralogical characterization of the ore samples and grinding products.

Table 35. Geochemical Test Results Used to Assess the Acid Generating Potential[69]

Sample	Total Sulphur (%)	Total Carbon (%)	Organic C (%)	Total Inorganic Carbon (%)	Acid Generating Potential (kg CaCO3/tonne)	Acid Neutralizing Potential (kg CaCO3/tonne)	Net Neutralizing Potential (kg CaCO3/tonne)	Neutralizing Potential Ratio (NP/AP)
Primary Ore Samples								
L06012909	5.42	5.43	1	4.43	169.4	369.0	199.6	2.18
L06012910	2.94	7.3	1	6.3	91.9	524.8	432.9	5.71
L06012911	2.51	6.52	1	5.52	78.4	459.8	381.4	5.86
L06012912	3.31	7	1	6	103.4	499.8	396.4	4.83
L06012913	3.82	4.16	1	3.16	119.4	263.2	143.9	2.21
L06012914	5.39	5.79	1	4.79	168.4	399.0	230.6	2.37
L06012915	6.37	5.65	1	4.65	199.1	387.3	188.3	1.95
L06012916	3.77	6.85	1	5.85	117.8	487.3	369.5	4.14
L06012917	3.41	6.84	1	5.84	106.6	486.5	379.9	4.57
L06012918	5.08	6.88	1	5.88	158.8	489.8	331.1	3.09
L06012919	5	7.8	1	6.8	156.3	566.4	410.2	3.63
L06012920	8.61	5.27	1	4.27	269.1	355.7	86.6	1.32
L06012921	3.62	7.03	1	6.03	113.1	502.3	389.2	4.44
L06012922	3.65	7.06	1	6.06	114.1	504.8	390.7	4.43
L06012923	3.43	7.97	1	6.97	107.2	580.6	473.4	5.42
L06012924	3.41	6.24	1	5.24	106.6	436.5	329.9	4.10
L06012925	5.23	6.36	1	5.36	163.4	446.5	283.1	2.73
L06012926	6.88	6.54	1	5.54	215.0	461.5	246.5	2.15
L06012927	7.03	7.7	1	6.7	219.7	558.1	338.4	2.54
L06012928	4.22	6.58	1	5.58	131.9	464.8	332.9	3.52
L06012929	2.21	7.64	1	6.64	69.1	553.1	484.0	8.01
L06012930	4.18	7.2	1	6.2	130.6	516.5	385.8	3.95
L06012931	5.75	6.18	1	5.18	179.7	431.5	251.8	2.40
L06012932	7.4	6.69	1	5.69	231.3	474.0	242.7	2.05
Primary Wall Rock Samples								
L06012885	1.24	4.39	1	3.39	38.8	282.4	243.6	7.29
L06012886	1.64	5.71	1	4.71	51.3	392.3	341.1	7.66
L06012887	1.73	8.72	1	7.72	54.1	643.1	589.0	11.90
L06012888	0.62	9.46	1	8.46	19.4	704.7	685.3	36.37
L06012889	4.6	5.46	1	4.46	143.8	371.5	227.8	2.58
L0601289	0.89	8.59	1	7.59	27.8	632.2	604.4	22.73

[69] Shalkiya Geochem From Outotec2006Mineralogy_2015 07 15

Sample	Total Sulphur (%)	Total Carbon (%)	Organic C (%)	Total Inorganic Carbon (%)	Acid Generating Potential (kg CaCO3/tonne)	Acid Neutralizing Potential (kg CaCO3/tonne)	Net Neutralizing Potential (kg CaCO3/tonne)	Neutralizing Potential Ratio (NP/AP)
0								
L06012891	2.12	9.72	1	8.72	66.3	726.4	660.1	10.96
L06012892	1.86	6.56	1	5.56	58.1	463.1	405.0	7.97
L06012893	2.43	6.43	1	5.43	75.9	452.3	376.4	5.96
L06012894	0.56	9.3	1	8.3	17.5	691.4	673.9	39.51
L06012895	1.48	8.4	1	7.4	46.3	616.4	570.2	13.33
L06012896	1.88	11	1	10	58.8	833.0	774.3	14.18
L06012897	1.54	6.11	1	5.11	48.1	425.7	377.5	8.84
L06012898	3.28	7.15	1	6.15	102.5	512.3	409.8	5.00
L06012899	1.87	9.68	1	8.68	58.4	723.0	664.6	12.37
L06012900	2.56	6.48	1	5.48	80.0	456.5	376.5	5.71
L06012901	1.99	9.31	1	8.31	62.2	692.2	630.0	11.13
L06012902	1.31	8.53	1	7.53	40.9	627.2	586.3	15.32
L06012903	4.3	9.72	1	8.72	134.4	726.4	592.0	5.41
L06012904	1.79	7.21	1	6.21	55.9	517.3	461.4	9.25
L06012905	8.25	9.84	1	8.84	257.8	736.4	478.6	2.86
L06012906	1.43	9.32	1	8.32	44.7	693.1	648.4	15.51
L06012907	4.51	6.46	1	5.46	140.9	454.8	313.9	3.23
L06012908	3.69	9.19	1	8.19	115.3	682.2	566.9	5.92

The test results for ore and rock samples are summarized below:

1. Sulphur content in the tested samples is generally relatively high and ranges between 2.2-8.6% and 0.56-8.25 % in ore and rock samples, respectively.
2. Inorganic oxygen content (mainly in the form of the carbonate oxygen) in the samples is also relatively high due to a widespread occurrence of carbonate rock, ranging between 3.16-6.97% and 3.39-10 % in ore and rock samples, respectively.
3. The Acid Generating Potential (AGP) calculated by multiplying the [percent sulphur in a sample by 31.25] and expressed as kg $CaCO_3$/tonne varies broadly between 69.1-269 and 17.5-258 kg $CaCO_3$ /tonne of ore and rock, respectively.
4. The Acid Neutralizing Potential (ANP) depends upon the content of carbonate materials (expressed as kg $CaCO_3$/tonne) that are able to neutralize acidic drainage water as a result of oxidation of sulphides. The ANP values are relatively high, ranging between 263-580 and 282-833 kg $CaCO_3$/tonne for ore and rock, respectively.
5. The Net Neutralizing Potential is calculated as a difference between ANP and AGP and indicates the ability of tailings to neutralize generated acid.

6. The Neutralization Potential Ratio (NPR = ANP/AGP) is widely used to assess the acid drainage generation risk. The higher the ratio the lower the ARD risk.

The NPR values are widely used in international practice to categorize ore, rock, tailings and processing waste as potentially acid generating (PAG) or non-acid generating (NAG):

- NAG is a non-acid generating mineral:
    - NPR > 2 under the classification adopted by MEND (Mine Environmental Neutral Drainage)[70] (2009);
    - NPR > 3 under the classification adopted by U.S. Bureau of Land Management[71]
- PAG is a potentially acid generating mineral:
    - NPR < 1.0;
- Minerals whose ARD potential is uncertain and need to be clarified by, inter alia, conducting additional surveys:
    - 1< NPR< 2.

The ABA test results indicate that despite a relatively high sulphide content, virtually all ore and rock samples are classified as non-acid generating (NAG) (**Figure 27**). The tested ore and rock samples have relatively high content of carbonate material (with inorganic carbon content varying in the range 3.16-6.97% and 3.39-10% for ore and rock, respectively). The presence of carbonate may provide the ability to neutralise acid.

The only exception are two samples with NPR values of 1.32 and 1.95 that are classified as samples with uncertain ARD potential. It should be noted that ores will be stored at the open ore storage facility for a short period of time before being delivered to the processing plant. This means that the uncertainty associated with classifying some samples as NAG is not to be considered as a justification for further tests.

It is important to note that the overwhelming majority of tested bearing rock samples fall under the NAG category in a more strict classification where NPR > 3 (U.S. Bureau of Land Management).

The 2006 geochemical testing programme did not include long-term kinetic tests designed to assess the acid generation and metal leaching potential of minerals in an acidic environment. Kinetic tests simulate the ore and rock leaching processes that occur in the natural environment and are therefore performed in the humidity cells; they may last from 40 weeks to 1 year depending on the mineral composition. Supplemented with the static ABA test results, the kinetic tests enable the short-term and long-term projections regarding the behaviour of waste rock and tailings during their disposal and storage throughout the mine life including mine closure and site restoration phases.

[70] MEND Report 1.20.1. 2009. Prediction Manual for drainage chemistry from sulfide geological materials

[71] U.S. Nevada Bureau of Land Management's. 2008 Water Resource Data and Analysis Policy [Guide] for Mining Activities"

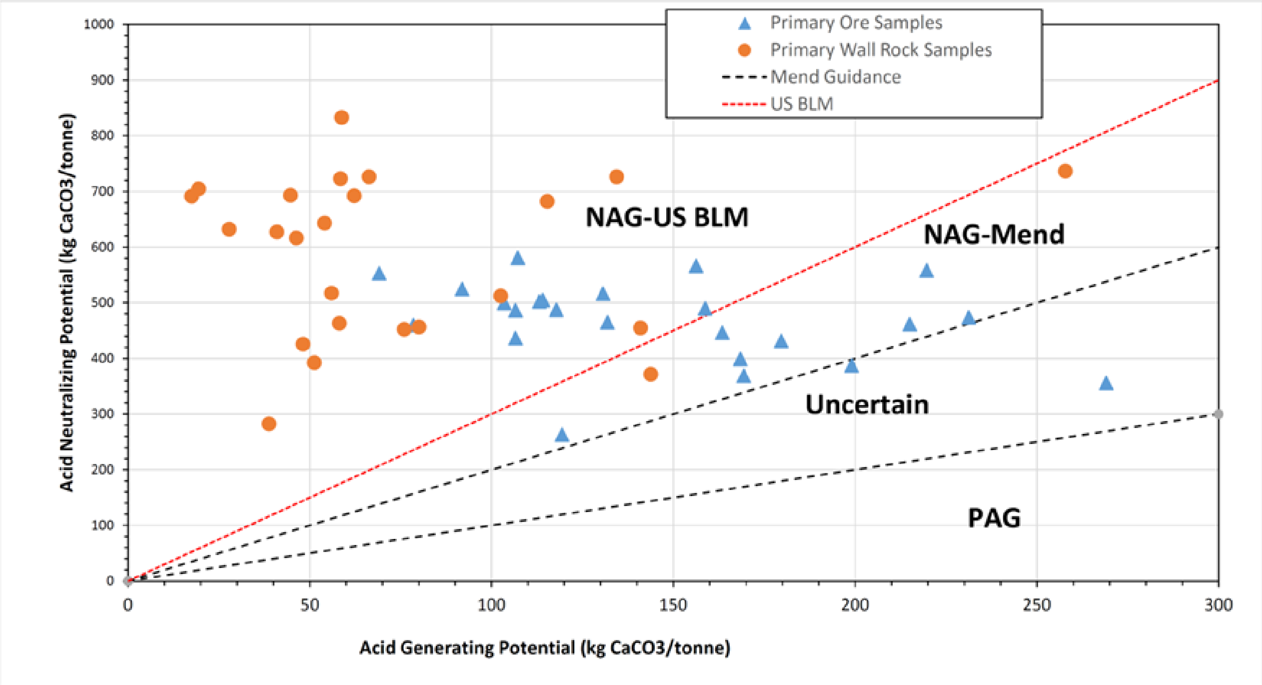

Figure 27. ABA Test Results for Ore and Bearing Rock Samples

Due to the tight timeframe set for the Project ESIA and long duration of kinetic tests requiring from 40 weeks to one year, it is not possible to conduct these tests for the Shalkiya ores and rocks as part of the current Project development stage. However, the high carbonate content in ores along with the presence of a thick layer of host carbonate rocks (1,400 m) render the need for kinetic tests doubtful. In addition, the lack of kinetic tests simulating the generation of acidic drainage in the natural environment can be offset by the presence of historical observation data covering the period of 2005-2015 and characterizing changes in mine water composition which is shaped by the initial composition of mine drainage and its contact with disturbed sulphate and carbonate materials (selected data on the composition is presented in Table 36).

The historical monitoring results indicate that the composition of mine water extracted from the mine can be described as ranging from near neutral to weakly alkaline, occasionally showing higher alkalinity levels (the pH between 6.8 to 8.95)[72]. No elevated or slightly elevated acidity levels were recorded in mine water samples; the highest pH value was recorded in 2006. The sulphate levels ranged from 312 to 1898 mg/l; the highest level was recorded in 2005[73].

Widespread occurrence of carbonate rock that is easily dissolved in water results in the neutralization of mine water with elevated acidity levels resulting from the oxidation of sulphide rock. The neutralization of acidic water as it dissolves carbonate rock reduces its leaching potential and migration resistance of metals. This results in relatively low levels of copper, lead and zinc in mine water as compared to other similar sulphide ore deposits.

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[72] The pH levels were not measured in mine water samples since 2011 to 2014

[73] EcoLimit, 2007. OVOS Report for the Mine.

Table 36. Results of Mine Water Tests

Parameter	Units	Mine Water							
		2007	2008	2011	2012	2013	2014	2015	2016
pH	-	6,8–7,77	7,15-7,25	н/о	н/о	н/о	н/о	7.94-7,45	7,66-7,95
Total hardness	meq/L	2,5–13	22,4-25			-	-	18.8-23,5	19,2-24,6
Sulphate	mg/L	313-1295	1065-1164	335-374	358-490	34	474	451-1207	841-1196
Calcium	mg/L	38-294	205-272	236		-	-	226-260	212-277
Magnesium	mg/L	41,3-135	138-149			-	-	88.4-127	104-131
Iron (total)	mg/L	0,11-0,31	0,26-0,37	0,06-0,30	0,101-0,210	0.07	0.16	0.08-15,6	0,064-0,17
Copper	mg/L	0,024-1,29	0,05-0,47	0,02-0,09	0,022-0,058	0.009	0.033	<0,05	<0,05
Lead	mg/L	0,01-0,32	0,001-0,01	0,001-0,01	,003-0,066	0.020	0.021	<0,003-0,003	0,05-0,069
Zinc	mg/L	0,02-0,6	0,001-0,64	0,02-0,13	0,02-0,335	0.061	0.034	<0,05	<0,05
Arsenic	mg/L							<0.005	<0.005
Cadmium	mg/L							<0.001	0.003
Mercury	mg/L							<0.001	<0.0002

It should be however noted that the historical results of mine water monitoring provided as part of this ESIA assignment are difficult to compare; any attempts to establish which laws govern changes in water composition are therefore impeded due to the following factors:

1. Radical changes in the mining operations that have occurred throughout the observation period.

   The mine has not been operational since 1994 to 2002 when mining resumed and continued till 2009. That year, the mine was put into care and maintenance including the removal of drainage water from mine workings located at elevations of +100 and +40 m. The repair, renovation and tunnelling works resumed in 2014 (horizontal workings at elevations +163, +100, +90 and +40 m). Consequently, the 2002-2009 monitoring results characterize the period during which the mine water composition was taking its shape through interactions between mine water and bearing rock and ore disturbed by active mining operations. The elevated concentrations of sulphates were recorded at that time. If mining operations are halted, this may result in reduced inputs of oxidized sulphates and dissolved carbonates to mine water.

2. Key compounds whose actual concentrations exceed the RK domestic/drinking water quality guidelines are cadmium and barium. That notwithstanding the mine water is not fit for drinking anyway due to the high natural salinity of the water.

3. During a long observation period (from 2002 to 2016), samples were tested in different analytical laboratories using techniques with varying metrological characteristics (sensitivity and precision of methods employed). Real problems arise when it comes to comparing test results for trace metals because some of these tests were performed in the past using semi-quantitative spectral methods.

4. There are gaps in the monitoring data sets in the period from 2011 to 2014 for the following important parameters: pH, bicarbonates, calcium, and magnesium.

5. Only the total metal content was measured in all samples; this means that the detectable metal concentrations depend upon the transport of suspended metals. Fine ore particles can be also transported with the suspended materials and thus produce elevated concentrations of metals. Variable concentrations of ore minerals in mine water can be attributed to this fact. Determining the concentrations of toxic metals in suspended and dissolved forms in mine water would support more accurate predictions on concentrations of toxic compounds in bottom sediments and water in the mine water pond.

6. Historical mine water monitoring data sets do not include data on such toxic compounds as arsenic and mercury. Some occasional observations focused on these trace metals were performed in 2005-2006 using a semi-quantitative spectral method. Cadmium concentrations were typically measured using insufficiently sensitive techniques; the determination of actual concentrations of this metal in mine water was therefore impossible.

7. In 2015, the Mine resumed measuring trace compounds (mercury, arsenic, cadmium and other compounds) in mine water. However, analytical techniques employed by the contracted accredited laboratory do not allow

the actual concentrations of trace metals to be measured because they are mostly lower than detection limits of these techniques.

8. Due to the fact that ore contained in the deposit has been found to have the elevated concentrations of arsenic and cadmium[74] (**Table 33**) the leaching and migration of these toxic trace elements to mine water should be monitored. It should be noted that elevated concentrations of arsenic, mercury, molybdenum, and antimony can be observed in weakly alkaline water. The need for monitoring is further justified by the fact that the mine water pond is used by local residents for livestock watering and amateur fishing. As the trace compounds are able to bioaccumulate along the trophic chains in the aquatic ecosystems, their accumulation in fish tissues in dangerous quantities could be possible.

Despite these constraints affecting the completeness and quality of available monitoring data, the following conclusions regarding the acid rock drainage and toxic metal leaching processes at the Shalkiya mine:

- The overwhelming majority of mine water samples can be characterized and near neutral or weakly alkaline.
- Sulphate concentrations in mine water have been relatively high in the past years (2012-2016), ranging from 360 to 1270 mg/l and showing an upward trend. Further increases in sulphate concentrations in mine water are possible once the mining operations have resumed and mine water monitoring should therefore continue.
- Over the past 3 years, the concentrations of toxic substances (copper, zinc, and lead) in mine water generally were lower than those observed before. Additional information is however required to clarify leaching characteristics for cadmium, arsenic, mercury and other metals and how they enter mine water.

In line with the IFC EHS Guidelines for Mining (2007) that recommend conducting the acid rock drainage and metal leaching tests on an ongoing basis, the Mine should ensure that these tests are performed as part of exploration and mining activities in each new area of the deposit. The amount of these tests could be limited because the available information about rock and ore mineralogy, geochemical test results and historical observation data regarding the composition of mine water indicate that any significant development of processes leading to the generation of acid rock drainage and/or near neutral or alkaline water containing toxic compounds is not likely. The scope of geochemical tests should include the collection of representative geological samples and performance of both initial static and long-duration kinetic tests for a limited number of samples. The sampling and testing programmes for ore and bearing rock will be formulated as mining operations progress at the Mine.

Relatively favourable ARD/ML projections notwithstanding, waste rock storage areas should be lined to prevent groundwater contamination and equipped with a

[74] Freiman G.G., Topoyev A.N., Selifonov S.E., Akhmetov K.S et al. Report on the Estimated Lead and Zinc Ore Reserves in the North Western Property of the Shalkiya Mine (Kyzylorda Region). GeoInCentre LTD, Almaty, 2004. Also, Agafonov V.A., Freiman G.G., Topoyev A.N. et al. Report on the Estimated Lead and Zinc Ore Reserves in the South Eastern Property of the Shalkiya Mine (Kyzylorda Region) as of 01.01.2006. GeoInCentre LTD, Almaty, 2006.

system of drains for collecting and diverting surface runoff that would help control the risk that contaminated materials can be transported and spread with floodwater during flash floods in spring.

Outdoor storage facilities will be designed according to more strict specifications including a bottom lining system that would prevent the contamination of underlying groundwater aquifers by drainage flow generated through exposure of ore material to precipitation. To further reduce the risk of groundwater contamination, it might be possible to include in the ore storage facility design a two-component lining system comprising the gravel/clay lining to be covered with polymeric material or concrete lining on a special foundation. This lining system would help significantly reduce the risk of groundwater contamination.

The need for incorporating a bottom lining system in the design of waste rock and ore storage facilities is underpinned by the requirements of the best international mining practices and water monitoring results collected at the monitoring well near the mine water pond. Water composition in this well has been influenced by the presence of mine water pond (mine water filtration) and is characterized by higher concentrations of both macrocomponents and metals as compared to groundwater in the Kuttekozha well intake. Variations in well water composition depend upon changes in mine water composition. In the recent years (2012-2014), concentrations of pollutants in well water decreased due to the termination of mining operations.

Based on the results of historical observations, the Mine has obtained a conclusion that water contained in the mine water pond is not toxic and can be used in agriculture for irrigation. Currently, this pond is used as a drinking water source for livestock[75] and for fishing but both practices should be discontinued before the mine commences operations again.

In 2006-2007, in accordance with the requirements of the RK legislation regarding the hazard classification of overburden material, this material was sampled, tested to determine its composition, biotested to assess toxicity, and also tested for radioactivity. Test results showed that overburden material disposed of at the waste rock storage sites falls into the Hazard Class IV and can be described as low-hazard waste based on the following criteria:

- Composition: the levels of copper, zinc, nickel and lead in materials disposed of at the waste rock storage sites exceed the RK sanitary guidelines for soil. No exceedances were recorded for other toxic compounds.
- Biotesting: biotests using ***Daphnia magna*** showed no indication that water extract of the overburden rock sample has any toxic effect on Daphnia.
- Toxicity tests: the results of tests performed using white mice showed no indication that water extract of the overburden rock sample has any toxic effect on the test animals.
- Radiation hazard: the overburden rock sample shows no exceedances of relevant radiation safety guidelines including those pertaining to the

[75] Starting this year (2016), water from the mine water pond is no longer used for livestock watering.

composition of radionuclides and can be classified as Class 1[76], which means that this material can be used without limitations.

Overburden and waste rock historically accumulated at the site as a result of past activities was transferred to the stone crushing plants and used to produce crushed stone.

Summary

Results of static geochemical tests completed to assess the ARD/ML potential and historical observation data on the composition of mine water lead to the conclusion that the tested ore and rock materials generally fall into the category of non-acid generating (NAG). Historical observation data indicate that mine water can be characterized as near neutral and being slightly inclined toward alkalinity. Despite generally elevated levels of sulphates and toxic compounds, the RK domestic and drinking water quality guidelines have been exceeded in the recent years only for cadmium, barium and – very rarely – for lead. While mine water does not fall into the domestic and drinking water use category[77], this assessment indicates that the levels of toxic compounds are quite low. Recorded variations in concentrations of other compounds also do not exceed admissible limits. The water monitoring programme for both mine water and groundwater present in the monitoring well should be updated to ensure that the real concentrations of cadmium, arsenic, mercury and trace elements in both dissolved and suspended form are determined.

6.7. Hydrogeology

The main hydrogeological unit at the Shalkiya deposit and surrounding area is a complex of Paleozoic carbonate rocks. Water is confined to fissured and karst limestones, dolomites and carbonate breccias assigned to the Upper Devonian Famennian stage and the Lower Carboniferous Tournaisian stage. The open fracturing of the rocks for water includes primary endogenic and secondary exogenic fissuring. Primary endogenic fissuring is associated with faulting and was formed during folding of carbonate rocks. Secondary exogenic fissuring and cavern porosity of the rocks was formed in the Mesozoic Era due to the action of weathering agents on carbonate rocks.

The caverns gravitate toward the fault zones. They reach a maximum size of 1 m in diameter. Caverns occur to a depth of 330 m based on well survey results; the cavern porosity ratio is 0.01 [78],[79]. The water inflow of water-hosting rocks is non-uniform and well flow rates vary within a wide range from 0.1 to 50.0 dm^3/s with drawdown of 18.1 and 1.4 m, respectively. The flow properties of the rocks are also extremely non-uniform. The flow parameters obtained from mine drainage in the Northwestern section are as follows: permeability coefficient 0.46 m/day, transmissivity 166.0 m^2/day, and conductivity 4.83×10^4 m^2/day.

[76] Sanitary Rules “Sanitary and Epidemiological Radiation Safety Requirements” (SERSR-2015). Approved by the Order of the RK Acting Minister of the National Economy of 27 March 2015 No. 261.

[77] As per established legal practice in Kazakhstan, water quality in technogenic water bodies is assessed against drinking and domestic water quality guidelines

[78] Freiman, 2004.

[79] Agafonov, 2006.

The water-bearing zone of the carbonate rocks forms a single fissure-karst water basin that extends more than 30 km in the east-west direction in the form of a belt of 4.1 to 14 km wide. According to the current hydrogeological zoning of the RK, this basin[80] belongs to the Karatau second-order hydrogeological basin and the Central Tian Shan first-order hydrogeological basin of the Dzhungara-Tian Shan hydrogeological region. The water-bearing zone within the deposit consists of structure fragments of the Baktysai and Akyuk synclines and is bounded by impermeable rocks of the Tulkubash series (**Figure 28**).

The block of impermeable rocks within the Akyuk syncline extends in plan northwest-southeast in the form of a belt from 1.4 to 2 km wide and from 4 to 5.8 km long, and overrides ore-hosting rocks belonging to the Baktysai syncline. The block is bounded by faults: An intermediate thrust fault along the northwest boundary, the Eastern thrust fault along the northeast boundary and the Central thrust fault along the southeast boundary (**Figure 29**). The true thickness of the impermeable rocks of the Tulkubash series, in the overriding block within the South-Eastern section of the deposit varies from 400 to 680 m. The roof of the ore-hosting rocks within the South-Eastern section of the deposit occurs at depths from 260 to 870 m (absolute depth marks from 0 to minus 660 m). Under natural conditions, the fissure-karst water in this section had a head from 230 to 620 m, and the occurrence depth of the piezometric surface varied from 35.6 to 58.2 m (**Figure 30**). The permeability of the rocks in this section is rated as the lowest for the explored area of the single fissure-karst water basin; it has an average value of 10 m^2/day[81].

Carbonate rocks belonging to the Akyuk syncline occur north-eastward of the Tulkubash block of the Eastern thrust fault. The transmissivity of the carbonate rocks within a belt 3 km wide extending for 10 km along the Eastern thrust fault is rated as the highest for the explored area of the single fissure-karst water basin; it has an average value of 470 m^2/day[82]. Under natural conditions, the groundwater level within the belt described above occurred at depths from 16 to 24.5 m along the northeast boundary of the South-Eastern section of the deposit.

The high-rate (up to 36.5 dm^3/s) Kuttykozha spring is located in the centre of this belt extending along the Eastern thrust fault. A section of the Kuttykozha groundwater water intake is located 2.3 km north of spring and 700 m southeast of the southeast margin of the deposit. This water intake draws water from the Shalkiya groundwater basin classified as water suitable for drinking and domestic use[83] (**Figure 28** and **Figure 29**). The Kuttykozha water intake has been in operation since 1994 to supply water for drinking and domestic purposes to the Mine site and Shalkiya settlement. There is currently no direct information on water drawdown or the position of the depression cone from the water supply well.

[80] Nesterkina N. V., Smolyar V. A. et al. Map of groundwater deposits with hydrogeological zoning elements. Department of Groundwater Analysis, Monitoring and Conservation of the Kaznedra Main Office of Material Resources, Almaty, 1997. V.V. Veselov. Hydrogeological zoning and regional evaluation of Kazakhstan's groundwater resources. Gylym R&D Center. Almaty, 2002.

[81] Agafonov, 2006.

[82] *ibid*.

[83] Rachkov S.I., Zheksembaev Yu.M., Andrusevich V. I. "Report on exploration and evaluation of proven groundwater reserves in the Kuttykozha section for supplying utility and drinking water to the camp at the Shalkiya mine (based on studies as of November 1, 2007). ShalkiyaZinc Ltd LLP, KazGIDEK Scientific Production and Design Company, Almaty, 2007.

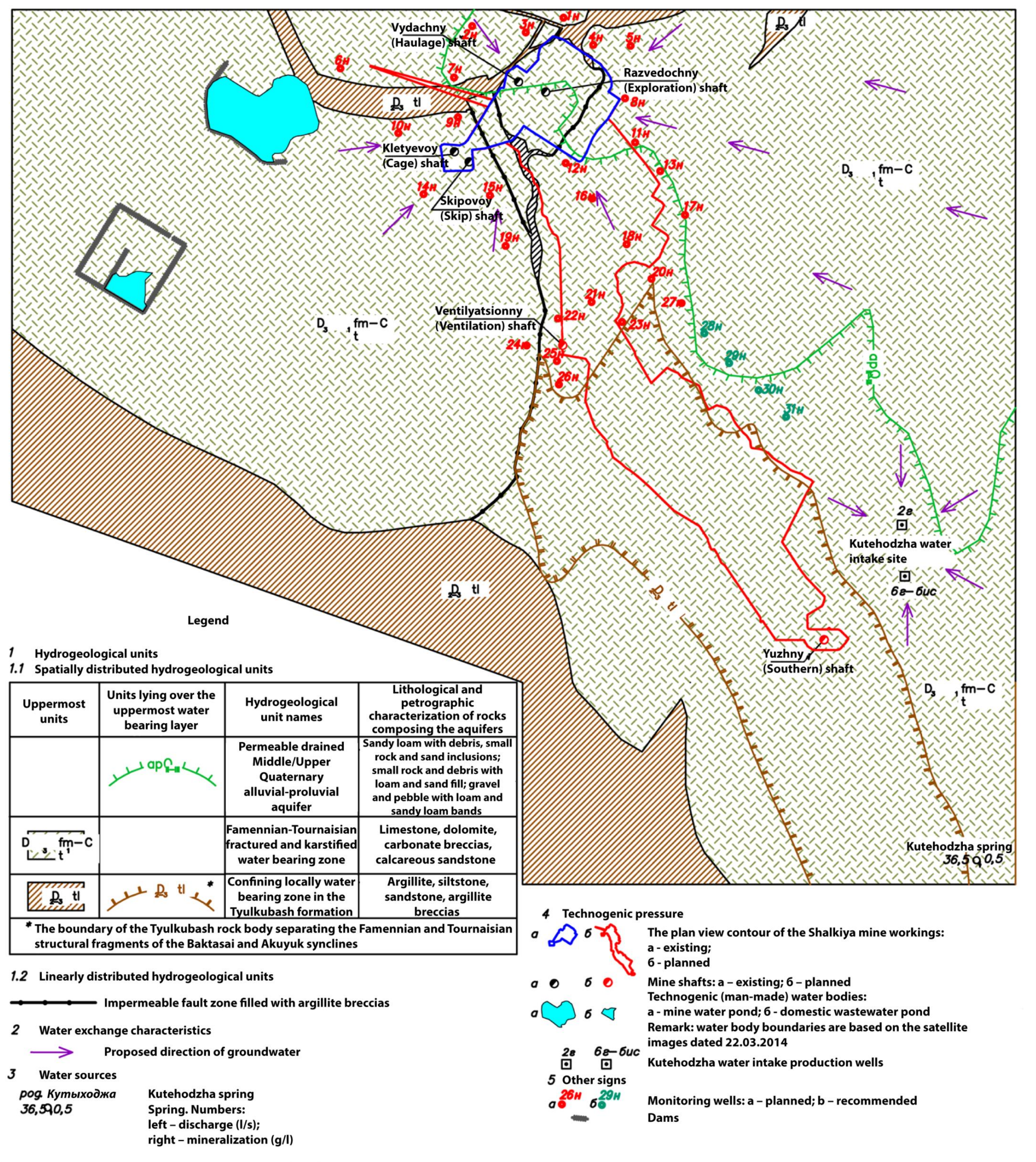

Figure 28: Sketch map of the hydrogeological environment of the area around the Shalkiya deposit

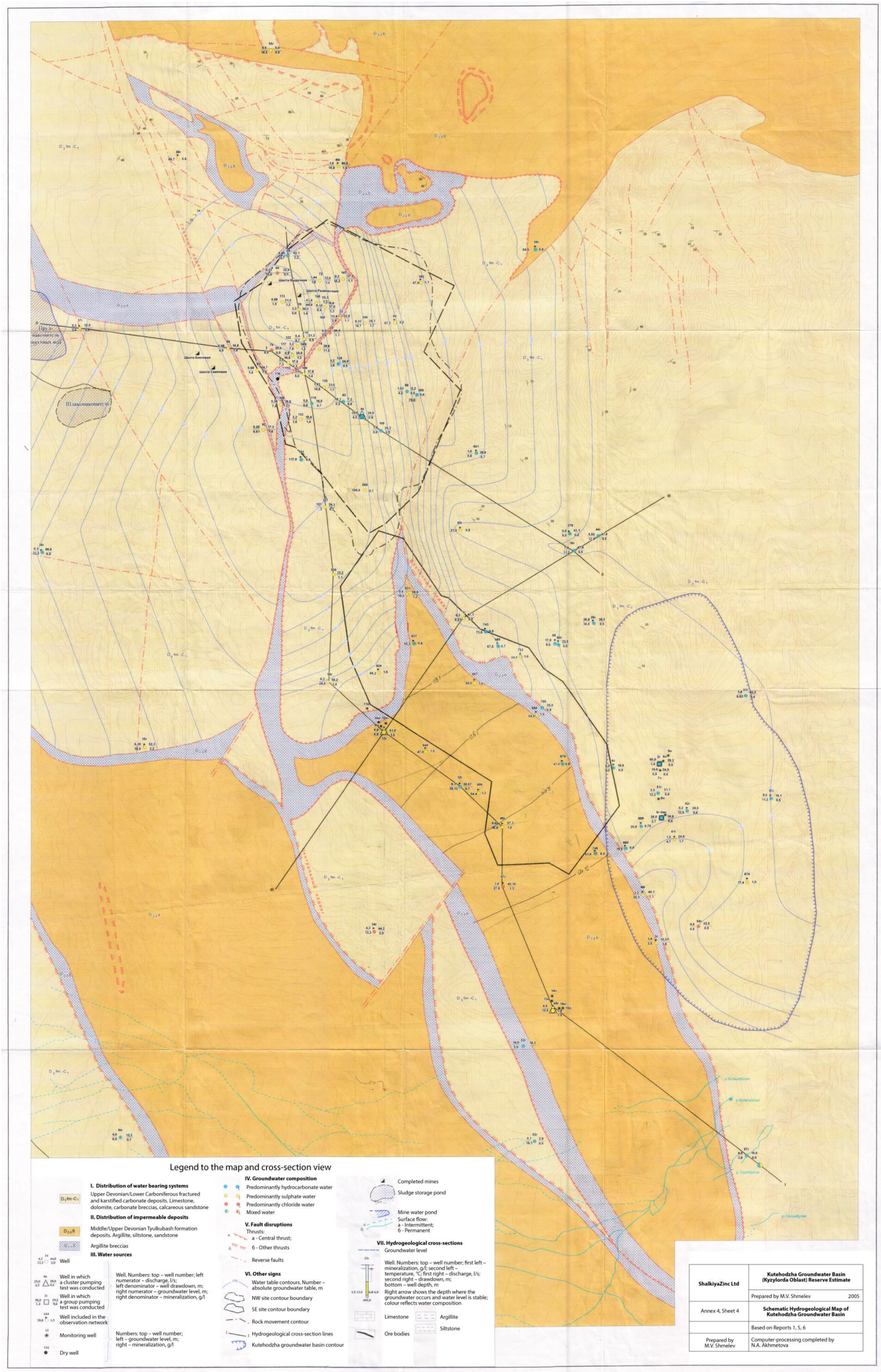

Figure 29. Sketch map of the hydrogeological environment in the area of Kuttykozha ground water deposit

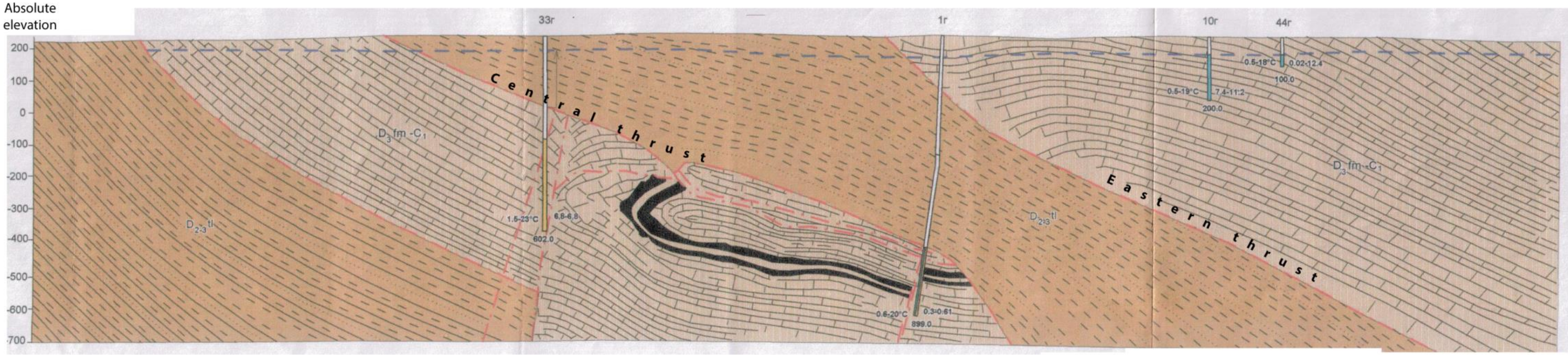

Figure 30. Hydrogeological section along the line III-III of the Kuttykozha groundwater deposit

Based on the results of hydrodynamic surveys, the North-Western section of the deposit has been identified in a separate section of the single fissure-karst water basin with average transmissivity of 166 m^2/day. The flow properties of the carbonate rocks in this section of the deposit are typically non-uniform, which is confirmed by experience of excavating underground mine workings in 1984-1994. During this period, the heaviest groundwater inflows were observed in the eastern and South-Eastern parts of the section – up to 45 and 65.6 m^3/h, respectively. Drainage has been going on from the + 40 m level since March 2003. The flow rate of discharge water in 2004–2005 varied from 122.4 to 172.6 m^3/h. The average annual flow rate was 166.9 m^3/h for 2004, 146.1 m^3/h for 2005, and 133 m^3/h from 2006 to 2013, inclusive[84]..

Under natural hydrogeological conditions, the occurrence depth of groundwater in the North-Western section of the deposit varied from 14.7 to 37.2 m. The system of underground mine workings developed in this section currently has an area of the generalized horizontal alignment contour of 0.89 km^2. As a result, it forms a large hydrodynamic depression with maximum subsidence of 140 m in the centre[85] (**Figure 29**). No observations of the depth of occurrence of the fissure-karst water level are being carried out at present due to the lack of observation wells; therefore, the current dimension and shape of this depression have not been fully studied. The assumed presence of impermeable or slightly permeable barriers between the North-Western section of the deposit and the Kuttykozha water intake explain why the hydrodynamic depression does not reach the water intake section and has no impact on its water regime and drinking water quality.

Average transmissivity of the remaining fissure-karst water area (outside the North-Western and South-Eastern sections of the field and the band extending along the Southern thrust fault) is rated at 30 m2/day.

The basin is recharged mainly by infiltration of atmospheric precipitation over its entire area and seepage of runoff from the Akyuk River and Shalkiyasai Stream. Observational data of groundwater levels have shown that the groundwater regime of the deposit is associated with the hydrogeological and hydrometeorological conditions in the area. Levels rise in spring from melting snow and river flooding. The rise starts in late February – early March and continues until late April, when the level gradually starts dropping. The minimum level is recorded during the period when the groundwater supply stops (November–December). The amplitude of level fluctuation, depending on the dryness of the year, varies from 0.5-1.0 m to 3.0-6.0 m[86].

Under natural conditions, the fissure-karst water in the area of the deposit is fresh, with salinity up to 1.0 g/dm^3 (northeastern part of the deposit) and slightly saline, from 1.0 to 3.0 g/dm^3 (the area of the impermeable rocks of the Tulkubash series occurring above the ore-hosting strata. By chemical type, the fresh water is hydrocarbonate, calcium sodium; the slightly saline water is calcium sodium sulphate, more rarely sodium sulphate. The micro-component composition of groundwater is subject to seasonal variations, but the micro-component content does not exceed the maximum permissible standards for utility and drinking water.

[84] Agafonov, 2006.
[85] Freiman, 2004.
[86] Rachkov, 2007

The first estimate of proven drainage groundwater reserves of the Shalkiya deposit was given in the "Report with estimation of reserves according to detailed exploration of the Shalkiya deposit as of August 1, 1994". Proven category B drainage groundwater reserves of 5,600 m^3/day (65.0 dm^3/s) at the Shalkiya deposit were approved by the SRC RK by Minutes No. 35 of December 28, 1995 for supplying process water to the Shalkiya mine for its entire life.

Summary data for 2013-2015 on the composition of mine water and groundwater tapped by the Kuttykozha drinking water intake wells is presented in Table 29and the most recent measurement results are provided in Annex 21.

Table 37. Well Water and Mine Water Quality

Parameter	Units	Well Water	Mine Water*
pH		7.61	7.70
Total Solids (TS)	mg/L	460	1,738
Total Suspended Solids	mg/L	-	22.7
Total Dissolved Solids (TDS)	mg/L	469[3]	1,719
Total Hardness	mEq/L	4.75	18.8
Oil & Grease	mg/L	-	0.03
Nitrite	mg/L	0.005	0.70
Nitrate	mg/L	6.8	13.6
Sulphate	mg/L	110	429
Chloride	mg/L	56.0	186
Fluoride	mg/L	0.35	-
Calcium	mg/L	59.4	226
Magnesium	mg/L	21.9	88.4
Sodium	mg/L	81.8	-
Ammonia	mg/L	0.04	0.32
Iron	mg/L	-	0.10
Copper	mg/L	-	0.02
Lead	mg/L	0.005	0.02
Zinc	mg/L	-	0.10

* Concentrations are average calculated using analyses from 2013, 2014, and 2015.

Based on the monitoring results collected from 2002 to 2015, the mine water composition has the following characteristics:

- Sulphate and chloride sulphate by anionic composition;
- Predominantly three-component by cationic composition;
- Brackish in terms of mineralisation levels (dry residue varies from 1.0 to 6.4 g/dm^3);
- Near neutral, alkaline and slightly alkaline in terms of pH levels (from 6.8 to 8.8).

Historical maximum values of general water quality parameters for mine water [8788] are summarized as:[89]: 6.4 g/dm^3 for mineralisation; 27.8 mmol/dm^3 for total

[87] Sanitary Regulations "Sanitary and Epidemiological Requirements for Water Sources and Withdrawal Points for Utility and Drinking Purposes, Utility and Drinking Water Supply, Points of Amenity Water Use, and

hardness; 0.25 mg/dm^3 for petroleum products; and 11.2 mg/dm^3 for permanganate index.

The concentrations of some substances were found to be very high. For example, the following maximum concentrations of individual substances were recorded:

- Ammonia: 17 mg/dm^3 ;
- Chlorides: 1,163 mg/dm^3
- Copper: 3.75 mg/dm^3;
- Sulphates: 1,564 mg/dm^3 ;
- Lead: 0.09 mg/dm^3 ;
- Nitrites: 7.5mg/dm^3 ;
- Iron: 0.57 mg/dm^3.

The 2016 results of mine water tests are presented in Annex 21.

However, it should be noted that in the majority of cases, these maximum concentrations were recorded at the beginning of the observation period. Over the three year period of 2012–2014, elevated concentrations were recorded only for lead (0.05 mg/dm^3); sulphates (797 mg/dm^3); and ammonium (2.6 mg/dm^3). These reduced concentrations are attributed to the cessation of underground mining operations. The 2015-2016 monitoring results indicate that the levels of sulphates in mine water have now started to grow again up to 1200 mg/dm^3, along with high concentration peaks shown by iron (15.6 mg/dm^3) and lead (0.069 mg/dm^3)

Terrigenous rocks of the Middle-Upper Devonian Tulkubash series are represented by continental and coastal and marine sandstones alternating with siltstones and mudstones, and are stratified as predominantly impermeable. At the same time, according the data[90] it was noted that in the exogenic weathering zone, these rocks, which are no more than 30 m thick, were water-bearing. This is confirmed by the presence of springs with flow rates of 0.2–0.3 dm^3/s on valley and gully walls. These data allow stratification of rocks of the Tulkubash series as a hydrogeological unit of the designated impermeable, locally water-bearing zone of the Tulkubash series. Salinity of the groundwater of springs on the hydrogeological map of the area around the deposit varies from 0.2 to 0.3 g/dm3; and by chemical type it is classified as hydrocarbonate calcium.

In most of both the Shalkiya deposit and the area around it (except the northeastern part), the carbonate rocks are overlain by Middle-Upper Quaternary friable fragmental rocks of alluvial and proluvial origin: sandy loams with grus

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the Safety of Water Bodies” approved by Decree No. 209 of the Ministry of National Economy of the RK of March 16, 2015.

[88] It is an established practice in Kazakhstan to compare water quality parameters and concentrations of key and trace components in groundwater with the health-based water quality guidelines adopted for drinking water sources, regardless of whether the water is classified as being suitable for drinking water use or not.

[89] Sanitary Regulations “Sanitary and Epidemiological Requirements for Water Sources and Withdrawal Points for Utility and Drinking Purposes, Utility and Drinking Water Supply, Points of Amenity Water Use, and the Safety of Water Bodies” approved by Decree No. 209 of the Ministry of National Economy of the RK of March 16, 2015.

[90] Agafonov, 2006.

inclusions, pebbles and sand; rock debris and grus with sand-clay aggregate; and pebble gravel with streaks of pebbles and sandy loam. According to data from exploration drilling and geological engineering surveys at the mine facilities, these rocks do not contain groundwater; therefore, in hydrogeological terms, they are classified as a permeable, drained Middle-Upper Quaternary alluvial-proluvial horizon.

Two man-made ponds have been developed within the area of this horizon; one of them is currently being used as a mine water pond. The other pond was a sewage lagoon, but is not currently being used. According to satellite data (as of March 22, 2014), the water tables of these ponds have areas of 50.9 and 8.5 ha, respectively. It is assumed that the mine water containment pond is a constant supply source for the underlying Middle-Upper Quaternary alluvial-proluvial sediments, in which a groundwater leakage dome could form. Groundwater in the leakage dome may be stratified as local man-made water content of the permeable Middle-Upper Quaternary alluvial-proluvial horizon. The presence of groundwater is confirmed by an observation well close to the mine water containment pond.

The results of groundwater tests from 2008 to 2015 show that the maximum values of the generalized groundwater quality indicators were 5.9 g/dm^3 for salinity; and 21 mmol/dm^3 for total hardness. The maximum concentrations of individual polluting substances were as follows: 30 mg/dm^3 for ammonia; 0.17 mg/dm^3 for lead; 2,654 mg/dm^3 for sulphates; 1.28 mg/dm^3 for copper; and 0.33 mg/dm^3 for iron. However, as in the case of mine water, these elevated concentrations were mainly recorded in the beginning of the observation period. Over the past three years (2012–2015), only lead concentrations were seen to be elevated (0.06 mg/dm^3).

For reliable identification of the boundaries of the local man-made water area of the permeable Middle-Upper Quaternary alluvial-proluvial horizon, it is advisable to carry out specialized environmental and hydrogeological studies, including three-dimensional logging and drilling small water wells.

The Kuttykozha water intake, drawing water from the Shalkiya groundwater basin, is located closest to the deposit, just 3 km southeast of the margin of the North-Western section. It is used to supply drinking/domestic water to the existing mine. The water intake consists of five wells drilled in 1990–1991; the well depth is 250–835 m. The groundwater level is 19.9–32.3 m, and well flow rates are 8.5–25 dm^3/s, with drawdown of 0.06–9.6 m. Average water intake capacity is 6,100 m^3/day; minimum (in winter) is 2,800 m^3/day; and maximum (in summer) is up to 9,700 m^3/day. The groundwater quality of the Kuttykozha water intake meets the requirements for utility and drinking water. The groundwater quality has not changed since the Kuttykozha water intake started operating in 1992. By chemical composition, the groundwater is classified as hydrocarbonate sulfate and calcium magnesium sodium with mineralisation of 0.5–0.6 g/dm^3.

Proven category B groundwater reserves of the Kuttykozha section of 4,600 m^3/day were approved by the SRC RK for 25 years of operation (minutes No. 666-08-U of February 12, 2008) applicable to the existing water intake process from two wells.

The Shalkiya groundwater deposit is used to meet the Mine's demand for industrial water. The water intake is located near Zhanajorgan. This groundwater source is located in the Syr Darya River valley 18 km from the mine. The groundwater is confined to Upper Cretaceous Senonian sediments represented by differently grained sands from 12 to 25 m thick. The water-bearing horizon within the water intake is 23 m thick. The occurrence depth of the groundwater level varies from 12 to 195 m. The water is artesian, and the piezometric surface is set from 11 m below to 5.5 m above ground level. The pressure head reaches 184 m. Well flow rates vary from 3.4 to 21.7 dm^3/s with drawdown to 10–12.4 m, respectively. The groundwater of the level is fresh with salinity of 0.3–0.6 g/dm^3; and by chemical composition, it is hydrocarbonate sulphate and calcium sodium.

Based on studies as of February 1, 2007, the proven groundwater reserves contained in the Upper Cretaceous Senonian deposits in the area of the Zhanakorgan water intake were re-approved for supplying process water as category B at a rate of 20,700 m^3/day for 25 years of operation (minutes of the SRC RK No. 598-07-U of July 28, 2007).

6.8. Surface water

The Shalkiya Project area lies within the Syr Darya River catchment.

6.8.1. Syr Darya River

The Syr Darya River is the longest river in the Central Asia flowing for 2,212 km and being the second largest river in terms of river flow after Amu Darya. Together, these two rivers constitute the major part of the Aral Sea Basin.

The Syr Darya has a catchment area of 485,000 km^2 with a total population of 25 million people[91] (**Figure 31**).

The total annual flow of the Syr Darya River is over 40 km^3. The River and its major tributaries are mainly fed by snow and glacier melt in the high mountain regions. The major proportion of the annual flow is discharged in May-June and regulated by the Naryn – Syr Darya reservoir chain.

Irrigation and hydropower are equally significant water uses in the Central Asia, and all existing water management facilities in the Syr Darya Basin (**Figure 31**) have been designed and built as the multiple-purpose projects. The total available capacity of the chain of reservoirs is 24 km^3 and the total installed capacity of 9 major hydropower plants is 3,720,000 kW.

In order to regulate river flows and manage limited water resources and growing water demand, a sophisticated system of dams, reservoirs and hydro-facilities has been built in the Syr Darya Basin. The management of the Basin's water resources has become an increasingly challenging task. The river flow was almost fully regulated by the mid-1970s when the Basin began to experience water deficit in the dry years. In the years or normal water content, the Aral Sea annually received about 10 km^3 of the Syr Darya flow while no flow at all reached the Sea in 1982–1987.

When the Central Asian republics declared independence and five sovereign states (Kyrgyzstan, Kazakhstan, Tajikistan, Turkmenistan, and Uzbekistan) emerged after the collapse of the USSR, the Syr Darya River became an international watercourse. Faced with the need to establish the coordinated water resource management regime, the riparian countries founded the Interstate

[91] M.Kh. Khamidov. 2008. Experience in the Coordinated Management of Water Resources by the Countries Lying in the Syr Darya Basin. The Syr Darya River Basin Management Authority. Available at: http://www.icwc-aral.uz/workshop_march08/pdf/khamidov_ru.pdf

Commission for Water Coordination (ICWC) in 1992 to lead the management of water resources in the Aral Sea Basin. In the 1992 Almaty Agreement, the parties expressed their commitment to ensure the environmental protection and address the Aral Sea issue. The Syr Darya River Basin Management Authority (RBMA) was established as an executive body under the ICWC to implement the Commission's decisions and manage water resources in the Syr Darya River Basin. The Syr Darya RBMA is in charge of managing the flow regime in the Naryn, Kara Darya, Chirchik and Syr Darya Rivers within the Syr Darya Basin extending from the Uchkurgan and Andijan HPPs to the Charadara Reservoir[92].

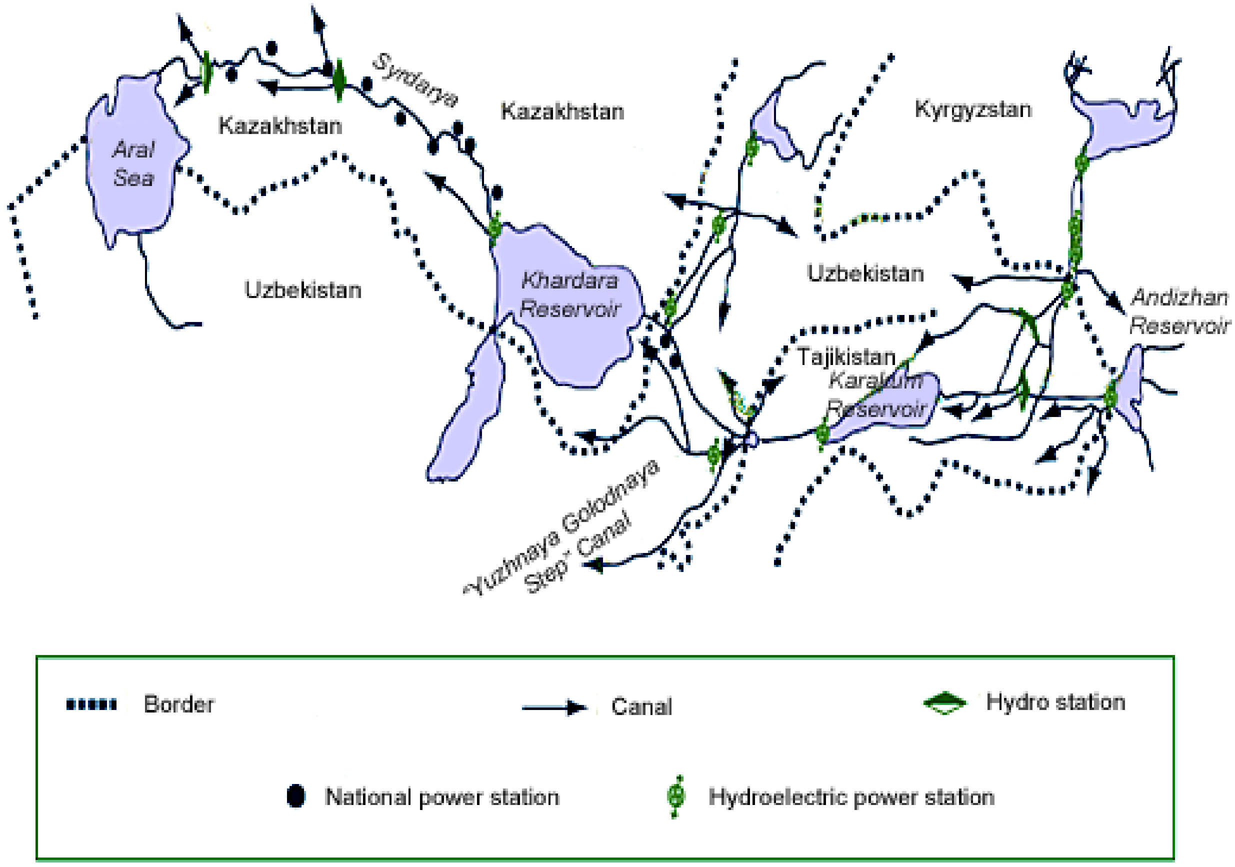

Figure 31: Key Water Reservoirs and Hydropower Stations in the Syr Darya Basin[93]

The Central Asian countries are now in the process of signing the Framework Convention on the Environmental Protection and Sustainable Development in the Syr Darya Region[94].

In the early 1990s, the Kazakhstan Government undertook a number of large-scale measures aiming to save the Aral Sea including the construction of dam isolating the Little Aral from the main part of the Aral Sea and a dramatic reduction

[92] M.Kh. Khamidov. 2008. Experience in the Coordinated Management of Water Resources by the Countries Lying in the Syr Darya Basin. The Syr Darya River Basin Management Authority. Available at: http://www.icwc-aral.uz/workshop_march08/pdf/khamidov_ru.pdf

[93] http://kzdocs.docdat.com/docs/index-16260.html

[94] http://www.wwf.ru/resources/publ/book/659

in the Syr Darya flow diversion to irrigation. As a result, the Northern Aral Sea has restored, water mineralization decreased and fisheries rebound[95].

As part of planning the mine expansion, the Company is conceptually considering the possibility of using the Syr Darya River as a backup source of water for industrial purposes at the processing plant at a rate of 30,000 m^3/day. Because the proposed water intake is located further downstream of the river section managed by the Syr Darya RBMA, an interstate permit is not required. The Company has agreed the possibility of abstracting the specified quantity of water with the Republican Enterprise “Aral-Syr Darya Basin Water Resource Management Inspectorate” under the Water Resources Committee within the RK Ministry of Agriculture[96]. It should be noted that the special protection status of the Syr Darya River requires that a separate environmental and social impact assessment be conducted to evaluate potential impacts associated with the design and construction of the river water intake.

6.8.2. Watercourses in the Project Area

The Project Area comprising the Shalkiya Mine site and surrounding areas drained by the Syr Darya River has a weakly developed hydrographical network. The most significant watercourses flowing across the Mine site and surrounding areas are small rivers Akuyuk (Akuik or Akuyik) and Zhideli. Other watercourses present in the area are the Shalkiya-sai stream and its tributary Kelte (**Figure 1**).

These watercourses flow in the southern and southwesterly direction along the general incline of the surface. The study area has a significant number of springs that give rise to local streams. Many of them are seasonal and dry up in their downstream sections. The local melt season ends in April and 50–70% of the annual flow volume is discharged over 2–2.5 spring months.

The Akuyuk River rises at an altitude of 900 m where the Ordovician sandstone deposits are present throughout the area. The River flows southwest within the boundaries of the Akuyuk Syncline and turns west as it leaves the mountains. The river has a catchment area of 312 km^2 and a length of 38 km. While flowing through the Akuyuk Syncline extending for 13 km and composed of carbonate rocks, the Akuyuk River loses part of its flow. According to the hydrological observation data for 1986-1990, water losses due to filtration range from 0.15 to 0.23 m^3/s, or 0.18 m^3/s on the average (under a 50% probability). Maximum flow discharge rates are recorded in March-April (20 m^3/s in 1973) dropping to only 0.2 m^3/s in August[97].

The Zhideli River rises at the confluence of two streams, the Domba and Zhilanda, the left and right tributaries. The headwaters of the Zhideli River rise at an altitude of 800-900 m. The river forms a catchment basin with an area of 589 km^2 and flows for about 33 km. The water level in the river in the high-flow period rises by 0.5-1.5 m as compared to the low-flow period. The highest flow discharge

[95] M.Kh. Khamidov. 2008.

[96] Letter of the Republican Enterprise “Aral-Syr Darya Basin Water Resource Management Inspectorate” under the Water Resources Committee within the RK Ministry of Agriculture No. 24-07-02-17/113 of 12 March 2015.

[97] Freiman G.G., Topoyev A.N., Selifonov S.E. et al. Report on the Estimated Lead and Zinc Ore Reserves in the North Western Property of the Shalkiya Mine (Kyzylorda Region). GeoInCentre LTD, Almaty, 2004.

rates occur in March-April, rising up to 20 m^3/s (the 1973 spring flood) while the minimum flow period falls on September (0.002 m^3/s).

The Shalkiya-sai stream as the right tributary of Kelte, rises at an altitude of 700-800 m and flows south west for 21 km and disappears in the loose clastic sediments. The stream has a catchment area of 272 km^2. Maximum flow discharge rates are observed in March-April (0.50–1.63 m^3/s) and the stream dries up in July-September[98].

Key hydrometric factors shaping the spring and annual river flow in the area are snow and rain falling in the river basins. Mean maximum snow cover thickness ranges from 130 mm at an altitude of 1850 m to 40 mm at 700 m and to 20-30 mm in the foothills. Spring rainfall plays a significant role in the river flow regime. The water from precipitation falling during the warm season (May-August) is almost completely lost due to evaporation and infiltration, contributing little to nothing to the river flow. Autumn and winter precipitation in some years may cause one or several significant floods that result in a general increase in flow volume[99].

Snow melting process is shaped by temperature conditions prevailing in winter and spring, which also influence the level of melt water losses. Winter thaws and longer snow melt season in the mountains result in significant surface flow losses.

A specific feature inherent to the right-bank tributaries of the Syr Darya River is spring floods whose intensity depends upon the snow cover thickness on the Karatau piedmont slopes and significant snow melting rates. Spring typically comes very quickly and can produce intensive flooding. For example, the 2014 spring flood arrived very fast due to a significant amount of snow accumulated on the Karatau slopes. High snow melt rates cause a rapid increase in runoff that may produce flash floods in winter and spring.

None of the watercourses flowing in the Project area reaches the Syr Darya River, as these flows totally infiltrate the coarse sand and gravel deposits of the mountain foothills. A number of small reservoirs and ponds have been established in the upper sections of these watercourses to provide water for irrigation and other purposes. These facilities are typically located in the valley-type lowland areas and have earth-filled dams. Each reservoir occupies a relatively small area ranging from 0.01 to 1.5 km^2 and normally has water outlets connected to the irrigation channels. These reservoirs are filled in spring and during rainfall events[100].

The irrigation facilities in the watercourses were mostly constructed many years ago and dams, water outlets and irrigation channels fell into disrepair. The situation began to improve during recent years with the launch of the state programme supporting the development of private farming and implementation of flood control measures. The government has financed the repair of dams, reservoirs and water outlets. These improvements help manage high flows in winter and spring and store water for irrigation.

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[98] *ibid*.

[99] *ibid*. Also, KazGiproTsvetMet Report: Environmental Impact Assessment (EIA). Shalkiya Mine Development (Design Revision). 2008.

[100] Environmental Impact Assessment of the Western Europe – Western China International Corridor Upgrade in the 1837–1917 km Section of the M-32 Samara-Shymkent Motorway. GeoData Plus LTD, Almaty, 2008.

A number of floods that occurred in 2012-2014 were caused by rapid snowmelt on the Karatau slopes. One flood occurred in the Kyrash reservoirs built in 1928 with a capacity of 2.5 million m^3 and occupying 28.5 ha. The reservoir is mainly fed by snowmelt water, rainfall, and flow carried by the Kainar Bulak stream and is mainly used for irrigation[101]. Similar flooding events occurred in the Koltogan, Zhideli, and Besaryk reservoirs[102]. As a result of these flooding events, the adjacent human settlements were flooded, some buildings and structures ruined, and livestock suffered[103]. These flooding events occurred in the adjacent areas located in the Karatau foothills 10-20 km away from the Shalkiya Mine site. The Mine staff informed during interviews that the water level in the mine water pond rose significantly in 2014. There is no systematic monitoring of water levels in the pond and no reliable historical data is therefore available to provide a basis for developing the design estimates regarding the mine water pond capacity.

It is recommended that the design developers use information about the 2012-2014 flooding events as a basis for predicting flooding risks for the mine facilities (waste rock stockpiles, tailings storage facility, mine water pond, wastewater treatment facilities etc.). It is required to design and construct a system of drains for collecting and diverting surface runoff and flood flows down the slope to areas where these flows can be safely discharged without risk to the mine infrastructure and human settlements. Intensive spring floods and rainfalls may cause the offsite migration of contaminated surface runoff from the production site, in particular from the waste rock storage areas, wastewater treatment plant site and TSF, resulting in the pollution of soil, vegetation cover, groundwater and surface waters. Flash floods events may cause impacts of moderate to long duration.

In line with preliminary recommendations provided in the earlier drafts of this document, the Mine in 2016 completed the diversion channel to divert the Shalkiyasai stream flow from the mine water pond. This flow diversion system has helped reduce the risk of pond overflow and downstream flooding significantly.

The reports do not provide information about the seasonal flow variations in the intermittent watercourses flowing in the Project area and drying up in summer. This information is essential for estimating the filling rate of the tailings storage facility, etc.

6.8.3. Water Quality in the Watercourses of the Syr Darya River Catchment Area

The water composition of the Syr Darya has changed significantly over the past decades due to the widespread river water use for agriculture. Earlier, the chemical composition of the water classified it as hydrocarbonate-calcium with small fluctuations of salinity between 500 and 600 mg/l.

As the river of the Syr Darya flows through the territory of Kyzylorda Region, the total mineralization of the water increases dramatically. The reason for such growth is the abstraction of the water into irrigation canals, losses in the river channel, and discharges of collector-drainage waters. These processes cause the degradation of the natural river regime and water quality. Thus, the total

[101] http://spec.emer.gov.kz/index.php?option=com_content&view=article&id=29959%3A------------lr&catid=20%3A2011-06-09-13-26-46&Itemid=35&lang=ru

[102] http://ru.dchs-kyzylorda.kz/news/114-proshlo-zasedanie-oblastnoy-komissii-po-preduprezhdeniyu-i-likvidacii-chrezvychaynyh-situaciy.html

[103] http://tengrinews.kz/tv/novosti/proisshestviya/1281/

mineralization of the water of the Syr Darya crossing the territory of Zhanakorgan District increased 1.4 times from 2005 to 2009; in Kyzylorda this indicator increased 3.9 times[104]. The seasonal variations in the water composition are observed due to the water abstraction for irrigation of agricultural lands.

The water quality of the Syr Darya within Kyzylorda Region does not meet sanitary-epidemiological norms regarding content of harmful substances in water bodies of domestic and fishing designation, including bacteriological indicators[105]. Thereby, the total number of bacteria in some cases far exceeds the standard indicators. However, the residents of some rural settlements still continue to use surface waters as drinking water.

The water quality is described further as per the Report on the calculation of lead-zinc ores reserves of the Shalkiya Deposit's North-Western property[106]. The water is fresh; it contains solids, which do not exceed 0.3 g/dm^3; by the chemical composition – it is soft hydrocarbonate calcium-magnesium water. The value of the total water hardness does not exceed 2.9 mmol/dm^3. The oxidation of the river waters varies in the range of 0.4 to 1.44 kg/dm^3. The salinity of the surface water in the spring does not exceed 0.2 g/dm^3; in low-flow period it increases to 0.5 g/dm^3; the chemical type of the water is sulphate-hydrocarbonate and hydrocarbonate-sulfate. The content of pollutants does not exceed maximum permissible concentrations for drinking water.

The test results for water quality samples collected from the Syr Darya River at the proposed location of water intake are presented in Annex 21.

6.9. Seismicity

Kazakhstan belongs to a system of Eurasian seismic activity bands and is characterized by intensive geodynamic processes. This country saw a number of devastating earthquakes over the past 140 years, with two of them – the 1889 Chilik and 1911 Kemin earthquakes – having a magnitude of over 8 according to the MSK-64 scale. The seismic risk in the southern and south eastern regions of Kazakhstan remains high and tends to grow even further as a result of the intensive development of hydrocarbon deposits[107]. This is why the existing seismic zoning maps of selected regions in Kazakhstan are being updated with the use of modern survey techniques[108]. According to the seismic zoning map of the RK, the major part of Kyzylorda region is classified as a weak seismicity area with the level of seismic intensity being below 6 degrees (**Figure 32**). According to the Kazakhstani construction regulations[109], Zhanakorgan district belongs to the 6-7-degree zone (according to the MSK-64 scale) while Shalkiya village lies within the 7-degree zone.

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104 Zhakashov N.ZH., Ibragimova N.A., Kylimbetov A.S., Hygienic characteristics of water sources of Kyzylorda region of the Republic of Kazakhstan

105 Balabykbayeva G.T. The ecology of the Syr Darya basin. Actual problems of humanitarian and natural sciences. 2012, No. 7. Available at: http://cyberleninka.ru/article/n/ekologiya-syrdarinskogo-basseyna

106 Freiman, 2004.

107 A. Nurmagambetov. Technogenic Seismic Phenomena Associated with the Development and Operation of Mineral, Oil and Gas Deposits. – In: Geology and Mineral Resource Protection Journal, No. 1 (34), 2010.

108 A. Sydykov. Seismic Regime and Seismic Hazard Prediction in Kazakhstan. The Doctorate Thesis Synopsys, Almaty, 2002. Available at: http://www.dissercat.com/content/seismicheskii-rezhim-i-prognozirovanie-seismicheskoi-opasnosti-v-kazakhstane#ixzz3nunz8HaX

109 RK Construction Standard SNiP RK 2.03-30-2006. Construction Activities in Seismic Areas. Design Standards

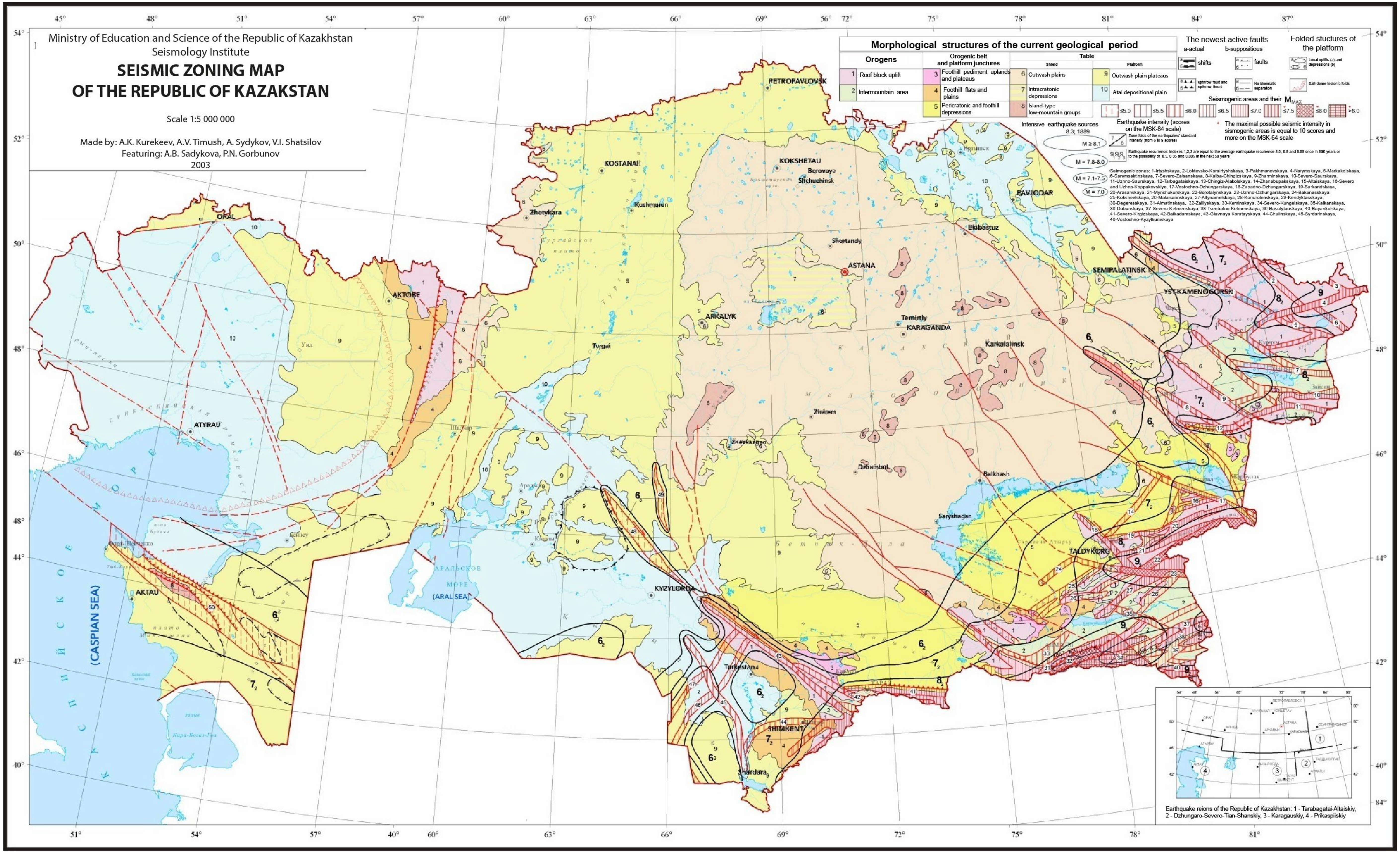

Figure 32: Republic of Kazakhstan Seismic Hazard Zoning Map

The Shalkiya Mine is located within the boundaries of the Turan Platform between the South Tianshan and Talas Fergana axes of the regional seismogenic structures. These transitional areas lying between the mountain structures and platforms form the geodynamic tension zones that are characterized by high seismicity potential. The Main Karatau Seismicity Generation Zone is located close to the Shalkiya site and may promote seismic activity in the area[110]. This zone extends for over 800 km from the southeast to the northwest (from the Kazakhstan border to the Aral Lowland). It may potentially produce earthquakes of maximum magnitude 5.5 and is aligned along the Karatau Ridge. The Shalkiya site occupies the eastern spurs of the Ridge, lying only 55-60 km from its axis (**Figure 32**).

According to the seismic hazard zoning data, the likelihood for the Shalkiya Mine site to have a magnitude 7 earthquake of within the next 50 years is 0.05[111].

Summary

Because the Shalkiya Mine and surrounding areas belong to the 7-degree seismicity zone, the provisions of the RK Construction Standard SNiP RK 2.03-30-2006 “Construction in the Seismic Areas” must be followed in the design, construction and operation of all Mine facilities including underground and surface infrastructure, processing plant, tailings storage facility and so forth. Earthquake Emergency Preparedness Plans will be developed at the Mine and the mine staff will be prepared to take prompt action if an earthquake occurs in order to manage potential consequences caused by the collapse of surface and underground structures.

6.10. <u>Radiation</u>

6.10.1. Overview

The operation of any mining facility involves the movement of huge masses of rock, groundwater, ore, and ore processing products that contain natural radionuclides and their decay products in various quantities that can be significant. Sometimes their concentrations in rocks, and more specifically in the ore from various deposits may be close to the commercially viable levels (over 100 g/t of uranium and over 1,000 g/t of thorium). These conditions promote the development of elevated gamma-radiation doses and radioactive gas (radon) flows (over 100 $mBq/m^2 \times c$), as well as higher concentrations of natural radionuclides in dust in working areas. These conditions may also entail radiation exposure risks for the environment and human health. It is therefore important to consider two equally important aspects of radiation hazards associated with the mining operations, namely health hazards (human exposure to radiation in the workplace) and environmental hazards (rate and scale of change in the radiation levels in various environmental components).

It is obvious that the assessment of these aspects requires information about the radiation characteristics of ore-bearing rocks and ores contained in the deposits, which should be continuously studied during the exploration and development of

[110] Current Seismic Hazard Zoning Map of Kazakhstan is available at: http://emer.gov.kz/index.php?option=com_content&view=category&layout=blog&id=133&Itemid=20&lang=ru

[111] Current Seismic Hazard Zoning Map of Kazakhstan

these deposits[112].

Under the current arrangement and in line with the SERSR-2015[113] provisions, all commercial deposits containing solid mineral resources can be classified into the following four radiation hazard categories[114]:

– extremely hazardous;
– hazardous;
– assumed to be non-hazardous;
– non-hazardous.

Those deposits that do not require a special survey to assess potential radiation hazards for communities and employees are considered as non-hazardous. The category of 'assumed to be non-hazardous' deposits includes those deposits that are not considered to represent hazards based on their radio-geochemistry but additional radiation surveys are required to confirm whether they are hazardous or not.

The hazardous and extremely hazardous deposits are those whose exploration and development requires special precautionary measures to protect local communities.

The limit values of the radiation factor $\boldsymbol{A_{eff.}}$[115] and gamma-radiation exposure dose[116] measured in the exploration wells (in a $\boldsymbol{4\pi}$-geometry) for different categories of deposits are presented in Table 38.

The occupational radiation safety requirements applied in circumstances where employees are exposed to naturally ionizing radiation are set out in key radiation regulations[117] [118] and can be summarized as follows:

- The single-factor effective gamma-radiation exposure dose in the workplace should not exceed 2.5 μSv/h;
- The equivalent equilibrium volumetric activity of radon (thoron) in the breathing area air should not exceed 310 (68) Bq/m^3;
- The management of raw materials and products whose $A_{eff.}$ value is below 740 Bq/kg and process waste whose $A_{eff.}$ Value is below 1,500 Bq/kg is allowed without the radiation factor based restrictions.
- It should be noted that radiation factor thresholds specified in the above mentioned regulations and summarized in the table enable a preliminary assessment of radiation hazards associated with any mining facility. The key criterion for assessing the level of radiation hazard/safety is the annual effective exposure limits set for employees and local communities, which

[112] RK Environmental Code of 9 January 2007 No. 212 (amended as of 15.06.2015), Article 276

[113] Sanitary Rules "Sanitary and Epidemiological Radiation Safety Requirements" (SERSR-2015). Approved by the Order of the RK Acting Minister of the National Economy of 27 March 2015 No. 261.

[114] Khaikovich I.M., Mats N.A., Kharlamov M.G. Radiation Hazard Classification of Solid Mineral Deposits // Regional Geology and Metallogeny. – 1999. – No. 8.

[115] Effective Specific Activity of Natural Radionuclides ($\boldsymbol{A_{eff.} = A_{Ra} + 1{,}3A_{Th} + 0{,}09A_K}$)

[116] Gamma-Radiation Dose Rate Measured Using the $\boldsymbol{4\pi}$ Geometry (Gamma-Ray Logging)

[117] RK Environmental Code of 9 January 2007 No. 212 (amended as of 15.06.2015), Article 276

[118] Sanitary Rules "Sanitary and Epidemiological Radiation Safety Requirements" (SERSR-2015). Approved by the Order of the RK Acting Minister of the National Economy of 27 March 2015 No. 261.

should not exceed 5 and 1 mSv/year, respectively[119]. These criteria are also used in the radiation monitoring programmes maintained at the industry-level when necessary.

Table 38. Limit Values of $A_{eff.}$ and Gamma-Radiation Dose Rates Used for Assigning a Radiation Hazard Class to a Solid Mineral Deposit

Deposit Category (Hazard Class)	$A_{eff.}$, Bq/kg		Gamma-Radiation Dose Rate, μR/h	
	From	To	From	To
Extremely Hazardous	Over 3 300		Over 350	
Hazardous	1 100	3 300	115	350
Assumed to be Non-Hazardous	100	1 100	10	115
Non-Hazardous	Less than 100		Less than 10	

6.10.2. Radiation Safety of Ores and Ore-Bearing Rocks Contained in the Shalkiya Deposit

The most complete and reliable information about radiation levels in all lithological varieties of rocks present in the ore body of the deposit has been derived through geo-physical investigations conducted in the exploratory wells[120] [121] and is schematically presented in the gamma-logging diagrams produced for core samples collected at the well sites (**Figure 33**).The gamma-radiation dose rate was measured and recorded using the ***4π***-geometry and certified high-sensitivity radiometric logging equipment in the continuous regime at a 1:200 recorder scale and a detection unit hoisting speed of up to 500-550 m/h.

The statistically processed gamma-logging results for key varieties of bearing rocks and ores are presented in **Table 39**. As can be seen from the table, virtually all key varieties of bearing rocks and ores present in the deposit have a weakly differentiated gamma-field. Their radioactivity ranges from 2 to 13 μR/h throughout the planned mining depth, reaching abnormally high levels (up to 30-34 μR/h) at some intervals.

[119] Sanitary Rules "Sanitary and Epidemiological Radiation Safety Requirements" (SERSR-2015). Approved by the Order of the RK Acting Minister of the National Economy of 27 March 2015 No. 261.

[120] Ovchinnikov V.V., Aralbayev Yu.K., Zorin Ye.S. et al. Detailed Geological Exploration Report and Reserve Estimates for the Shalkiya Deposit as of 01.08.1979. Report by Sorbulak Geological Exploration Team (Karatau GEE), 1979.

[121] Davletshin R.M. et al. Preliminary Estimate of Reserves Contained in the Shalkiya Deposit. The South Kazakhstan Gold Ore Expedition Well Logging Team Report, 1993.

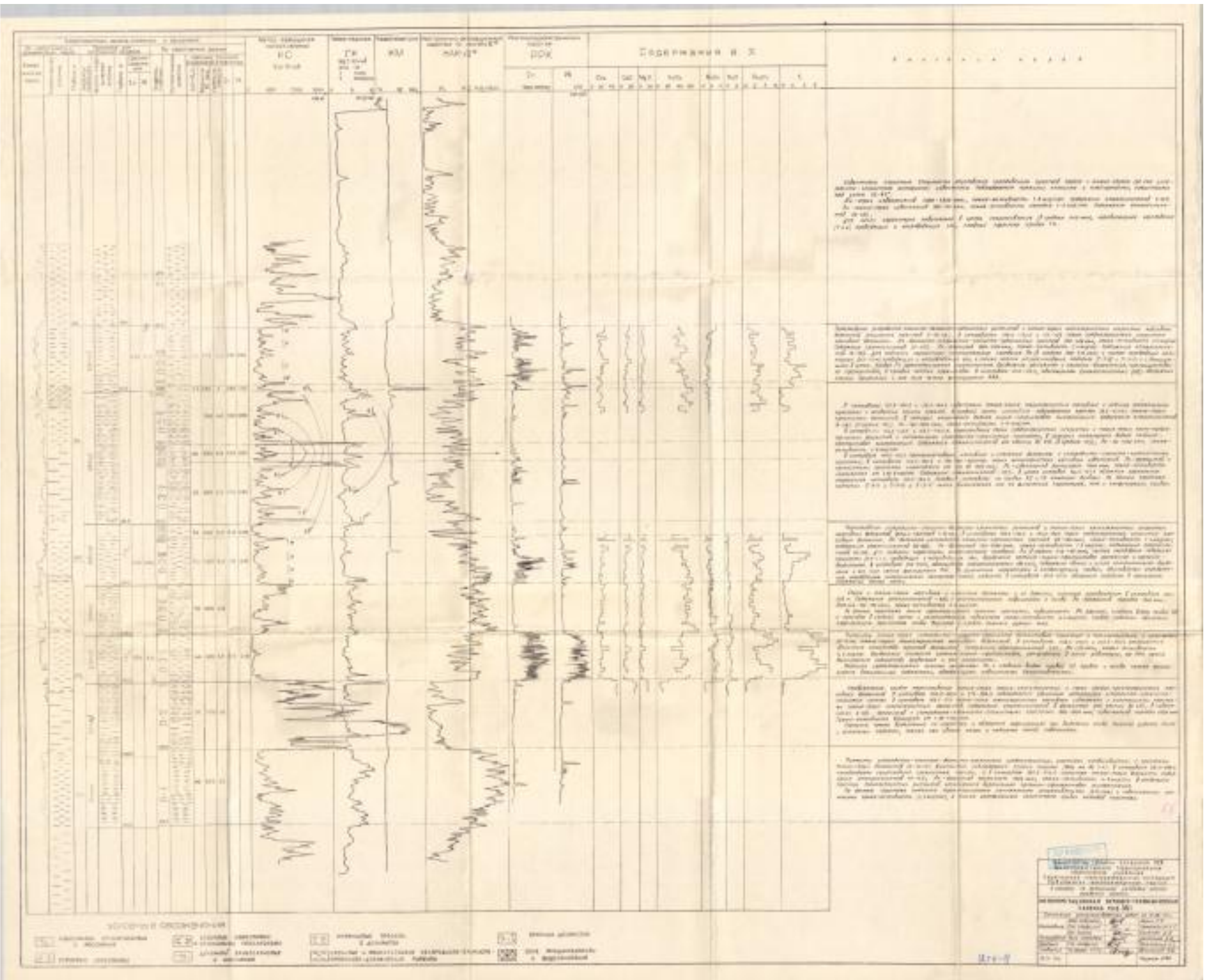

Figure 33: Geological Exploration and Gamma-Logging Results for Well No. 361

(Source: [122])

[122] Ovchinnikov V.V., Aralbayev Yu.K., Zorin, Ye.S. et al. Detailed Geological Exploration Report and Reserve Estimates for the Shalkiya Deposit as of 01.08.1979. Report by Sorbulak Geological Exploration Team (Karatau GEE), 1979.

Table 39. Gamma-Radiation Exposure Dose Rate Measured Using 4π Geometry

Rock	Gamma-Radiation Exposure Dose Rate, μR/h		
	Minimum	Maximum	Average
Loose Quaternary formations	9	13	9,3 ± 0,9
Coarsely stratified massive limestone	2	9	3,6 ± 1,3
Stratified limestone with clayey bands	3	11	7,8 ± 2,7
Argillite, aleurolite	15	34	23,9 ± 3,1
Carbonate-clayey-siliceous-dolomite rhythmites	3	8	3,9 ± 1,0
Carbonate-clayey-siliceous-dolomite (productive) rhythmites	2	12	3,7 ± 1,8

The analysis of radioisotope composition of five overburden samples collected at the waste rock storage site[123] indicates (**Table 40**) that the radiation characteristics of these samples are within the guideline limits set out in the SERSR-2015[124] and thresholds set for the Radiation Hazard Class 1. This means that the overburden material can used for various types of construction works and other human activities without radiation factor based restrictions.

Low radioactivity levels also characterize groundwater present in the deposit. The analysis of groundwater samples collected from the 6g BIS well shows that the total specific alpha-activity and beta-activity is 0.04 Bq/l and less than 0.1 Bq/l, which is considerably lower than relevant sanitary guidelines - 0.2 Bq/l for alpha-activity and 1.0 Bq/l for beta-activity.

[123] Protocol Produced by the Kyzylorda Region Sanitary and Epidemiological Review Centre within the Consumer Rights Protection Committee of 09.02.2015 No. 06-10

124 Sanitary Rules “Sanitary and Epidemiological Radiation Safety Requirements” (SERSR-2015). Approved by the Order of the RK Acting Minister of the National Economy of 27 March 2015 No. 261.

Table 40. Gamma-Spectrometry Results for Overburden Samples

Sample Material	Specific Activity, Bq/kg				
	Cs-137	**Th-232**	**Ra-226**	**K-40**	**$A_{eff.}$**
Bearing rock	Less than 2.7	4,3	9,6	120	31
	Less than 0.3	4,2	9,6	102	23
	Less than 2.8	4.4	10,4	115	28
	Less than 2.8	4,2	11,6	90	24
	Less than 3.9	5,9	11,9	83	31
Average values	Less than **2.5**	**4,6**	**10,6**	**102**	**27,4**

6.10.3. Environmental Radiation Levels at the Mine Site

The environmental radiation surveys at the mine site are part of the Industrial and Environmental Monitoring Programme and have been conducted since 2011 by specialized organisations[125].

The radiation monitoring includes measuring the gamma-radiation equivalent dose and radon flux density on the soil surface at the mine site, at the Sanitary Protection Zone boundary and in the residential area of Shalkiya village. No exceedances of existing sanitary guidelines have been recorded over the entire observation period.

The background gamma radiation levels at the mine site can be characterized using the measured levels of gamma radiation equivalent dose (that take account of radiation levels generated by the measurement equipment and response to space radiation) that do not exceed 0.16 µSv/h which is below the existing sanitary guideline.

The radon flux density on the surface of the waste rock dumpsite varies from 17 mBq/(m^2×s) to 37 mBq/(m^2×s), also well below the existing sanitary guideline set at 250 mBq/(m^2×s). Similar radon flux densities were recorded in Shalkiya village (17-35 mBq/(m^2×s)), which is also significantly lower than the existing guideline level set at 80 mBq/(m^2×s).

6.11. <u>Biodiversity</u>

6.11.1. Landscape Diversity

The morpholithology and terrain are the most stable component of the local landscape that serves as its ecological framework. The intensive anthropogenic transformation of the landscape pattern promotes the development of new features (stockpiles, technical water bodies, dams, terraced areas etc.). The landscape pattern in the southern region of the country where the mine is situated is a combination of scarcely populated desert and arid steppe areas that are relatively cold in winter and hot in summer.

The regional landscape is classified is the desert zone of the Turan Plain comprising two subzones which are divided into 4 regions, 6 provinces and 48 districts. The Shalkiya Mine and surrounding areas are part of the Kizilkum-Middle Syr Darya Plain Province[126] in which the desert landscapes prevail. The

[125] RGKP Kyzylorda Oblast Sanitary and Epidemiological Review Centre, Scientific Analytical Centre Test Laboratory, and RNPIC KAZECOLOGY Test Laboratory.

[126] Mukasheva Zh.N. The Lower Syr Darya Landscapes and Assessment of their Resilience against Anthropogenic Impacts. The Ph.D. in Geography Thesis Synopsis. Ashkhabad, 1992. Available at:

past and current human activities in the area have resulted in land transformation (the movement of rock masses, creation of new landforms, alteration/degradation of topsoil layer, development of obstacles impeding the migration of native animal species, etc.).

The Project area has a homogenous local landscape of gently undulating ephemeral steppe area, which is attributed to the arid climate, infertile soil and low-productive biota. The living resources in the area exist in extremely unfavourable temperature and moisture conditions virtually throughout all seasons. As a result, the existing vegetation cover is very scarce despite plants having relatively wide spreading roots.

The landscape pattern in the Project area is dominated by mining and Aeolian processes. These processes have varied intensity and orientation, and affect virtually all types of landscapes through deflation and accumulation[127].

The following taxa can be delineated through the typification of the landscape and geological systems present in the Project area:

- Mountain foothills with elevations of up to 450 m above sea level, partially dissected by erosion. Their gentle rocky rubble slopes are covered with the mixed grass/wormwood/salsola vegetation;
- Gentle plains with very scarce vegetation cover comprising silky wormwood/ephemeral/sandy ebelek and silky wormwood/crested wheatgrass plant associations;
- Intrazonal complexes (land depressions with shallow aquifers in the area where the cooling pond is located) comprising reed thickets (Anmdophragmites L.).
- Syr Darya floodplain composed of alluvial/meadow soils that often have elevated salinity levels, covered with meadow vegetation and sparse riparian woodland and shrubs (willows, poplars and silverberry trees); vast reed beds extend along the river banks.

The assessment of the resilience of the identified taxa against anthropogenic impacts[128] is provided below.

Taxa associated with the Karatau foothills: the major part of the North Western property, quarries and planned stockpile areas are considered to be ***weakly resilient*** against anthropogenic impacts (**Figure 34**). The Aeolian

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http://earthpapers.net/landshafty-nizoviev-syrdari-otsenka-ih-ustoychivosti-k-antropogennym-vozdeystviyam#ixzz3oCCMFYEy

The following landscape resilience categories are recognized in the thesis:

a. Very resilient;
b. Relatively resilient;
c. Strongly resilient;
d. Moderately resilient;
e. Weakly resilient;
f. Relatively non-resilient;
g. Non resilient.

[127] Milkov F.N. Physical Geography: Landscape Study and Geographic Zoning, Voronezh, 1986

[128] The resilience assessment of landscapes in Kyzylorda region is presented in the paper by Zh.N. Mukasheva.

deflation processes are most active in these areas that have a very scarce vegetation cover (40-60%); the denudation processes show a steady trend of being aligned toward the foothill.

Figure 34: Karatau Foothills

Gentle plains (elevations varying within a narrow range from 10 to 15 m) where the key components of the mine infrastructure are located including the Haulage Shaft, Skip Shaft, Ventilation Shaft, Cage Shaft, workshops, substation etc. are considered to be **moderately resilient** against anthropogenic impacts (**Figure 35**). Mine infrastructure and facilities present in this area function as barriers restraining wind erosion and decreasing wind speed. The area with vegetation cover in this area is reduced due to production operations (down to 70%).

Figure 35: Gentle Plains

Intrazonal Complexes associated with the surface depressions and the Shalkiya-Sai stream channel ending in the mine water pond **(Figure 36)** which, in its turn, is connected with the sanitary sewage lagoon via a waterlogged depression. These taxa are classified as relatively resilient. The groundwater in this area occurs close to the land surface and vegetation cover is quite dense, especially along the shores of water bodies. **The Aeolian erosion processes are weaker**.

Figure 36: Depressions on the Plain

Syr Darya floodplain is located less than 20 km from the Shalkiya Mine. The Syr Darya River valley is an important ecological corridor for various animal and bird species. The river floodplain in this area is dissected by numerous arms and branches; it is overgrown with reed and riparian woodland in some places and intensively used for farming (rice/melon/vegetable growing and gardening). With the existing level of anthropogenic pressure, this taxon can be assessed as being ***moderately resilient.***

Summary

Landscapes in the Project area (including the industrial site and adjacent areas) generally show the low level of resilience against anthropogenic disturbance. Various anthropogenic impacts associated with the past and current human activities (redistribution of soil, alteration of terrain, construction of motor roads and other utilities etc.) have reduced the resilience of the landscape pattern and caused the ecological destabilization of the natural environment. The topsoil layer is considered to be the most sensitive component of the local landscape.

6.11.2. Vegetation and Flora

The Project Area vegetation belongs to the westernmost exclave of the Central Asian mountain floristic province. Flora and vegetation of Kyzylorda Region is distinguished by the considerable variety related to the topsoil diversity by the degree of ground water salinity, texture and depth level. Flora of Kyzylorda Region is represented by 819 species belonging to 391 genus and 81 families[129].The Syr Darya River valley is distinguished by a significant variety of vegetation forms. Riparian forests, which, by predominance of woody plants in their composition, can be oleaster, willow, turanga and willow-oleaster, grow on the levees.

Thick grass vegetation, such as: liquorice, Sphaerophysa salsula, Limonium otopelis, Sophóra alopecuroídes, Alhagi pseudalhagi, Euphorbia jaxartica, Leymus multicaulis, Saussurea salsa and etc., grows in the more sparse riparian forest and open spaces. With distance from the river there is a decrease in the ground water level, and the wood riparian vegetation alternates with shrubs, which often form impenetrable thickets of Tamarix ramosissima–Halimodendron halodendron. Common reed thickets grow in the flooded areas.

Piedmont deserts occupy the main area of low-hill mountain trails and piedmont plains (production area peripheral sites and adjacent areas). The plant associations and gramineous-Artemisia-white-Salsola desert and their rockmat series with white salsola, Artemisia terrae-albae and turanica, Stipa richteriana, Poa bulbosa, Ephedra intermedia and Acanthophyllum are common on the rocky low-hill terrains.

Gramineous-ephemeral-Artemisia communities of Artemisia glauca Krasch, more rarely – of Artemisia turanica Krasch, are formed beneath the deluvial smooth hillside trail. Among the Artemisia there are synusiae of grass family ephemeras and ephemeroids (meadow grass, annual bromegrass, Eremopyrum). Herbage reaches its greatest growth in the second half of spring, then ephemeras dry out and green background alternates with the monotony of Artemisia thickets.

[129] Nazarova G.A., Baykenzheeva A.T. Vegetation of Kyzylorda Region. UDC 581.9, Kyzylorda, 2014. Available at:

Common reed is a dominant species from the northeast and east sides of the sewage detention pond. Analysis of vegetation recovery in the disturbed soils showed that ruderal species hardly occupy such areas because of low humus content, severe temperature conditions and moisture deficit (**Figure 37**). Plant cover of dumps, disturbed areas and others does not exceed 10-15%. Artemisia and Carlina acaulis are the main pioneer species in such areas.

Figure 37: Occupying of redeposited soils by the ruderal plants

In the production site (**Figure 34, Figure 35**) and adjacent areas the vegetation is very sparse, exposed to trampling by domestic animals and suffers from dust. The plants tend to occupy only those areas of disturbed land (**Figure 38**) where there is enough moisture (e.g., the riparian strip of the mine water accumulation pond).

Figure 38: Vegetation state in different habitats

Vegetation is very important for the households of Zhanakorgan District, as it is the main feed for almost all livestock on the summer pastures. The Project's land allotment is currently used for illegal livestock grazing.

The indicator species – Artemisia terrae-albae Krasch – was selected to assess the pollution of vegetation from the mine production activities. Analysis of toxic metal mobile forms content in the aerial part of Artemisia was carried out in 2007 and was continued within the industrial environmental monitoring program.

To date the rare and endangered plant species are not revealed in the Project Area (except for the Syr Darya River floodplain). However, the Red Book of Kyzylorda Region[130] indicates that the spurs of the north-western part of the Syr-Darya Karatau Mountains are distinguished by flora endemism. Some rare and endangered plants (classified by their conservation value and extinction risk)[131] were found to be present in Zhanakorgan District:

1. Spiraeanthus schrenkianus Maxim, Spiraeanthus schrenkianus Maxim – is a rare species with decreasing habitat and size.
2. Gypsophila aulieatensis B. Fedtsch – is a rare, epidemic species. Species habitat decreases due to intensive grazing and land development during open-pit mining.
3. Eminium lehmanni (Bunge) O. Kuntze – is a rare species with decreasing habitat.
4. Tulipaborszczowii Regel, Liliaceae Hall family – is a rare epidemic species.
5. Artemisia karatavica Krasch. Et Abol. Asteraceae Dumort family. Compositae – it is a rare, solitary species.

Considering the above information, the presence of plant species with conservation status at the mine site cannot be excluded. It is however important to bear in mind that these plants may have different conservation status. It can be assumed that the following endemic species are likely to occur at the mine site: Gypsophila aulieatensis B. Fedtsch and Tulipa borszczowii Regel.

Summary

Plant cover at the mine site and in the adjacent areas is extremely sparse, except for the wet areas of the mine water pond. The vegetation almost does not restore in the soil deformation areas.

It is possible that species contained within the Red Book are identified onsite; however, if this is the case due to the large homogeneous character of the local and regional area it is likely that such rare species will be abundant locally and/or able to be translocated/reintroduced.

6.11.3. Fauna

The first ever specialized survey of the vertebrate fauna at the Shalkiya mine site and in the surrounding areas was undertaken in 2007[132]. Local fauna comprises species that are considered to be typical of the Karatau Mountain Ridge and Syr Darya River floodplain and synanthropic species that live near humans (Annex 8). The terrestrial vertebrate species occurring in the Project area include 26 mammal species, 48 bird species, 11 reptile species, and 1 amphibian species. Overall, 78 bird species may occur in the area during the migration period, including five rare species listed in the Kazakhstan Red Data Book[133].

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[130] Red Book of Kyzylorda Region. Plants. Astana, 2014.

[131] The Republic of Kazakhstan Red Data Books use the numerical scale to classify species into various extinction risk categories that are aligned with the IUCN classification: I. – Possibly extinct; II. - Endangered; III. - Rare; IV. – Declining; V. – Fluctuating; VI. – Restored.

[132]Scientific Research Report: Environmental Monitoring at the Shalkiya Mine Waste Storage Area (Contract No. 126/04-07 of 17.04.07), EcoLimit Centre, 2007

[133]Kazakhstan Red Data Book, Volumes 1 and 2, Almaty, 1996, and RK Government Resolution on the Approval of the Rare and Endangered Plant and Animal Species Lists, Astana, 2006

Mammals

The local mammal community comprises desert species, species inhabiting the Karatau Mountains and those typical of the Syr Darya River floodplain, a total of 26 species. The common species include various rodents (ground squirrel, vole, jerboa, and gerbil). The steppe fauna is represented by the steppe polecat. Insectivorous and small canine species also occur in the Project area.

Birds

Kyzylorda region lies along a major branch of the West Siberia/Africa bird migration route that leads to the Lower Syr Darya Basin and Aral Sea. The Syr Darya River provides an ecological corridor for migratory species with the riparian woodlands being a vital intrazonal habitat for birds relying on trees and shrubs. There are 4 key bird areas in the region[134]. The Mine staff reported that goose and swan flocks were observed to use the mine water pond for resting and feeding during the spring migration of waterfowl species. The bird fauna survey undertaken in the Project area identified about 48 settled and nesting species and up to 78 seasonal migrant species. The common bird species include the representatives of the lark and wheatear species whose nests are distributed throughout the area.

The anthropogenic landscapes comprising residential buildings and support structures are home to the following seven most frequently occurring synanthropic species: rock pigeon, eastern turtle dove, little owl, whoop, tree sparrow, house sparrow, and common swallow. The nesting bird community includes 17 species. In milder winters, the local wintering community may be also joined by various waterfowl birds, representatives of the Corvidae family, some finch and bunting species.

Reptiles and Amphibians

Local reptile fauna in the Project area is scarce and largely limited to lizards (steppe agama, toad-headed agama, and sunwatcher). The latter is a sub-endemic Central Asian species occurring in the playas (takyrs) and in arid areas with clayey soil. The steppe runner is another endemic species widespread in the Central Asia. These species almost never occur in the anthropogenic and technogenic landscapes. The Central Asian tortoise has a higher population density in the western part of the region in the Syr Darya River floodplain. Other quite frequently occurring reptile species are Dione snake and steppe ribbon snake. Venomous snakes are represented in the Project area by the Orsini's viper and Central Asian viper. Green toad (**Figure 39**) is the only amphibian species occurring in the Project area in wetter places and near shallow water bodies.

[134] Sklyarenko S.L. Key Ornithological Areas in Kyzylorda Region. Applied Biology Centre of the Kazakhstani Biodiversity Conservation Association, 2013

Figure 39: Green Toad (Butoviridis)

Invertebrate Fauna

The list of common insect species occurring in the Project area is provided in Annex 8. Surveys show that the lowest number of species is typically observed in various salt-affected areas. Over 20 insect species occur in the areas where wormwood communities are distributed. Dangerous arachnid species occurring in the Project area include camel spider (*Geleodes araneoides*), tarantula (*Lycosa singoriensis*), scorpion (genus *Buthus*), and black widow (*Lathrodectus tredecimguttatus*).

Fauna Species of Social Significance

Fauna species of social significance are animals carrying dangerous infections – these first and foremost include rodents. The most numerous rodent species is the greater gerbil that is known as the main reservoir of bacteria that cause plague in the region. The dense populations of rodents may cause the development of epizootic outbreaks of plague, pseudotuberculosis, yersiniosis, salmonellosis, pasteurellosis, and erysipeloid. The bacteria that cause Cutaneous leishmaniasis, black fever and so forth maintain their existence in the greater gerbil populations. The infected animals may transmit these bacteria to humans.

The plague bacteria can be transmitted to humans by the bite of an infected flea or as a result of contact with tissue or body fluid of a plague-infected animal. For example, a human may become infected from fleabites when conducting the excavation work that may affect rodent holes where great numbers of fleas are concentrated. Many types of animals that may be affected by plague and other dangerous infections are hare, ground squirrel, jerboa, vole and other mouse-like mammals. The rabies virus can be transmitted by wolves, foxes, corsac foxes, and stray dogs and cats. This aspect is particularly significant in this administrative region where large epizootics (animal disease epidemics) occur among the livestock. The most recent large-scale loss of livestock occurred in June-July 2015; its cause is still unclear[135].

Venomous spiders (scorpion, black widow, and tarantula) may occur in the peripheral areas of the region. The black widows are the most dangerous spiders in the region.

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[135]http://regtv.kz/kyzylordinskaya-oblast/chp/item/3914-massovyj-padezh-melkogo-rogatogo-skota-proizoshel-v-kyzylordinskoj-oblasti.html

Animal Species Listed in the RK Red Data Book

No mammal, reptile, amphibian and insect species listed in the Kazakhstani Red Data Book were found to be present in the Project area during the 2007 survey of local fauna conducted by the EcoLimit Centre. However, one cannot exclude that rare species of animals, birds and insects may be found in the surrounding areas including the western spurs of the Karatau Ridge and the Syr Darya floodplain by conducting a longer term and larger scale fauna survey.

The 2007 bird fauna survey confirmed that the mine site and adjacent areas are visited by the migrating birds with different rarity and vulnerability statuses[136] and listed in the Kazakhstani Red Data Book (**Table 41**, Annex 8).

Table 41. Animal Species Listed in the Kazakhstan Red Data Book

No		Family	Habitat	Conservation Status
	Reptiles			
1.		Agamidae. Sunwatcher (Phrinocephalus helioscopus)	Occurs in the playas (takyrs) and in arid areas with clayey soil. Central Asia's sub-endemic species	Category 4
2.		Lacertidae. Steppe runner (Eremias arguta)	Widespread in the area. Central Asia's sub-endemic species	Category 4
3.		Viperidae. Meadow viper (Viperaursuni)	Occurs in the riparian areas of water bodies and near rodent colonies. Declining population	Category 3
	Rare and Endangered Bird Species[137]			
4.		Tawny eagle (Aquila rapax).	A relatively large population which was declining not long ago	Category 5
5.		Eastern imperial eagle (Aquila heliaca),	May occur in the area during migration	Category 2
6.		Demoiselle crane (Anthropoides virgo)	Restoring species. Occurs in the steppe and semi-desert areas; penetrates deep into the desert	Category 5
7.		Black-bellied sandgrouse (Pterocles orientalis)	Nests in the remote areas	Category 3
8.		Pallas's sandgrouse (Syrrhaptes paradoxus)	Declining species. Occurs in the semi-desert and desert areas	Category 4
9.		Eurasian coot (Fulica atra)	Rarely occurring	Category 5

[136] The numerical scale is used to classify species into five extinction risk categories that can be easily aligned with the majority of globally adopted categories (1996 IUCN Red List of Threatened Species of Animals):

I - Vanishing (EX? + CR, EN);

II - Declining Decrease (VU);

III - Rare (LR-nt);

IV - Uncertain (Indeterminate) (DD);

V - Restored (Out of Danger) (LR-cd)

0 Extinct (species included in this category are considered as being part of the Category 1 – Vanishing (extinct, and possibly extinct).

[137] By a degree of rarity, the Red Data Book species are divided into the following 5 categories: 1 - vanishing, 2 - rare, 3 – declining, 4 – uncertain (indeterminate), 5 - restored, i.e. out of danger due to action taken.

Summary

The mine site and surrounding areas lie within the zone where venomous insects and snakes, as well as various types of socially dangerous animals serving as long term reservoirs for the bacteria causing plague, Cutaneous leishmaniasis, black fever and so forth can be involved. The Red Data Book species only visit the Project area during seasonal migrations. Considering the conservation status of these species, it is required to develop a bird repellent system to scare away birds from the tailings storage area and incorporate it into the facility design.

The Red Data Book reptile species tend to move away from the disturbance areas and no special habitat protection measures are therefore required.

Generally, Kyzylorda Region and Zhanakorgan District have a limited amount the habitat (nature reserves, protected sites etc.) for bird species listed in the Red Data Book and/or involved in the global-scale migration. As part of the compensation strategy, it might be useful to consider the Mine's involvement in the development of new protected areas in the region.

6.11.4. Special Protected Areas

Kazakhstan has signed the Convention on Biodiversity Protection[138] and has been developing national legislation on special protected areas (SPA) based on the Constitution of the RK, Law of Kazakhstan "On Special Protected Areas"[139], Concept of development and placement of specially protected areas by 2030[140]. Currently, actively protected areas are 10 state nature reserves, 12 national natural parks, 5 natural sanctuaries and 50 nature reservations. Within the RK, the biggest Central-Asian ecological regions of West Tien Shan and Altai-Sayan occur.

In accordance with the List of SPAs[141], in Kyzylorda Region, three protected areas function under the subordination to the State Committee for Forestry and Hunting of the Ministry of Agriculture of the RK (**Table 42**).

Table 42. Special protected areas of Kyzylorda Region

№	Specially protected area	Distance from the Mine site, km	Area, ha	Location
1	Barsakelmes State Nature Reserve	Over 500	160,826	Aral District
2	Kargalinsk State Zoological Reserve	65	1,330	Shiyeliysk and Zhanakorgan Districts

[138] Decree #918 of the Cabinet of Ministers of Republic of Kazakhstan of August 19, 1994

[139] Law of Republic of Kazakhstan "On specially protected areas" (amended and updated as of September 29, 2014).

[140] Decree #1692 of the Cabinet of Ministers of Republic of Kazakhstan of November 10, 2000.

[141] Decree #1074 of the Cabinet of Ministers of Republic of Kazakhstan "On approval of the list of specially protected areas of the state importance". Astana, November 10, 2006 # 246 (25217).

3	Torangylsaisk State Zoological Reserve	Over 200	17,900	Terenozeksk District

The Kargalinsk State Zoological Reserve is located 65 km from the Project development area, on the border with Shiely District. The area is dominated by landscapes of the ancient and modern Syr Darya River valley, dissected by narrow river channels, small ephemeral lakes and marshes. Shallow groundwater provides for a rich and varied meadow and marshy shrubs. Arrays of saksaul, tamarisk, as well as tea and thick reed thickets have been formed. The reserve was established to protect and reproduction of Semirechensk pheasant and its subsequent acclimatization and re-acclimatization to other areas of the RK.

The South-Kazakhstan State Reserve zone was established in 2005 in Kyzylorda Region, and also covers South Kazakhstan Region and Zhambyl Region. This area covers 6,258,000 hectares. The aim of the protected area is to preserve the protected ecosystems of the Syr Darya River left bank and the eastern slopes of the Karatau Ridge.

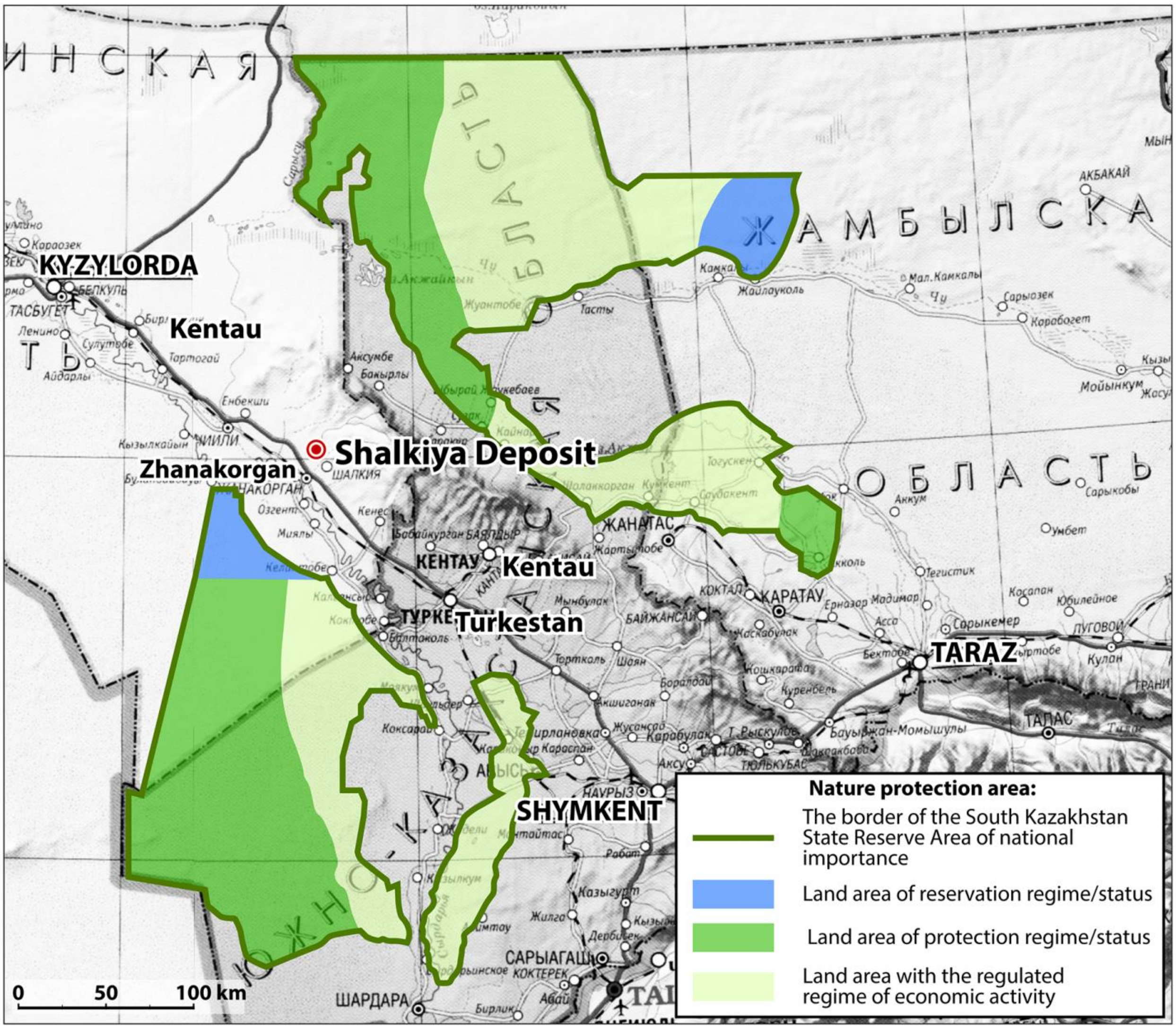

Figure 40: South-Kazakhstan State Reserve zone

The Medieval "Syganak Mound" (Sunakata) is located in the vicinity of the village of Sunakata that is about 45 km to the northwest of the mine. The Mound is a protected natural landscape and the historical and cultural monument. According to archaeologists, the settlement dates to the 5^{th}-6^{th} centuries AC. The Kyzylorda-Turkestan motor route passes near the Mound. The Kyzylorda-Turkestan motor route passes near the Mound.

Summary

The network of SPAs in Kyzylorda Region is underdeveloped, specifically in Zhanakorgan District. The existing protected areas are significant distances from the Project development site.

6.12. Noise, Vibration and Electromagnetic Radiation (EMR)

Instrumented measurement of noise, vibration and electromagnetic radiation (EMR) has not been conducted at the mine site, within the SPZ boundaries and in the adjacent residential areas.

Existing noise and vibration sources at the mine site are associated with ongoing repair and renovation activities. As part of the 2015 workplace certification, noise and vibration levels were measured near machinery, plant and equipment while they were operating[142]. The following vibration levels were recorded:

- Carpenter shop (smoothing plane and circular saw): 66-68 dB;
- Transformer substation electrical equipment: 55-78 dB for various type transformers;
- Mobile equipment repair shop: 90-95 dB;
- Vehicle maintenance and repair shop: 90-95 dB;
- Boiler house: 95-98 dB;
- Electrical welding shop: 56-59 dB;
- Pump stations: 91-94 dB;
- Railway tracks: 90-95 dB.

The following noise levels were measured:

- Carpenter shop: 64 dBa;
- Transformer substations: 54-57 dBa
- Mobile plant repair shop: 74 dBa;
- Vehicle repair and maintenance shop: 63 dBa;
- Electrical welding shop: 68 dBa;
- Pump stations: 79 dBa;
- Railway tracks: 77 dBa.

Other noise sources include the mine’s motor vehicles transporting freights and passengers between the mine and Shalkiya village and the mine and Zhanakorgan settlement. Longer-distance trips to Kyzylorda and other remote destinations take place less frequently.

[142] The measurement was conducted by the EmanExpert Company in September 2015.

At present, the mine's vehicles (cars and busses) are used to transport passengers along the access road connecting the M-32 motorway and Shalkiya and Kuttykosha villages. Freight is transported using a direct access road connecting the highway M-32 to the Mine; this straight access road is in worse condition than the one leading to Shalkiya village.

As traffic intensity increases, including passenger transportation, a short straighter access to the mine site should be used to avoid excessive noise impact on the Shalkiya village residents. This road should be rehabilitated.

External sources of physical impacts include adjacent stone crushing plants that also use vehicles to commute to and from their sites, including large haulage trucks transporting input materials for their processes. In addition, these plants conduct small-scale blasting operations in quarries located close to the mining and land allotment boundaries of the Project. Blasting and stone crushing operations at these plants generate vibration and noise affecting employees and local fauna. It should be noted that elevated vibration levels caused by blasting operations in the local quarries can be considered as a risk to stability of underground mine workings.

When estimating acceptable sound pressure levels for the mine construction and operation phases, one should not ignore baseline noise generated by dust storms at wind speeds of 20 m/s and more. The instrumented measurements should be conducted to produce correct estimates of acoustic and EMR impacts of the Project and determine the baseline levels of noise, vibration and EMR. These measurements should meet the requirements of the RK legislation, IFC General EHS Guidelines[143] and IFC EHS Guidelines for Mining[144].

Summary

Key noise and vibration sources at the mine site and in the surrounding areas are associated with the operations involving the use of equipment, vehicles and mobile plant and blasting operations performed at the Mine site and adjacent industrial sites.

Special focus needs to be placed on current freight and passenger transport operations conducted using the access road between the M-32 motorway, the Mine and Shalkiya and Kuttykozha villages. Larger traffic flows may result in increased noise levels that may negatively affect the livelihood of the local residents. In the future, large haulage trucks should use a special road to the Mine site.

The instrumented measurement of noise, vibration and EMR levels should be conducted to produce required baseline inputs for acoustic estimates.

[143] IFC. 2007. General Environmental, Health and Safety Guidelines (available at: https://www.google.com.ua/search?q=IFC%E2%80%99s+General+Environment,+Occupational+Health+and+Safety+Guidelines+&ie=utf-8&oe=utf-8&gws_rd=cr&ei=HVWmVb6-BMWgsgGllK3IDA#q=IFC+General+Environmental,+Occupational+Health+and+Safety+Guidelines).

[144] IFC. 2007. Environmental, Health and Safety Guidelines for Mining (available at: http://www.ifc.org/wps/wcm/connect/1f4dc28048855af4879cd76a6515bb18/Final%2B-%2BMining.pdf?MOD=AJPERES&id=1323153264157).

7. SOCIAL BASELINE

7.1. Republic of Kazakhstan

7.1.1. General Information

The Republic of Kazakhstan (RK) is located in the Central Eurasia and shares borders with Russia in the west and north, China in the east, and Kyrgyz Republic, Uzbekistan and Turkmen Republic in the south. The country occupies an area of 2,725,000 km^2, being the 9th largest country and the largest landlocked country in the world.

As of January 2015, the country has a population is 17,439,300 people[145] (being the 64th most populated country in the world). The population density (as of 2015) is only 6.3 people per km^2[146] with a global rank of 184.

The population's ethnic pattern is dominated by Kazakhs (66%), followed by Russians (21%), Uzbeks (3%), Ukrainians (1.7%), Uyghurs (1.4%), Tatars (1.2%), and Germans (1%)[147].

The Kazakh language is the state language, while Russian – the only minority language in Kazakhstan – has official status and can be equally used for all administrative and institutional purposes. According to the 2009 census, Russian is spoken and understood by 94.4% and Kazakh by 74% of the country's population. The popularization of English and the tri-unity of the Kazakh, Russian and English languages in the country are officially declared as one of the key objectives of the governmental language policy.

After the collapse of the Russian Empire, the Central Asian countries became part of the Soviet Union. Their borders, capitals, statuses and names altered many times in the 1920s-1930s. In 1936, Kazakhstan became the Soviet Socialist Republic with its capital based in Almaty.

In the 1930s–1940s, Kazakhstan experienced massive inflows of people deported from other parts of the Soviet Union based on their social class or ethnic origin. Numerous labour camps (GULAG) established in Kazakhstan in the late 1920s– 1930s, large-scale industrialization in the 1930s, evacuation of industries and people during the World War II, the Virgin Lands Campaign in the 1950s also brought millions of people from other Soviet republics to Kazakhstan.

During the Soviet era, major industrial sectors that developed most intensively were mining, cotton growing, and arms manufacture and testing. The Baikonur Cosmodrome, the world's first and largest operational space launch facility, was

145 http://stat.gov.kz/faces/wcnav_externalId/homeNumbersPopulation?_afrLoop=16217721457132239#%40%3F_afrLoop%3D16217721457132239%26_adf.ctrl-state%3D1jogo05ph_63 Demographic Indicators for the period from 2007 to July 2015.

146 http://stat.gov.kz/faces/wcnav_externalId/homeNumbersPopulation?_afrLoop=16217721457132239#%40%3F_afrLoop%3D16217721457132239%26_adf.ctrl-state%3D1jogo05ph_63 Country Area and Population Density

147 http://stat.gov.kz/faces/wcnav_externalId/homeNumbersPopulation?_afrLoop=16222912827286751#%40%3F_afrLoop%3D16222912827286751%26_adf.ctrl-state%3D81til7e7p_21 Population Number in the Republic of Kazakhstan by Ethnic Group as of the Beginning of 2015.

founded in 1957. In December 1991, after the collapse of the USSR, the RK declared independence. In 1997, the country capital was moved from Almaty to Akmola (currently known as Astana).

Kazakhstan is the unitary presidential republic. The president is elected every five years. Since the declaration of independence, Nursultan Nazarbayev has been the country's first and only president. He began his career as the country's leader in 1989 when he was appointed to the position of the First Secretary of the Central Committee of the Communist Party of Kazakhstan.

The executive branch is represented by the Government led by the Prime Minister who is appointed by the President and approved by the Majilis (the lower house of the Parliament).

The legislative power is exercised by the bicameral Parliament comprising the Senate (the upper house having 47 members with 15 of them being directly appointed by the President) and the Majilis (the lower house with 107 members elected by the direct national vote every five years.

7.1.2. Demography

The 1990s were marked by a decrease in the population number attributed to: 1) reduced natural increase rate of the country's population as a result of a profound crisis after the collapse of the USSR, which was also observed in other post-Soviet countries[148]; 2) emigration of many of the country's non-Kazakh people who historically accounted for a significant part of the country's population (refer to Section 7.1.1.).

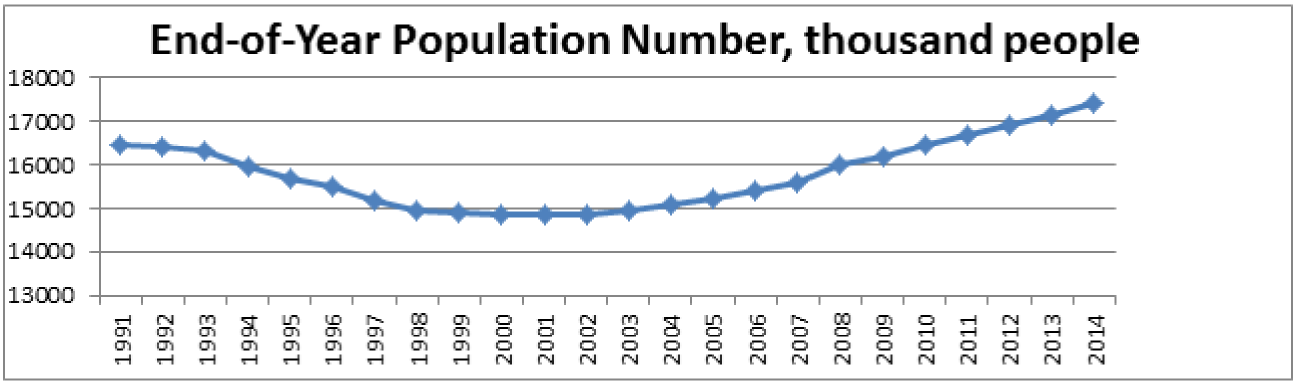

Figure 41: Population Number in the Republic of Kazakhstan in 1991-2014 (thousand people)[149]

Currently, the country's population is growing steadily **(Figure 41)** due to high natural increase rates. Relatively low net positive migration rates in 2004–2011 reversed in 2012–2014 **(Figure 42).** The population was shrinking significantly in the 1990s due to a decrease in the natural growth rates, which was greatly exacerbated by high outward migration rates. The natural population growth rates

[148] Unlike other post-Soviet countries, there has never been a natural decline in the population number in Kazakhstan. As can be seen from Table 2, births have always exceeded deaths.

[149] Source: http://stat.gov.kz/faces/wcnav_externalId/homeNumbersPopulation?_afrLoop=16217721457132239#%40%3F_afrLoop%3D16217721457132239%26_adf.ctrl-state%3D1jogo05ph_63 Dynamics of Key Indicators (in Russian)

began to stabilise and grow steadily in the 2000s. Some immigrant growth was observed in the early 2000s but the net migration rate has remained close to zero since then.

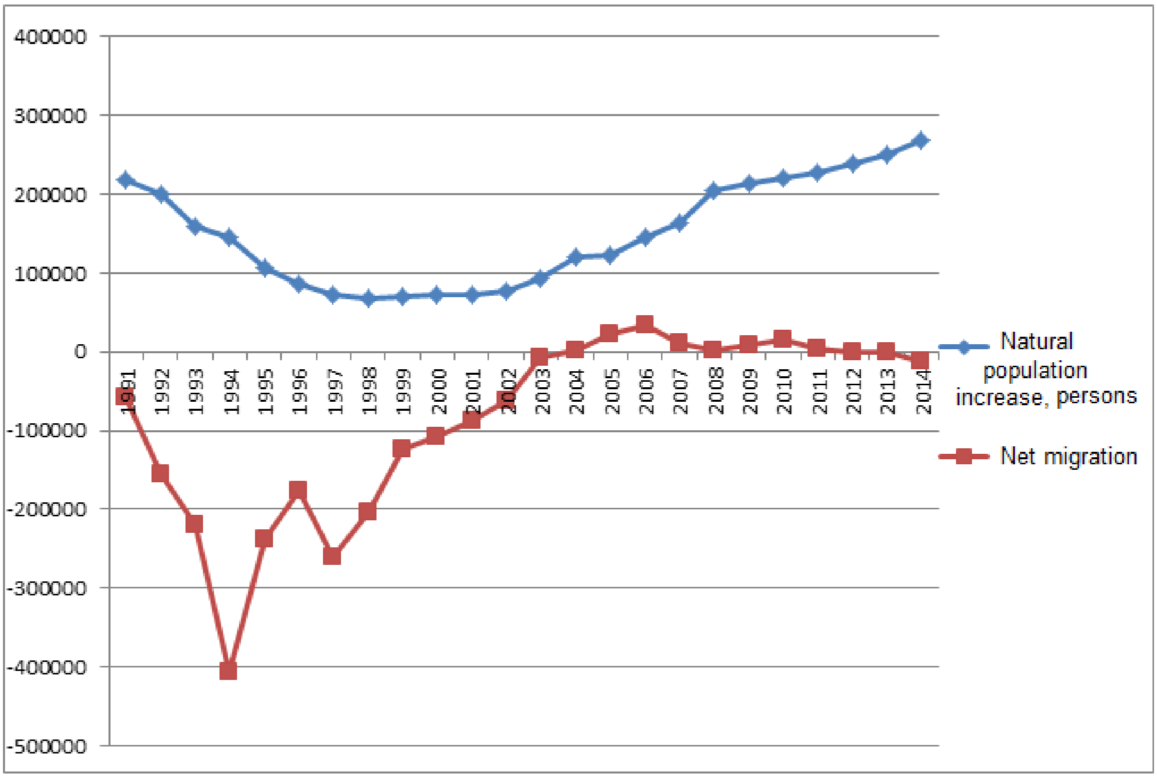

Figure 42. Natural Population Increase and Net Migration Rates in 1991-2014[150]

In the recent years, the urban population has increased at a more rapid rate than the rural population (until 2011, the average number of the rural population in the country was growing at a rate consistently higher than that of the urban population[151]). Nonetheless, the predominantly agrarian Almaty and South Kazakhstan Region remain the most populated regions in the country. Kyzylorda Region's rural population also exceeds urban.

7.1.3. Economy

Overview

Mining and resource extraction (oil, gas, uranium, other metals and minerals) is the leading economic sector in Kazakhstan.

[150] Ibid.

[151] Kaminsky A. Kazakhstan's rural population grows at a rate that is four times higher than the urban population (data by the Kazakhstan Social Survey and Economic Forecast Institute) http://www.meta.kz/novosti/kazakhstan/230344-celskoe-naselenie-kazakhstana-rastet-v-chetyre.html

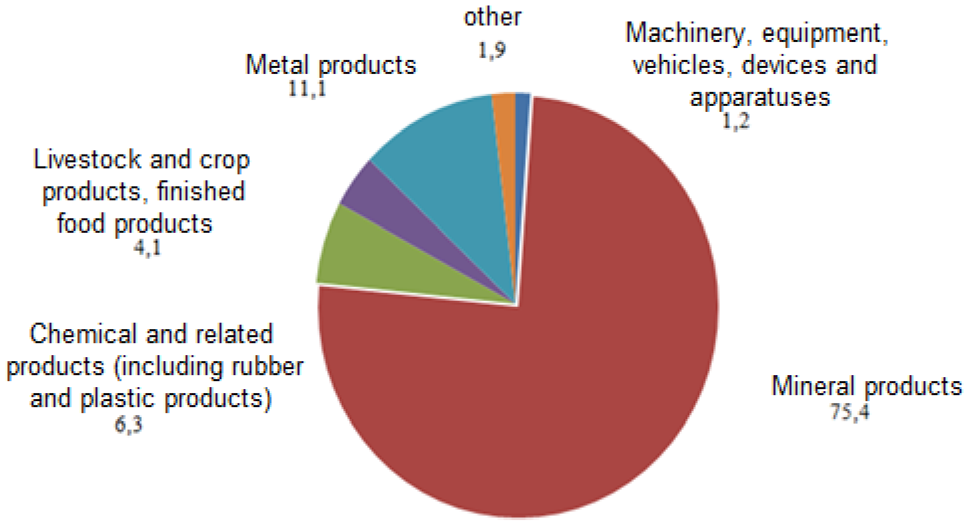

Figure 43: RK Exports Structure in January-July 2015[152], %

The mining/mineral extraction sector outputs account for about 90% of the country's exports (**Figure 43**). Russia is the main trade partners of the Republic of Kazakhstan, accounting for 16.4% of the total sales volume. However, Russia's share in the Kazakhstani exports is only 8%; the country's major export partners are the European countries (62%, including Italy with 20.2% and the Netherlands with 11%) and China (12.3%). The RK is a member of the Eurasian Economic Union and the Customs Union of Russia, Kazakhstan and Belarus.

The major proportion of the country's revenues goes to the national budget whose funds are distributed among the regions in the form of budget transfers provided to finance regional needs. The regional budgets in the majority of regions rely significantly on the national budget transfers (on the average, 55% in 2008 and 60% in 2011). As a result, regions are economically, socially and politically dependent upon the central government[153]. In Astana, Almaty and in the highly urbanized Karagandy Oblast, a significant part of budget revenue is collected locally while the share of local revenue in the budgets of many predominantly agrarian Oblasts (including Kyzylordy Region) is relatively low[154].

Population, Employment and Incomes

Despite mining and mineral extraction sector being the core of the country's economy, agricultural sector is the main employer in Kazakhstan. That said, the number of people employed in agriculture has decreased consistently over the past few years while the employment in industry has shown only minor increase. Sectors showing an increase in employment include the public governance, education, service sector etc. **(Figure 44).**

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152 http://stat.gov.kz/faces/wcnav_externalId/homeNumbersCrossTrade?_afrLoop=16385037801883684#%40%3F_afrLoop%3D16385037801883684%26_adf.ctrl-state%3D1aavoml7fu_21 Foreign and Mutual Trade. Exports and Imports Structure in 2015

153 Abdrakhmamov S. Comparative Review of Local Budget Revenues and Expenditures in 2008–2011. http://budget.kz/publikatsii/issledovatelskie-otchety/Analysis_MB_2008_2014.pdf

154 Ibid.

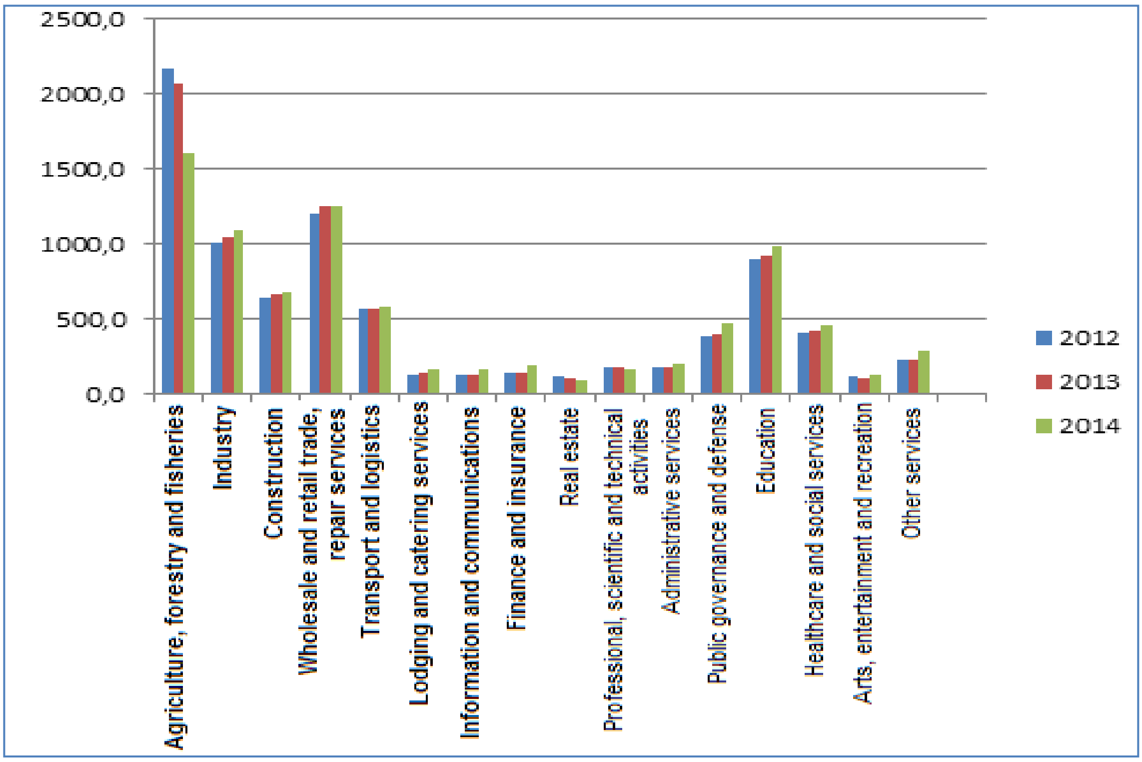

Figure 44: Employment by Economic Activity, Thousand People[155]

The unemployment rate hit record high after the 1998 crisis (13.5% in1999) and decreased consistently since then to 5% in 2014 **(Figure 45).**

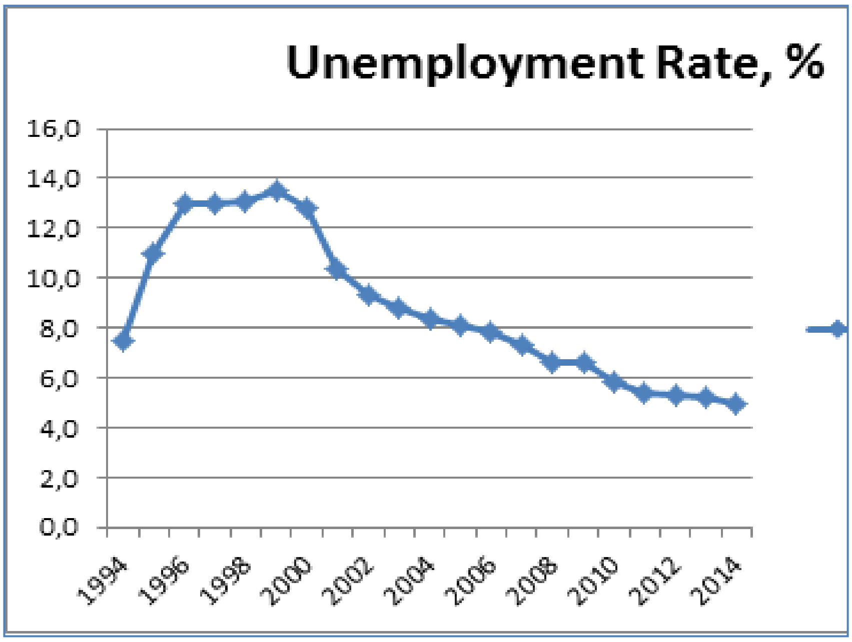

Figure 45: Unemployment Rates in 1994–2014, %

The average wage level grew from 2000, then showed a slight decrease due to the 2008 global crisis and dropped further in 2014 as a result of a reduction in

155 Employment by Economic Activity (quarterly data) in 2010–2014: http://stat.gov.kz/faces/wcnav_externalId/homeNumbersLabor?_afrLoop=16386227177450315#%40%3F_afrLoop%3D16386227177450315%26_adf.ctrl-state%3D1aavoml7fu_36

global oil prices and the overall economic slowdown in the country **(Figure 46).** In 2014, the average wage level was around USD650.

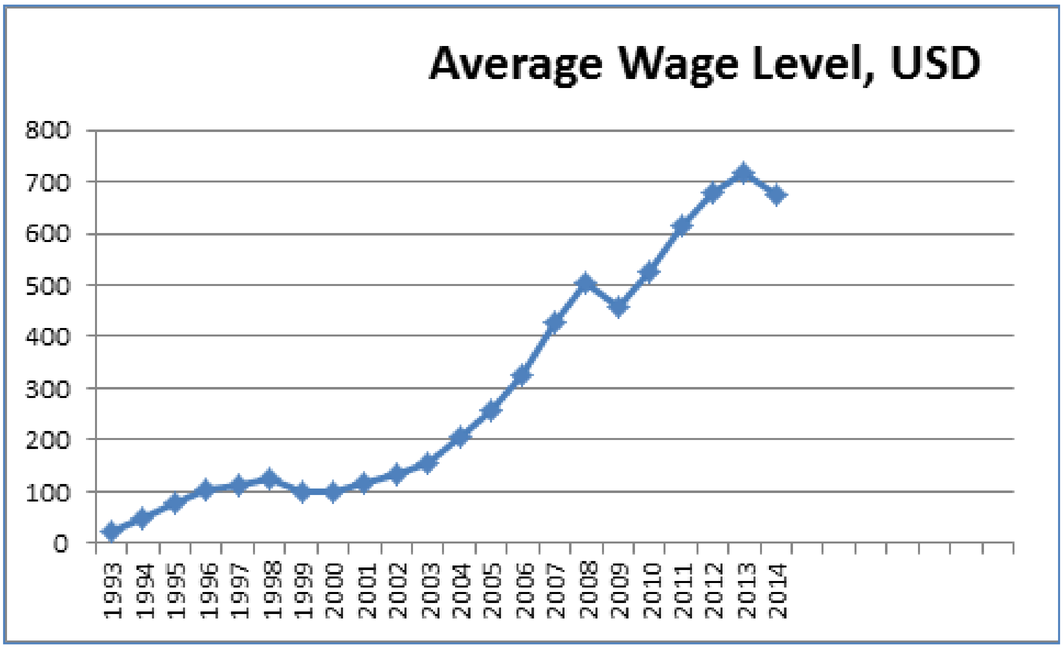

Figure 46: Monthly Average Wage Levels in 1993-2014, USD

7.1.4. Infrastructure

The country's transport system includes 96,000 km of public motor roads, with 89% of them being paved roads (the road network density is 31.7 km/1000 km^2, the only highway connecting the capital city with Schuchinsk is 217 km long); 15,300 km of railways, and 22 airports[156].

Electricity is mainly generated at the thermal power plants (37 coal-fired CHPs produce about 90% of the country's electricity output). The country now has no nuclear power plants but there are several hydropower plants producing about 10% of electricity. While the country exports electricity, weak links among various energy regions undermine the country's ability to meet its own electricity demand. As a result, electricity is imported from the Kyrgyz Republic to meet the existing demand in South Kazakhstan.

7.2. Kyzylorda Region (Oblast)

7.2.1. Background

The Kyzylorda Region is located in the south of the RK (**Figure 47**), it is bounded by the Aral Sea, and borders Uzbekistan from the south-west and south. The Syr Darya River flows through the centre of the region, most of the settlements of the region are located along it as the territories outside of the floodplain of the Syr Darya River are predominantly occupied by arid sandy areas unsuitable for living.

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[156] http://stat.gov.kz/faces/wcnav_externalId/homeNumbersTransport?_afrLoop=16393099538976963#%40%3F_afrLoop%3D16393099538976963%26_adf.ctrl-state%3D17uy0kvrm1_50 Railway Transport, Length of Motor Roads

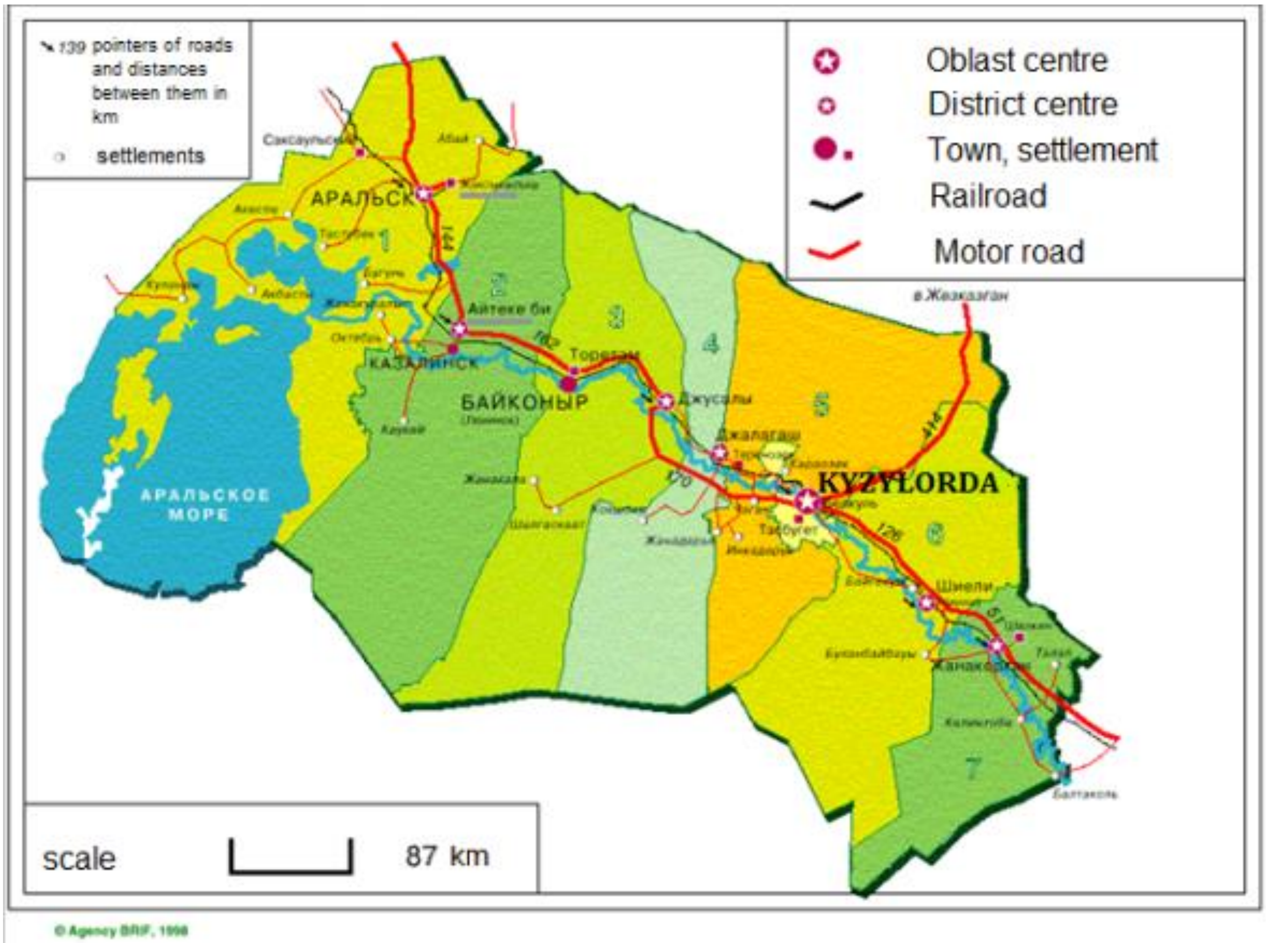

Figure 47: Map of Kyzylorda Region[157]

The area of the region is 226 thousand km^2 that is 8.3% of the territory of Kazakhstan. The population is 753.1 thousand persons (4.1% of the population of the country). The population density is 3.15 persons/km^2 – it is the lowest index in the RK.

Kyzylorda Region has the most ethnically homogeneous population among all the RK regions: 95.9% of the residents of the region are Kazakhs. Kazakhs make up 66% of the national average population[158].

Kyzylorda Region is administratively divided into seven districts and a town of the republican subordination to Kyzylorda. In the region there is Baikonur Town leased by the Russian Federation and being under its jurisdiction. In addition to Kyzylorda the region has two more towns (Aralsk and Kazalinsk) and three urban-type settlements, the remaining settlements are rural (264 villages and settlements united in 144 rural districts)[159].

Kyzylorda region is rich in mineral resources. Oil, gas, polymetallic ores, uranium, and salt are actively produced. The reserves of lead and zinc, uranium, cadmium,

[157] Map from the website http://mountains.ninepix.ru/view/23571905

[158] http://stat.gov.kz/faces/wcnav_externalId/homeNumbersPopulation?_afrLoop=16477041039768041#%40%3F_afrLoop%3D16477041039768041%26_adf.ctrl-state%3Dqmuyzox1d_50 RK population size by separate ethnic groups as of the beginning of 2015.

[159] Official portal of Kyzylorda Region. http://e-kyzylorda.gov.kz/?q=ru/content/obshchie-svedeniya-0 General information.

germanium, gold, silver, selenium, vanadium, molybdenum, iron, lignite, oil shale, brown iron ore, phosphate, molybdenum-vanadium and zirconium-titanic ore, high-quality quartz sand are identified. Nonmetallics such as brick clay loam, expanded clay raw materials, sand and gravel, sand for construction and silicate products, building stone, limestone for lime production are widespread[160].

Traditionally Kyzylorda Region was an agricultural region. The situation has started to change since the end of the 1980s, when oil and gas fields were explored and started to be actively developed there. Currently, the mining industry is a core of the regional economy.

The volume of agricultural production is much less (for details see Section "Economy"). However, Kyzylorda Region has several large agricultural enterprises. The region is a major supplier of rice in the country (90% of the total production). The majority of the population (56.8%) is still rural. Among the workers in industry there are a lot of migrants working on a rotational basis.

It is worth mentioning that the situation in the various sectors of agriculture is described in detail in the official bulletins available on the website of the regional akimat, in the statistical digests and reports. However, it is virtually impossible to obtain a similarly comprehensive description for the mining industry. This can potentially point to the fact that the agricultural sector still prevails in the perception of the public, thus holding a more significant position that it could expected given its actual share in the economy of the Region.

7.2.2. Demography

As of 01.07.2015, the population of the region was 758,518, including 379,047 men and 379,471 women. In all other regions of the RK the number of women exceeds the number of men by several thousand persons, the national average men-to-women index is 48.3% to 51.7% (2015)[161].

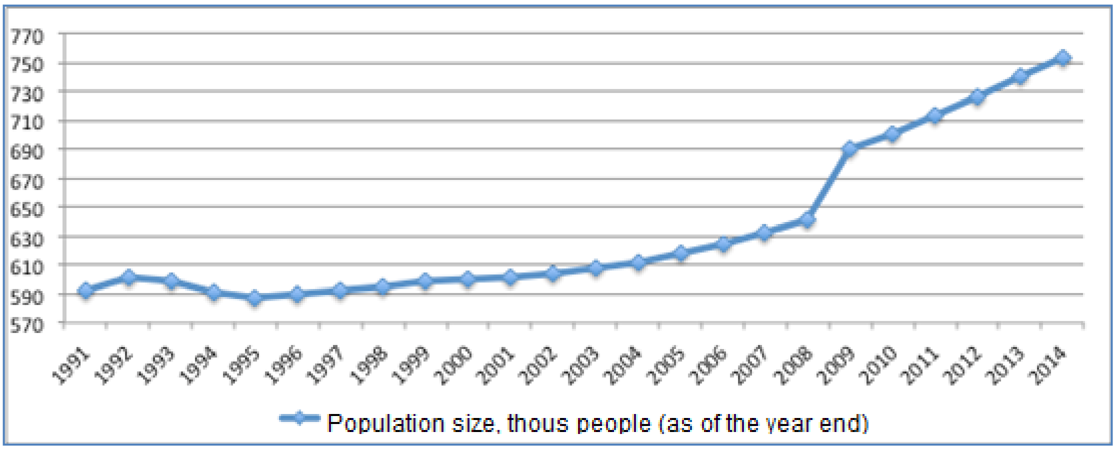

Figure 48: Dynamics of Kyzylorda Region population change, thousand people

[160] Shaymaganbekov R.A. Efficiency of investments into industrial and innovative projects (as exemplified by Kyzylorda Region) (author's abstract). Kyzylorda: Korkyt Ata Kyzylorda State University, 2013

[161] Unless otherwise stated, all statistical data are taken from the website of the RC Committee on Statistics www.stat.gov.kz.

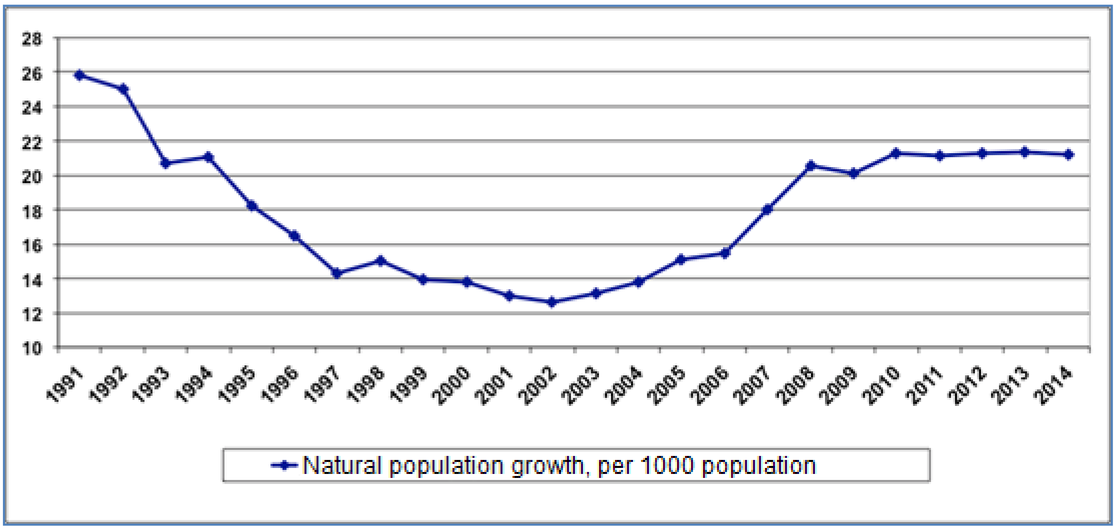

Figure 49: Natural population growth of Kyzylorda Region, per 100 000 population

Since the beginning of the 1990s there had been a sharp decrease in natural growth, which lasted until 2002; then the natural growth gradually increased (per 1000 population). However, even to date, the natural growth is lower than it was at the beginning of the 1990s (**Figure 48, Figure 49**).

Nevertheless, it is the natural growth that determines the dynamics of population growth with a negative migration balance. The main migration exchange occurs with other regions of the RK. In recent years there has been a positive balance of external migration that is apparently linked to the implementation of programs for the repatriation and attracting specialists from abroad. However, such processes are significantly less than internal migration.

The life expectancy in Kyzylorda Region is slightly below the national average (71.06 as compared to a country's average of 71.62). The difference in life expectancy for women living in urban areas (74.5 in Kyzylorda Region against 76.1 in the RK as a whole) is especially significant. The ethnic composition of the population of Kyzylorda Region is quite homogeneous: as of 2010, 95.7% of the population is Kazakhs, 2% - Russians, 1% - Koreans**.** Other nationalities together constitute less than 2 percent of the total population. Over the past 20 years there has been a statistically significant increase in the share of the Kazakh population, which has increased from 87.8% to 95.7% over the specified period.

7.2.3. Land resources

The total land reserves of Kyzylorda Region are 24,035.9 thousand ha. Among them 2,205.4 ha (9.2%) are provided to Karaganda Region for long-term use, 771.4 thousand ha (3.2%) are leased by the Russian Federation for the Baikonur complex and for the Sary Shagan testing in Aralsk District. Among the total land reserves there are 12947.9 thousand ha of agricultural lands, or 13.5% of the total land area of the region.

Topsoil of Kyzylorda Region refers to the desert zone. As to the thermal and solar resources, the conditions of Kyzylorda Region are favourable for growing of many crops, but due to the low precipitation agriculture is based on irrigation.

7.2.4. Economy

The economy of Kyzylorda Region is one of the most modest among the regional economies of Kazakhstan (the 12th position, as of 2014). The share of Kyzylorda Region Gross Regional Product (GRP) does not always reach 4% of the total

Gross Domestic Product (GDP) of the country[162]**.** However, in 2009, based on the results of rating of the social and economic development of the Kazakhstan regions, Kyzylorda Region entered the group of regions with average development dynamics, having taken the 9th place among other regions of the country. i.e. in the first half of the 2010s the economy of Kyzylorda Region grew more slowly than the economies of other regions and Kazakhstan as a whole. In 2014 – early 2015 there was some decline in the economy of the region.

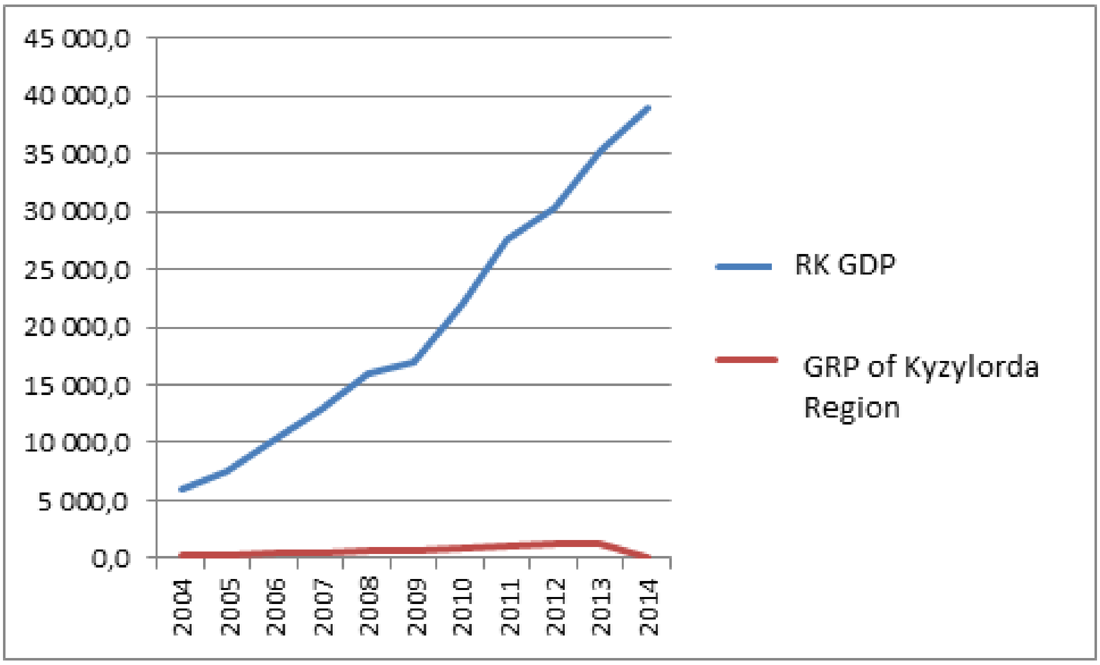

Figure 50: GDP of Kazakhstan and GRP of Kyzylorda Region in 2004 – 2014, billion Tenge[163]*

[162] Kyzylorda Region Metallurgical Sector Development Concept

[163] According to the RK Committee on Statistics and official website of the Akimat of Kyzylorda Region.

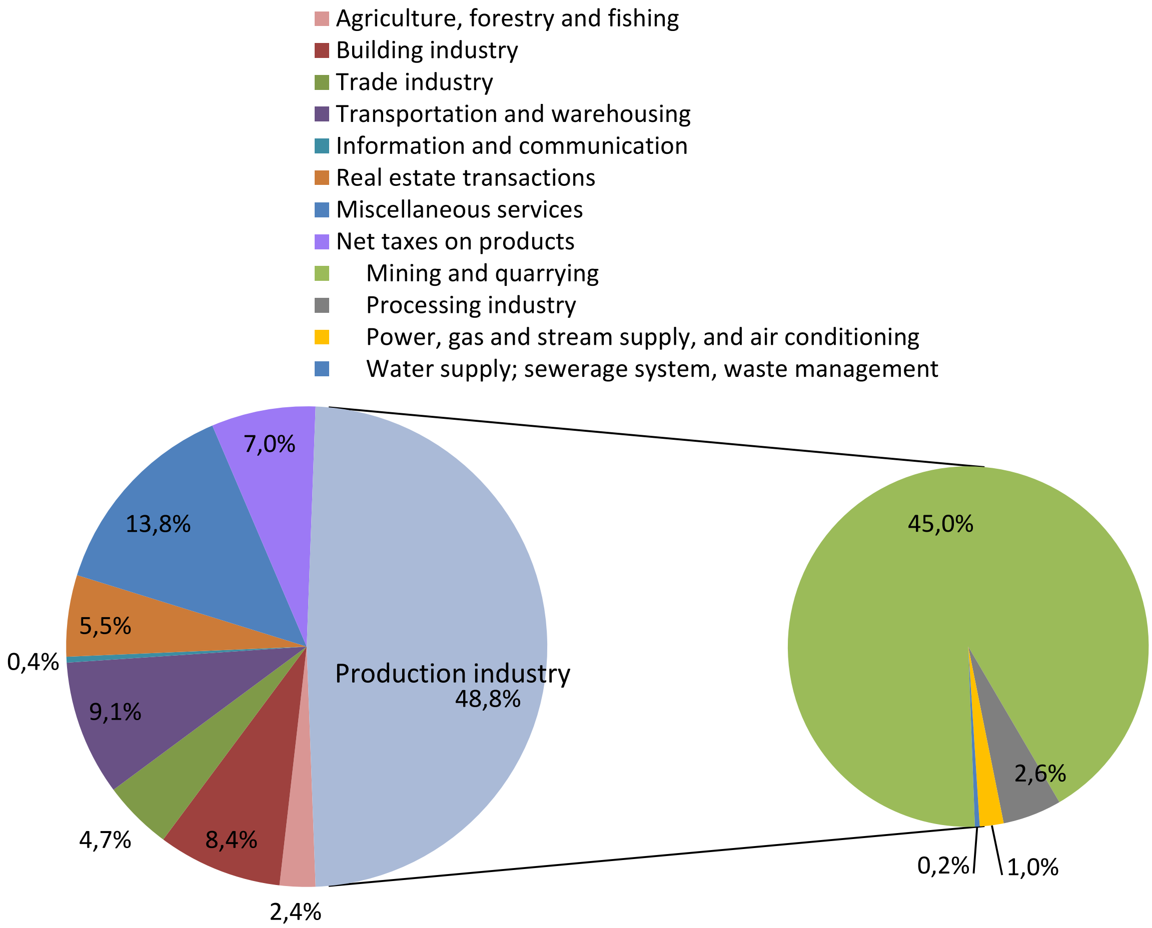

Figure 51. Ratio of types of economic activities by contribution to the GRP, %%, 2013[164]

As can be seen from **Figure 51**, industry generates 48.8% of GRP with the mining industry specifically contributing 45%. The 'Other Services' sector is the second largest contributor lagging far behind with its 13.8% GRP. The third largest sector is transport and logistics (9.1%). Agriculture plays a relatively minor role – the total contribution accounted for by agriculture, forestry and fisheries is only 2.4% of the total GRP.

The mining industry is also the most dynamically growing sector. It should be noted that in general, the regional economy shows an increase. The increase is not only in the mining industry but also in all other industries where a steady, , although less rapid, rise is evident.

Mining Industry

Kazakhstan adopted the "Comprehensive Plan for Development of Mining and Metallurgical Industry in 2014 – 2018" under the State Program of Innovative and Industrial Development. Pursuant to the given Plan in Kyzylorda Region there will be a metallurgical cluster, which will include such companies as "Baikonur" SEC" NC" JSC (state enterprise, social-entrepreneurial company, which contributes to the business development, attraction of investments, execution of the state programs, compliance with the social responsibility), "Tau-Ken Samruk" JSC

[164] Ibid.

(exploration, development, production, processing and marketing of solid minerals, prior metals are gold, zinc, copper, lead, iron, wolfram, tin, silicon and etc.), RSE NC CPMRM RK (Republican State Enterprise "National Center on processing of mineral raw materials", conducting and coordination of researches in the mining and metallurgical industry), JSC "Shalkiya Zinc LTD" (zinc production), Balausa LLP (vanadium production), and so forth.

Agriculture

Agriculture, forestry and fishing collectively produce 2-3% of the regional GRP. Agriculture is well developed in the region. Around 90% of rice produced in Kazakhstan is produced in Kyzylorda Region. In addition to rice, vegetables, melons and gourds, potatoes and grapes are grown in the region. Both large agricultural enterprises and farms (individual entrepreneurs) and private households are involved in the crop production.

Cattle, sheep and goats, camels, horses and pigs are bred. Animal products are meat, milk, karakul and other skins, and wool. Private households produce around 80% of animal products and around 90% of crop products, excluding cereals and legumes. On the contrary, the large enterprises and farms almost entirely grow cereals (including rice) and legumes (on average in the region the large enterprises grow around 55%, the farms – around 45%).

7.2.5. Infrastructure[165]

Transport

The Western Europe – Western China international highway, which is under construction, traverses the entire territory of Kyzylorda Region. Highway construction works include improvement of the logistics infrastructure of the entire region, repair and construction of new adjacent motorways. The length of the international transport corridor in the region is 817 km. In addition, the motor roads of republican subordination such as Kyzylorda-Zhezkazgan and Kyzylorda-Zhalagash-Samara-Shymkent go throughout the territory of the region. Their total length in the region is 295 km.

The total length of the regional and local motor roads is 2 228.5 km. There are 218 bus routes connecting 212 settlements, towns and villages with the administrative centres of the districts or of the region. The length of the railway network in Kyzylorda Region is 786 km. The Korkyt Ata Airport is in operation in Kyzylorda to handle 21 flights per week (7 flights to Astana, 10 flights to Almaty, 2 flights to Karaganda and Aktau). In 2013, the airport handled 75.9 thousand passengers.

Power Industry

Power industry of the region includes the following sectors: electricity generation, transmission and supply. Two power plants generate electricity in Kyzylorda Region: 50 MW gas turbine CHP plant and 63 MW Municipal Utility Service Kyzylorda HPP. The amount of energy generated over 2013 was 1,605.60million kWh. Meanwhile the energy sources do not meet the electricity needs of the

[165] Data from the official website of the Kyzylorda Region Akimat: http://e-kyzylorda.gov.kz, "Infrastructure" Section.

region. The rest deficient amounts (over 30% of the total consumption) are supplied mainly from the Northern and Southern regions of the country.

In the region, the electricity is supplied through the main power transmission lines (110 kV line with a length of 833.2 km and 35 kV line with a length of 2,555.58 km). However, there is a possibility to increase the electricity transit by only 3%. The technical condition of the regional power networks of the region is poor, with an unserviceability rate of up to 50 %.

Housing and Community Amenities

The total share of facilities that require major repair is 62.7% as of 2014. Funds for repairs are allocated from the national budget under the program “Modernization of the RK housing and community amenities for 2011 – 2020”. Since 2011, 7.3% of the facilities requiring repairs have been repaired under the above program.

Only the city of Kyzylorda has a centralised gas supply (92% coverage). By 2015, it is planned to connect 70% of the regional population (21 settlements) to the Beineu – Bozoi – Shymkent gas pipeline under construction in the region. The necessary infrastructure (gas distribution networks, etc.) is currently under construction. Some 71% of rural settlements were connected to the centralized water supply network as of 2014.

7.2.6. Social Sector

Health Care and Public Health

The state network of healthcare facilities in the region includes more than 40 institutions. In Kyzylorda there are regional adult and children's hospitals, as well as specialized medical centres and dispensaries (oncologic, tuberculosis neuropsychiatric and other institutions). In each of the seven administrative centres of the districts there are district hospital and district tuberculosis dispensary. In Kyzylorda, there is the city emergency station (30 cars, 25 teams) serving the population of the city and surrounding settlements.

The morbidity rate in Kyzylorda Region slightly exceeds the national average, but similarly to the national average, it shows a declining trend.

The highest share of morbidity is due to the acute respiratory infections. There was a sharp rise in morbidity rates in 2006-2009 (**Figure 52**), followed by a decrease.

Figure 52: The dynamics of the acute respiratory infection incidence; number of cases per 100 thousand people per year

Figure 53: The dynamics of the influenza incidence; number of cases per 100 thousand people per year

There is a general downward trend in the incidence of acute intestinal infections (**Figure 54**).

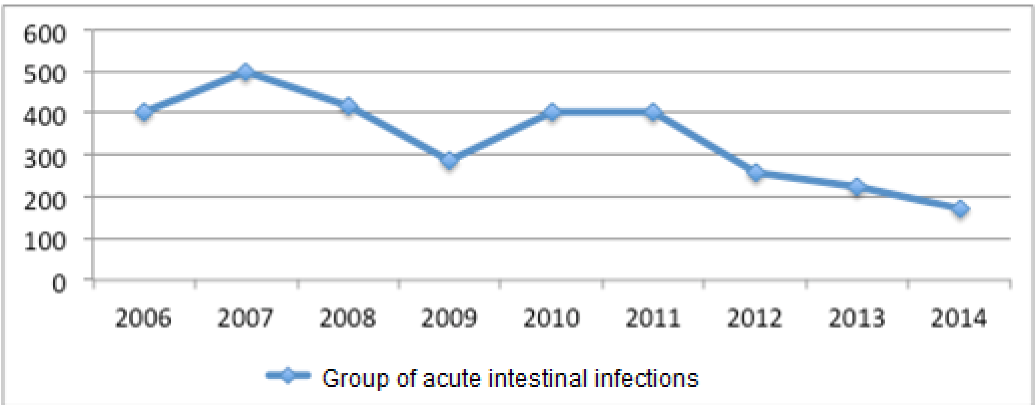

Figure 54: The dynamics of the acute intestinal infection incidence, number of cases per 100 thousand population per year

Tuberculosis and syphilis are a special concern with the growing incidence of syphilis being particularly alarming.

Tuberculosis and syphilis fall into the category of social diseases whose incidence is directly related to living conditions of people. To some extent, the incidence rates of social diseases reflect the general socio-economic situation. From 2006 to 2014, the incidence of all forms of active tuberculosis decreased almost 3 times. This decrease in the incidence of tuberculosis is likely to be explained by an increase in the disease detection level at early stages that significantly increases the chances of recovery from tuberculosis.

The incidence rates of syphilis continued to grow from 2006 to 2014. In this period, the number of syphilis cases registered at the specialised health care institutions grew by 2.6 times.

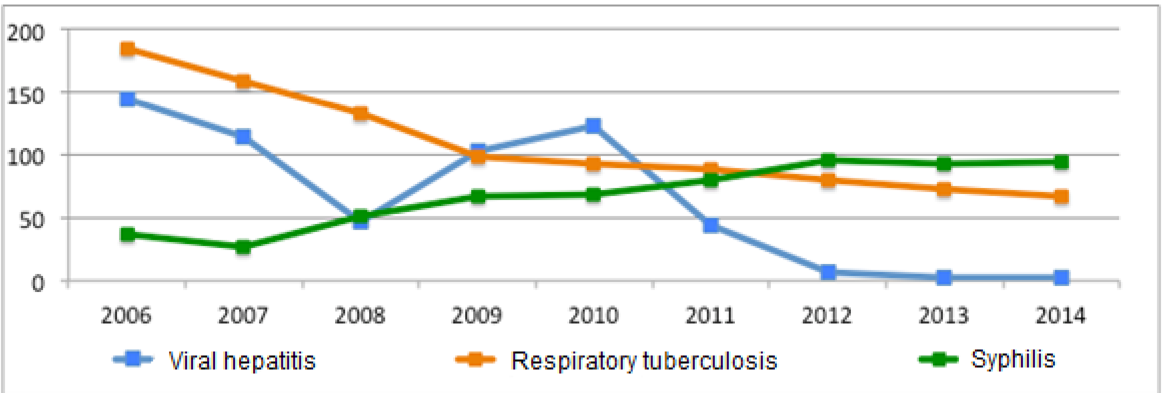

Figure 55: The dynamics of the incidence of hepatitis, tuberculosis and syphilis; number of cases per 100 thousand population per year

According to the Kyzylorda Regional Centre for AIDS Prevention and Control of the Public Health Department of Kyzylorda Region, the HIV / AIDS incidence in Kyzylorda Region is currently low with only one case registered in Zhanakorgan District (**Table 43**).

Table 43. Incidence of HIV / AIDS, in absolute figures

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Region	6	6	12	5	5	4	6	4	9	14	8
Zhanakorgan District							1				1

The rate of incidence of parasitic infections showed a downward trend from 2006 to 2014. For example, the incidence of pediculosis capitis decreased by 2.6 times from 2006 to 2014, while the incidence of scabies and brucellosis decreased by 5.9 and 4.87 times, respectively.

Table 44. The incidence rate of parasitic infections; number of cases per 100 thousand people per year

	2006	2007	2008	2009	2010	2011	2012	2013	2014
Brucellosis	56,1	37,1	32,6	20,8	18,4	20,3	12,1	12	11,5
Scabies	19,5	16,8	12,5	14,7	13,4	21,7	4,7	1,5	3,3
Pediculosis	66,6	55,8	56,8	35,3	19,3	21,2	22,7	26	25,8

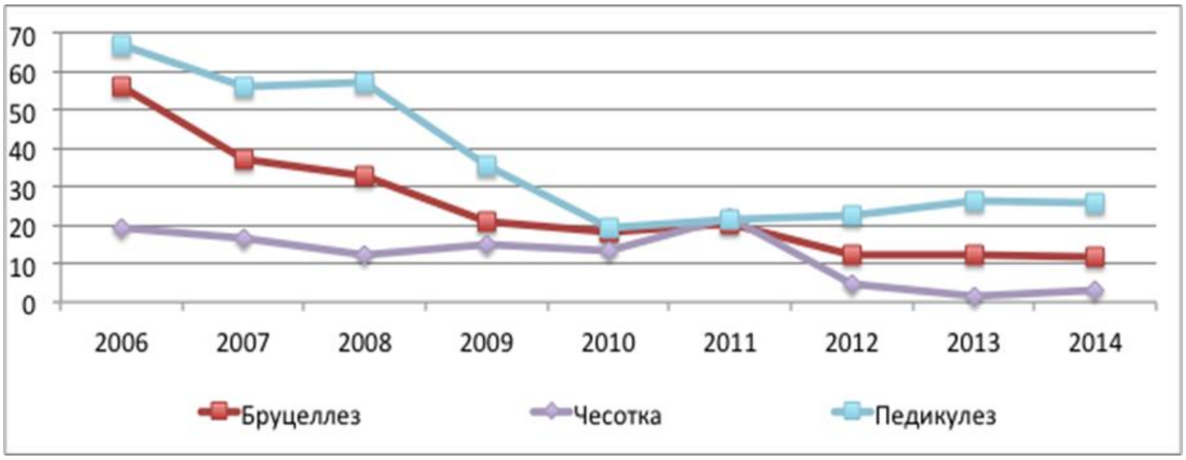

Figure 56: ***The dynamics of the incidence rate of parasitic infections; number of cases per 100 thousand people per year***

Table 45. Inflammatory infections; number of cases per 100 thousand people

	2006	2007	2008	2009	2010	2011	2012	2013	2014
Mumps	0,4	0,8	1,5	0,6	0,15	0,14	-	-	0,1
Meningococcal disease	1,4	1,7	0,2	0,6	-	0,14	-	-	0,1

Figure 57: ***The dynamics of inflammatory infections, number of cases per 100 thousand people***

Generally, it can be concluded that the incidence rates of acute respiratory infections and various socially transmitted diseases show a downward trend. The only exception is syphilis where incidence rates tend to grow.

Education

There are 611 preschool institutions in the region, including 203 private establishments. 41939 children attend them. Kindergartens cover 92.2% of children 3-6-years of age. In 2009 – 2013, the number of kindergartens increased by about 4 times (from 129 to 424). The number of children attending them also increased by over 3 times (from 10310 to 33503 persons). These trends are illustrated in **Figure 58.**

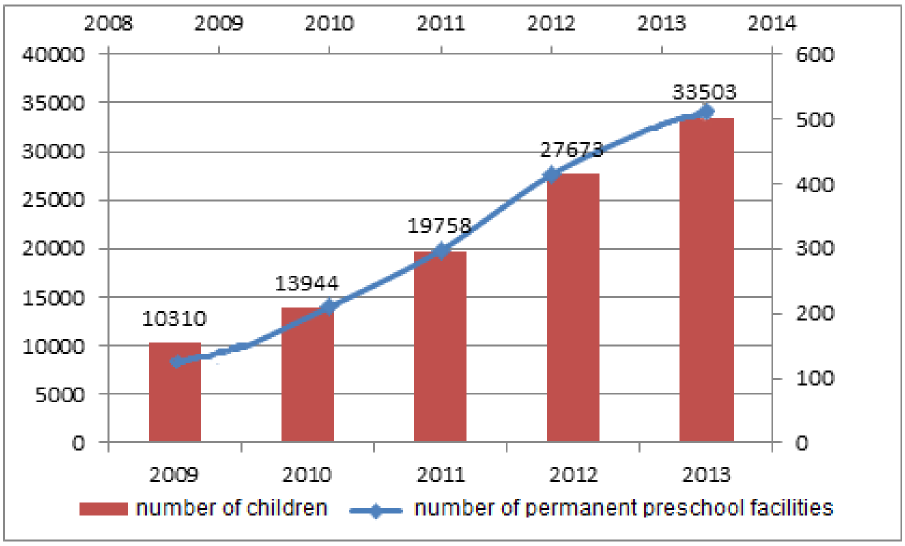

Figure 58: Trends in the number of kindergartens

There are 292 schools. In the recent years, several schools have been built every year **(Figure 59)** to stop the practice of teaching children in three shifts per day starting from the 2013/2014 academic year. All schools now work in one or two shifts. As of 2014, the technical condition of 25 school buildings was classified as dangerous.

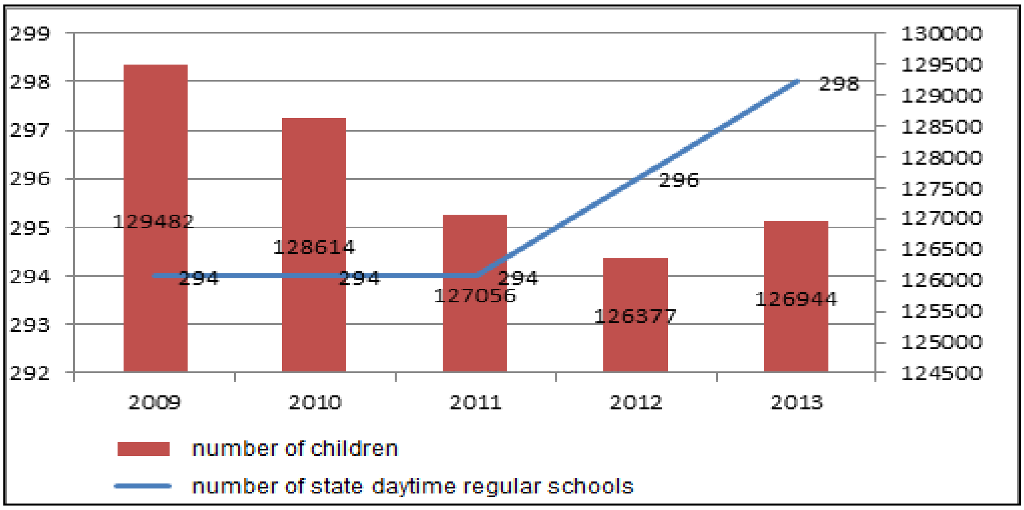

Figure 59: Trends in the number of secondary schools

There are 57 extended education institutions for children. As of 2014, there were 32 technical and vocational institutions offering 103 specialisations and attended by 24,493 students. The employment rate among technical and vocational institution graduates is 65.7%.

As of 2014, there were four higher educational institutions in Kyzylorda region, including one state (Korkyt Ata Kyzylorda State University) and 3 private establishments which are attended by 11,308 students.

Over the last 5 years, the number of colleges and students attending them has grown while the number of higher education institutions and students attending them has decreased **(Figure 60).**

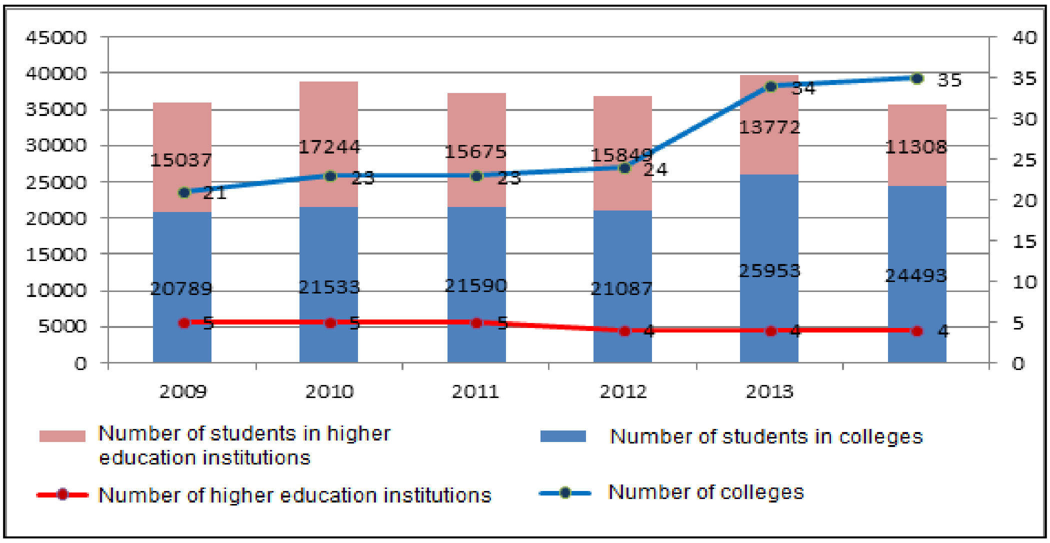

Figure 60: Higher and vocational secondary education

Cultural Facilities

As of 2014, there were 520 libraries in Kyzylorda Region including 207 public libraries, 1 scientific library, 1 specialised library, and 311 libraries at schools, colleges and universities.

There are 172 recreation and culture centres, with 163 of them working in the rural areas. These facilities include 116 neighbourhood houses and 55 recreation and culture centres.

There are 9 museums in the region, with 5 of them located in the rural areas. There is one concert agency organizing concerts in the urban and rural areas.

There are 4 recreation and amusement parks, 14 leisure facilities, including 12 amusement facilities, 3 cinemas and 1 theatre.

The city of Kyzylorda has the regional library, local history museum, Music and Drama Theatre, and Philharmonic Hall comprising the Chamber Orchestra and several folk music groups touring across the region.

Criminal situation

Kyzylorda region is among the regions with the lowest crime rates in Kazakhstan. As of 2013, 162 crimes per 10 thousand inhabitants were recorded that is substantially lower than the national average (212)[166]. The crimes against property prevail (67.1%). 73.9% of solved crimes were committed by unemployed people[167].

7.2.7. Employment and Unemployment

In 2014, the economically active population amounted to 362.1 thousand people, of which 343.9 thousand were employed and 18.2 thousand were unemployed. The unemployment rate was 5.1% that is slightly lower than the national average (5.4%). Since 2007, the unemployment rate has steadily decreased (**Figure 61**).

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[166] Analysis of statistical data on the state of criminality in the Republic of Kazakhstan over the 6 months of 2013.

[167] Social and economic development of Kyzylorda Region. Brief summary. January 2015. http://kyzylorda-stat.kz/rus/pokazateli/

As of the end of January 2015, 4,966 persons were officially registered as unemployed with the employment service bodies.

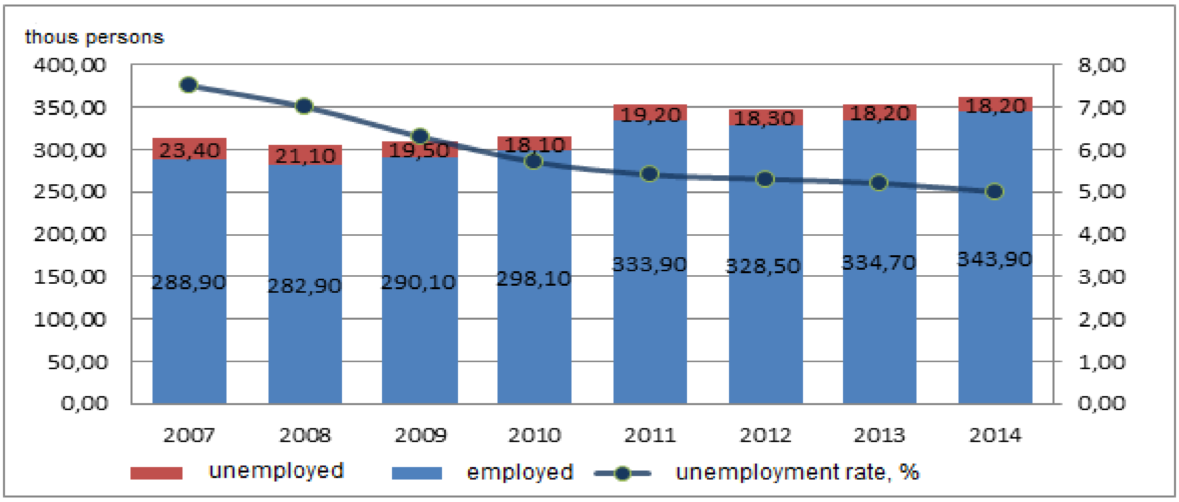


Figure 61: Employment and unemployment

The self-employment accounting for about 30% of the total employment plays an essential role. Employment structure is shown on the diagram below (**Figure 62)**.

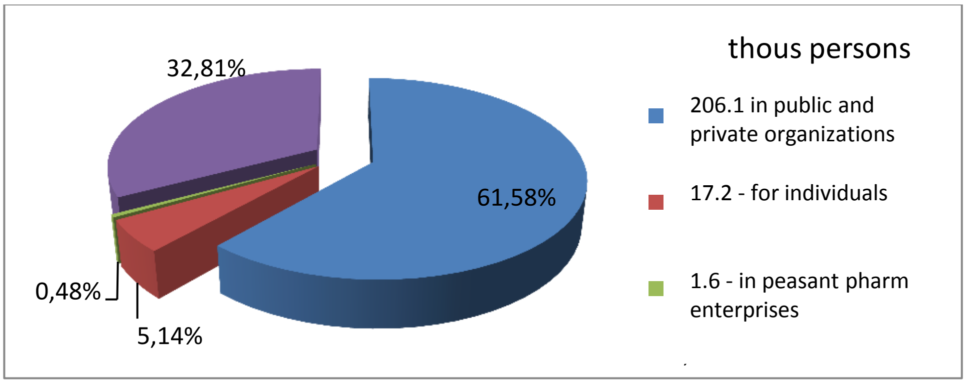


Figure 62: Employment structure, as of 2013

The small and medium enterprises are emerging in the region. As of 2014, there were about 30 thousand active small and medium enterprises, the vast majority of them were registered as individual entrepreneurs.

Table 46. Number of small and medium enterprises, legal entities, 2014

Total	**28,975**
Small enterprises	2,304
Medium enterprises	70
Individual entrepreneurs	25,016
Family farms	1,585

346.7 thousand people were employed in the regional economy as of 2013, among them the share of employees was 66.0%, self-employed – 34.0%.

7.2.8. Living Standard

In November 2014, the per capita nominal income of the population of Kyzylorda Region amounted to 52,733 tenge. Per capita expenditure of the population amounted to 88,911 tenge. The population income structure is shown in **Figure 63.**

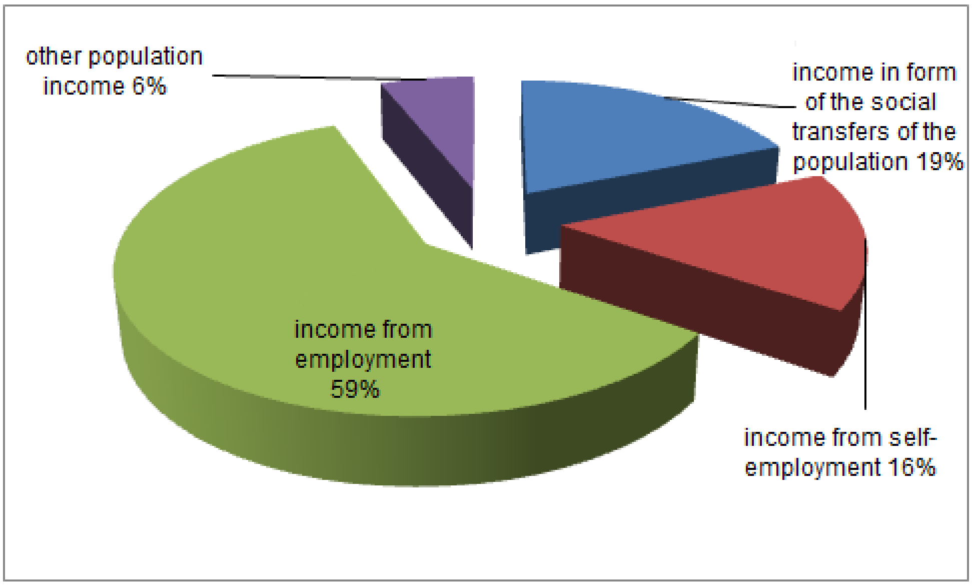
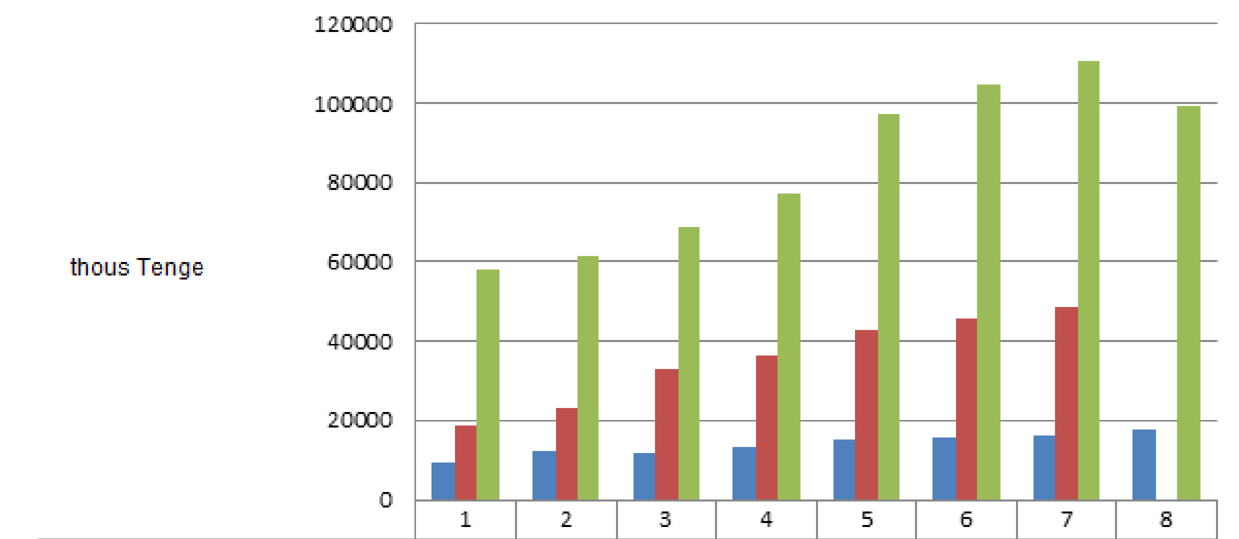


Figure 63: Population income structure

A noteworthy fact is that the average per capita expenditure exceeds the average per capita income. This may be attributed to insufficient revenue accounting and control, especially in the self-employment sector.

As of the end of 2014, the minimum subsistence level was 17680 tenge. The dynamics of the population living standards is shown in **Figure 64.**



	1	2	3	4	5	6	7	8
Minimum subsistence level	9248	12096	12014	13286	15099	15927	16187	17680
Per capita nominal income	18890	23070	32830	36180	42580	45480	48440	
Average monthly nominal wage	58034	61433	68656	76939	97434	104618	110400	99220

Figure 64: Dynamics of the population living standards

As can be seen from the above figure, the average nominal monthly wage is 2-3-fold higher than the average nominal cash income per capita. This suggests that each household has many dependents (underage children, student, unemployed family members, both officially and unofficially, and retired pensioners) whose monthly social welfare payments are significantly lower than the monthly average wage level.

7.3. Zhanakorgan District

7.3.1. General Information

Zhanakorgan District is located in the south eastern part of Kyzylorda Region (**Figure 1**) and shares border with Shieli District in the west, South Kazakhstan Region in the east, and Uzbekistan in the south.

The district occupies 16,600 km^2 or 6.8% of the total area of the region.

The administrative centre of the district is based in Zhanakorgan settlement located in 178 km from the centre of the region, the city of Kyzylorda. The district comprises 2 settlement-type and 24 Aul-type communities ('okrugs')[168].

Five of seven districts in Kyzylorda Region, including Zhanakorgan District, have only rural population and no urban communities.

7.3.2. Population

[168] http://www.zhanakorgan.gov.kz/page.php?lang=1&page_id=17 Official website of the Zhanakorgan district akimate, section "About Zhanakorgan district".

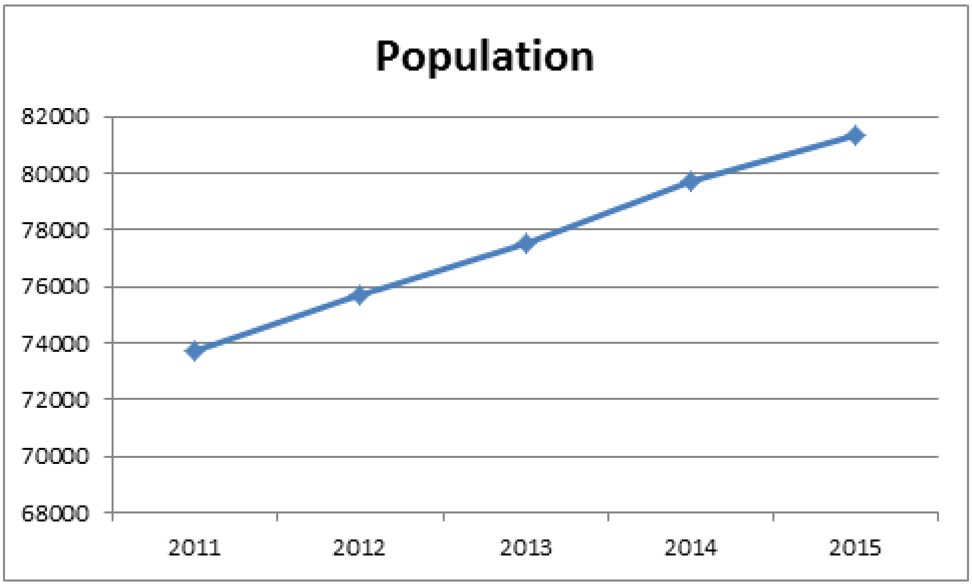


Figure 65: Population Number in Zhanakorgan District, 2011-2015[169]

The population number has grown steadily. The net migration in the district remains negative with several hundred people leaving the district every year to move to other areas within the boundaries of the same region. At the same time, the outbound migration is offset by the natural population growth at a rate of about 2,000 people per year[170].

The number of marriages exceeds the number of divorces by 7-8-fold on average (**Table 47**).

Table 47. Number of Marriages and Divorces in Zhanakorgan District in 2010-2014

	2010	2011	2012	2013	2014
Marriages	726	788	678	736	624
Divorces	80	96	99	81	101

The infant mortality rate in 2010–2015 has been about 1% or 10 deaths per 1000 live births. This rate is quite high as compared to the developed countries. Similar situation exists in the neighbour districts. Reports published on the Kyzylorda region akimate website indicate that the infant mortality has been decreasing in the past years.

Apart from relatively high infant mortality rates, the demographic situation in the district appears quite good.

Table 48. Gender Pattern of the Zhanakorgan District Population in 2009-2013, %[171]

	2009	2010	2011	2012	2013

[169] http://kyzylorda.stat.gov.kz/bulletins/ru/node/6 Kyzylorda Region Department of Statistics. Statistical Bulletins. Series 22: Demography.

[170] Ibid. "Population Migration" and "Natural Population Growth" Bulletins for 2008–2015.

[171] http://kyzylorda.stat.gov.kz/bulletins/#block-block-1 Official Website of the Kyzylorda Region Department of Statistics. 2013 Annual Statistical Bulletin "Women and Men in Kyzylorda Region".

Female	49,1	49,4	49,4	49,4	49,5
Male	50,9	50,6	50,6	50,6	50,5

It is notable that the male population exceeds the female population by about 1-2%. Similar picture is observed in all districts in Kyzylorda region. The only exceptions are urban areas (Kyzylorda and Baikonur cities) where the female population is larger than the male population by about 1.2–2.5%.

Unfortunately, there appears to be no available data about trends in life expectancy for men and women at a district level, but generally the situation is similar throughout the region with the female life expectancy being higher than that of men (75.0 and 66.5 years in 2013, respectively), i.e. this is a factor that could contribute to the increasing proportion of women in the human population. But even data on migration flows in the district does not offer any explanation why the number of men has been and remains higher than the number of women.

Table 49. Net Migration (Difference between the Number of People Entering and Leaving the Area) in Zhanakorgan District in 2009-2013

	2009	2010	2011	2012	2013
Female	1	114	45	-58	244
Male	-86	92	56	-67	74

While variations in the number of migrants and net migration rate are quite significant from year to year, one unchanging trend with 2011 being the only minor exception) is that women either come to the district more frequently or leave the district less frequently than men. This is another factor that could contribute to the higher proportion of women in the human population in the district.

7.3.3. Economy

Key Sectors of the Zhanakorgan District Economy[172]

The total amount of capital investments in Zhanakorgan District in 2014 was 12,433 million Tenge, which is 4.7% of the total investments in Kyzylorda region. Based on this indicator, Zhanakorgan District falls in the middle of all rural districts (over 50% of investments is concentrated in the city of Kyzylorda).

The industrial output was 38,782 million Tenge, being the largest among other rural districts in the region. Key industrial sectors are electricity generation, thermal power generation, and sulphuric monohydrate production (SKZ-U LTD, Zhanakorgan). Key building material producers (crushed stone etc.) are stone crushing facilities owned by the KazProm Kyzylorda Company LTD, KDSM Kyran Motor Road Department LTD, ShalkhiyaNerud LTD, and Sarman Tastak Zhanakrogan LTD. There are about 20 concrete block manufacturing shops.

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[172] 2015 Six-Month Sectoral Performance Report for the Small Business and Industrial Sectors zhanakorgan.gov.kz/upload/files/KASIPKER_6_AI_2015_RU.doc, Kyzylorda Region Socio-Economic Development Statistics by District http://kyzylorda.stat.gov.kz/kaz/korsetkishter, Kyzylorda Region Industry in 2009–2013. Statistical Bulletin.

Zhanakorgan district is the region's leading meat and poultry producer (6,283,8 t live weight in 2014). It has the largest number of cattle and about 40% of sheep stock in the region. Goats, horses and camels are also bred in the district. Similar to other districts in the region, there is no vegetable farming because the local arid climate and soil pattern are more conducive to cattle rearing.

Over the first six months of 2015, 2,670 small business entities were registered in the district including 134 legal entities, 606 farming entities, and 1930 individual entrepreneurs. These entities employed 5,530 people, produced services and products for a total value of 3,203.2 million Tenge; of that, 1,829.1 million Tenge is accounted for by industrial products.

As of 1 July 2015, the region has 448 trade and service enterprises including 4 shopping centres, 118 grocery and manufactured goods shops, 8 mini-bakeries, 7 pastry shops, 1 market, 77 public catering facilities, 12 petrol and 2 gas filling stations, 10 furniture, window and door manufacturers, 35 agricultural product processing shops (rice, wheat, safflower) and greenhouse facilities, and 105 consumer service enterprises.

As 1 July 2015, the retail turnover reached 1,661.5 million Tenge, representing a 89.7% growth as compared to the previous year.

Economic Development Plans

The Regional Industrial Development Map includes four projects with a total value of 1,747 billion Tenge: stone crushing plants (KazProm Kyzylorda Company LTD, KDSM Kyran LTD, and UAD LTD) and a tomato processing plant owned by the Tatu Agro Farming Enterprise. One project with an estimated value of 32.4 billion Tenge is included in the Republican Industrial Development Map (the sulphuric acid production at the SKZ-U LTD).

There is a number of larger investment projects planned including the construction of the Shalkiya Mine processing plant (the Mine ownership has been taken over by Tau-Ken Samruk JSC), cement plant with a capacity of 750 thousand tonnes of cement per annum (Syr Cementi LTD), 75 MW wind plant (YuzhShakhtStroy LTD), 50 MW solar plant (ZhanakorganEnergy LTD) to be located at Zhanbai between Shalkiya and Zgaiylma, and a 24.95 MW solar/wind plant.

7.3.4. Infrastructure[173]

The development of the centralized gas supply network is a key priority for the regional government. In 2015, about 80 human settlements remain not connected to the gas supply network but they are planned to be connected within the nearest years. There is no centralized gas supply system in Zhanakorgan district; local households and trade enterprises rely on the liquefied gas in cylinders.

The 2015 electricity consumption is 91,887.7 thousand kWh and electricity generation is 73,773 thousand kWh; the supply gap is covered by electricity imported from other regions of the country.

[173] http://kyzylorda.stat.gov.kz/bulletins/ru/node/20 Statistical Bulletins. Series 5: Energy Sector. Series 8: Construction Sector. Series 11: Transport. Series 12: Communications. http://www.nomad.su/?a=3-201502190018 "Kyzylordinskye Vesti" Newspaper 19.02.2015, Speech by Krymbek Kusherbayev, Kyzylorda Region Akim.

The residential houses mostly use individual heating systems because the central water supply and heating systems do not exist in the majority of human settlements. People use water from non-networked water supply sources, many of them being open water bodies where water quality does not meet the drinking water quality guidelines. A centralized sewage system is also lacking.

Populated settlements in the district are connected with each other by the privately operated shuttle bus routes with commercially unviable routes being subsidized from the regional budget. The railway line runs across the area of the district.

7.3.5. Living Standard

Population Income[174]

The average wage level in Zhanakorgan District is somewhat lower than the region’s average (see Annex 13). Similar picture is observed in all other rural districts in Kyzylorda region. Higher than average wages are only paid in the city of Kyzylorda.

As of December 2014, the minimum subsistence level and average wage level in Zhanakorgaxn District were 17,497 Tenge and 92,371 Tenge, respectively.

7.3.6. Employment and Unemployment

Employees working at large to medium-sized enterprises constitute the majority of the employed people in the district (**Table 50**).

Table 50. Number of People Employed by Large and Medium-Sized Enterprises in 2009– 2013

	2009	2010	2011	2012	2013
Large and Medium Enterprises					
Workers	2 314	2 724	2 809	3 130	3 263
Office staff	3 943	4 545	5 074	5 400	5 495
Small Enterprises					
Total	978	1 043	612	428	477

The number of employees working at large and medium-sized enterprises has been growing steadily while the number of people employed at small enterprises has not demonstrated any growth, perhaps showing a slight decline instead. Similar picture exists at the regional level where the number of people working for small enterprises has not shown any clear trends at both sectoral and overall regional levels.

The 2015 unemployment rate is 4.9%, which is the lowest level in the region.

[174] http://kyzylorda.stat.gov.kz/kaz/korsetkishter/ Kyzylorda Region Socio-Economic Development Statistics by District

It can be assumed that most local residents in the district are self-employed. It also appears that the hidden unemployment is higher than the official unemployment rates.

7.3.7. Education[175]

The district has 42 secondary comprehensive schools and one agro-technical college located in Zhanakorgan. No new schools have been built in the district over the past five years; the number of pupils in the existing schools has decreased (**Table 51**). This decrease can be attributed to the demographic gap in the 10-14 age group. Data on the population distribution by age group is only available at the regional level. As regards the rural districts, they have shown a gradual decrease in the number of students over the past five years. The only exception is the city of Kyzylorda where the number of students has increased.

98% of schools are connected to the Internet.

Higher education can be received at the Korkyt Ata Kyzylorda State University in the city of Kyzylorda.

Table 51. Number of Schools, Colleges, Pupils and Teachers in the 2009/10-2013/14 School Year

	2009/10	2010/11	2011/12	2012/13	2013/14
Schools	42	42	42	42	42
School pupils	15 469	15512	15282	15127	14862
School teachers	2 165	2 210	2 232	2 377	2 361
College	1	1	1	1	1
College students	666	569	625	525	547

7.3.8. Public Health[176]

The district has 6 hospitals, 17 medical laboratories, 14 medical and obstetrical stations, and 7 medical stations. A medical laboratory based in Shalkiya village comprises 1 GP doctor, 2 paramedics, and an ambulance car with a driver. The central healthcare institution is the central district hospital in Zhanakorgan headed by the hospital director.

Zhanakorgan District ranks one of the lowest in the region in terms of medical staff availability. This can be illustrated by comparing the 2013 region's average levels with the district's levels recorded in the same period (28.2 medical doctors per 10 thousand people in the region against 16.6 in the district and 101.8 nurses per 10 thousand people against 77.7 in the district (**Table 52**). The level of availability of medical doctors has remained virtually the same over the past 5 years while the availability of nurses has even decreased.

[175] Sections "Education", "Public Health, "Criminal situation" are mainly based on information contained in the statistical bulletin "Key Social Indicators in the Region". Kyzylorda, 2013.

[176] Data collected by the Ecoline EA Centre during the field survey.

Table 52. Availability of Medical Doctors and Nurses in 2009-2013

	2009	2010	2011	2012	2013
Number of doctors	123	128	128	147	131
Availability of doctors per 10 thousand people	16,4	17,4	17,4	18,9	16,6
Number of nurses	610	610	610	566	614
Availability of nurses per 10 thousand people	81,2	82,9	80,6	73,1	77,7

Zhanakorgan District ranks last in the region in terms of availability of healthcare facilities and hospital beds.

The most common reasons for people living in Zhanakorgan district to visit a doctor include respiratory diseases (24.8%), blood and circulatory system diseases (16.5%), and digestive system diseases (12.7%) [OVOS 2008]. According to the same source, the population's disease pattern in Shalkiya settlement may differ from one existing in Zhanakorgan district because the blood and circulatory system diseases may prevail in Shalkiya. The data and information provided are insufficient to come to a certain conclusion. It is recommended to clarify this issue by conducting a medical examination among the Shalkiya Okrug residents or at least the most vulnerable groups

Social diseases recorded in the district include tuberculosis and 2 HIV infection cases.

Key public health issues that exist in the region include poor drinking water quality and high disease incidence rates among labour migrants (members of rotating crews working at the uranium mines).

7.3.9. Criminal Situation

The number of recorded crimes grows gradually (**Table 53**) and Zhanakorgan ranks third after the city of Kyzylorda and industrialized Shieli District by crime rates. Thievery accounts for about 50% of all crimes.

Table 53. Crime Rates in 2009-2013

	2009	2010	2011	2012	2013
Number of crimes	222	207	389	448	527

7.4. Shalkiya Aul Okrug (Aul District)

7.4.1. Background

The Shalkiya Aul Okrug (aul district) is located in Zhanakorgan District, Kyzylorda Region, Kazakhstan, in the Karatau foothills, 40 km north-west of the administrative centre of the district, Zhanakorgan. The Shalkiya Aul Okrug is connected with Zhanakorgan by a highway and railway line.

The administrative centre of the Okrug is Shalkiya settlement. In addition, the Aul district includes Kuttykozha settlement. In the past, the district also included the

Pioneer settlement[177]. The settlement has recently ceased to exist and the land occupied by it has been taken over by the Shalkiya settlement.

7.4.2. Population

As of 1 January 2015, 3,056 people live in the Aul district, including 2,035 people in Shalkiya and 1,021 people Kuttykozha. A ratio of men to women in both settlements is almost equal (**Table 54).**

Table 54. Ratio of men to women

	Shalkiya		Kuttykozha		Total	
	total	**%**	**total**	**%**	**total**	**%**
Men	964	47,37	515	50,44	1479	48,40
Women	1071	52,63	506	49,56	1577	51,60
Total	2035		1021		3056	

The Shalkiya Aul Okrug has 494 households including 338 households (an average household comprises 6 members) in Shalkiya and 156 households (an average household has 6.5 members) in Kuttykozha.

The Shalkiya Aul District is one of the most densely populated areas in Zhanakorgan District. The population of the district has a largely homogenous ethnic composition. The overwhelming majority of the population are Kazakhs. Other ethnic groups are less than 5% of the total population.

7.4.3. Employment

The number of economically active population is 1692 (538 people in Shalkiya and 1154 in Kuttykozha) or 55% of the total population. The number of people officially employed in the public sector is 350, and 100 people are employed in other sectors. The official unemployment rate is 0.3%. Self-employment of the population is essential for the Okrug's economy. Such small business activities as trade, passenger transportation, repair of motor vehicles, and manufacturing of wood and metal articles are well developed in the area.

The area has good conditions for the development of livestock farming. There are 10,280 sheep, 1,021 cattle, 302 horses and 35 camels in the private farmsteads. In Shalkiya Okrug, 23 family-run farms specialise solely in agriculture. Some of them get subsidies for the development of agribusiness amounting to a total of about 3 million Tenge.

The State Programme "2020 Employment Road Map" aims to reduce unemployment in the area. In 2014, 9 people received soft loans amounting to 22.7 million Tenge to start their own business. The development of the municipal utility sector also continues.

[177] The Kazakh name of Pioneer settlement is Ulan.

7.4.4. History of Settlements

Shalkiya Settlement

Shalkiya settlement began in the 1980s in parallel with the development and operation of the underground mine at the Shalkiya site. From the very outset, the settlement was intended to provide accommodation to people coming to work at the mine. According to the official records, the Shalkiya Aul Okrug and Shalkiya settlement were founded in 1986[191]. The settlement comprised high-rise buildings with all conveniences, a kindergarten, a secondary school, a stadium and other social facilities. The population was growing at a rapid pace and many single-storey private houses were built at that time.

The economic crisis that began in the early 1990s caused a dramatic decline in production outputs. In 1994, the Mine suspended its operations for the first time to resume them in 2004 and continue till 2008 when the Mine was put into care and maintenance.

This inevitably triggered the outflow of people who arrived to the Project area only several years before to work at the Mine. From 1990 to 1994, the Shalkiya population shrunk by almost 10-fold (Figure XXX).

The demographic situation somewhat stabilized in 1994-95 and positive population growth trend has persisted since then, being partly attributed to the natural population growth and, to a certain extent, migrant workforce inflow.

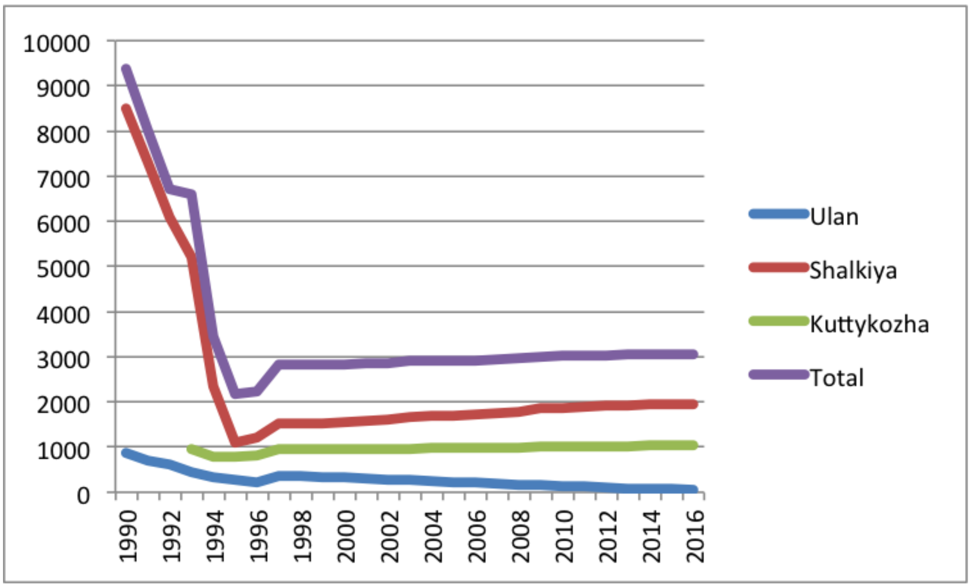

Figure 66. Changes in population numbers in Shalkiya, Kuttykozha, and Ulan

With the Mine operating intermittently to cause an abrupt decline in the population number, some components of local infrastructure have fallen into disrepair and population composition and lifestyles changed significantly.

Pioneer Settlement

Pioneer settlement was built in the 1980s to provide housing for the mine employees and used to be a vibrant residential area with low-rise apartment houses and a school. Mine workers were the residents of the settlement, which was particularly hard hit by the termination of mining operations.

The settlement has gradually fallen into decay after the mine closure and never revived; the majority of residents have left it and infrastructure has degraded. Currently, the former Pioneer settlement has only 54 residents (10 households).

Kuttykozha Settlement

Kuttykozha settlement began in the first quarter of the 20th century by people who used to practice nomadic pastoralism but shifted to a settled lifestyle. A collective farm, organized in the settlement in the 1930s, was subsequently named after Lenin. The karakul fur plant was built there. The Kuttykozha residents have been traditionally engaged in agriculture, especially in livestock farming. With the construction of the mine, some of them shifted from agriculture to mining. The settlement became home for people arriving to work at the mine.

Kuttykozha has a remarkably stable population with no sharp fluctuations observed since 1992[178] to date.

7.4.5. Existing Housing

Shalkiya Settlement

The Shalkiya Settlement housing pattern comprises a mix of low-rise and high-rise houses.

Low-rise housing. At present, low-rise buildings, especially private houses, dominate local housing sector; each house is located on a small plot of 8-25 Ares where residents keep fruit/vegetable gardens; some households keep livestock. Despite the continuing economic decline, delays and breaks in the operation of the mine, the single-storey housing sector has gradually developed throughout all these years. The household survey results show that the local residents have now settled and started to build new houses in the recent years (Annex 17.1). The level of amenities available in a residential house depends on the household income and affluence. Some houses are equipped with conveniences. Other houses use water from standpipes and/or wells in the backyard. Generally, low-rise houses have a good appearance.

The ShalkiyaZinc Company is also contributing to the development of low-rise housing. It has built two (one two-storey and one single-storey) hotels for the mine. In 2008, five one-storey corporate houses were built and commissioned. Additional 6 one-storey houses for the mine staff are under construction. These good-quality houses have all modern conveniences and furniture (please see photos in Annex 18.

High-rise housing. Seven high-rise houses with all modern conveniences were financed and built in the 1980s by the Shalkiya Mine. After the suspension and termination of the mining operations at the Shalkiya site, these houses have been taken over by the Akimat, which lacks funds to maintain them properly: there is no heating and centralized water supply[179], sewer system does not function properly.

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[178] There no data covering the period before 1992

[179] In some houses, water supply is available on the lower floors. Water cannot be lifted higher due to the lack of pumping capacity

These houses now pose a serious issue for Shalkiya settlement. Their technical condition shows a varying degree of disrepair. Some houses have been partially renovated and the tap water is available on the ground floor. Several flats have been sold to new owners in the past few years. While three houses have been recognized to be in dangerous condition of disrepair, people still live there with some flats being occupied by low income families that do not have alternative housing.

The Shalkiya Akimat is now taking effort to improve housing conditions. The housing recognized as dangerous is planned to be renovated within the framework of the 2nd phase of the 2011-2020 Housing and Municipal Infrastructure Modernisation Programme in the Republic of Kazakhstan. Residents of these houses are offered to move temporarily to the building formerly occupied by a healthcare resort. The Akimat is taking steps to identify the owners of those flats that are not occupied. Those flats whose owners have remained unidentified are recognized as unattended property in accordance with the RK legislation. It should be noted that other four houses are not considered to be in dangerous condition. No information has been provided during ESIA process about the future fate of these houses It is however obvious that living in high-rise housing not connected to standard services can hardly be considered normal. Residents of these houses install self-made coal stoves and stove pipes routing them to the facades or staircase shafts. As there is no centralized gas supply, residents install gas cylinders in their flats. The centralized water supply service is similarly lacking and sewer system does not function properly. It is hardly possible to ensure fire and sanitary safety for local residents in these circumstances.

In principle, this situation has no direct relation to the Company or the Project because the houses were built during the Soviet time under a different set of conditions and by a different legal entity. Formally, the legal authority over this matter rests with the local administration that lacks internal resources to finance the renovation of these houses and tries to attract funding through the governmental programmes. This tactics is only partially successful. At this stage, there is no clear vision of how the issue of high-rise housing can be addressed in a sustainable manner. It is important to develop a rational strategy that not only would help address the issue effectively today but also prevent it from occurring in the future.

Former Pioneer settlement. Existing housing in the former Pioneer settlement is a separate issue. This area has become part of Shalkiya settlement and currently has 12 households.

The majority of residential houses in this area is in dilapidated condition (Annex 18.1, **Figure 83**). There is a water supply line but the tap water is not available in the flats. People use water from street standpipes. The electricity supply is on in the houses. There are no school, kindergarten, shop and other infrastructure, nor is there the public transport service (which is a really important issue given that this area is quite far away from the main part of Shalkiya settlement and its infrastructure). Generally, living conditions in this part of Shalkiya settlement are best described as hardly attractive Finding solution to the issue for the former Pioneer settlement is another important task that requires joint effort. Kuttykozha Settlement

Kuttykozha settlement mainly comprises single-storey houses. Despite the continuing decline and lack of employment, local residents try to improve their houses. Housing quality varies from household to household depending on a household's level of affluence.

There are no centralized water supply and sanitation services in the settlement; local residents take water from wells. However, existing housing in the settlement generally has a good appearance.

7.4.6. Lifestyles[180]

Part of people living in low-rise houses in Shalkiya work at the mine and various public establishments in Shalkiya and Zhanakorgan. There are entrepreneurs, some of them running relatively large businesses. Some residents use their land plots to grow vegetables (tomato, cucumber, beet, pepper, corn, and rarely potato), edible greens, and fruits (apricot, cherry, apple, peach, pear etc.). Some households keep livestock (cattle, sheep, goats, horses, and camels). People normally keep only a small number of livestock at their backyard farms (e.g., a couple of cows, several dozen sheep or goats). Those households that keep large numbers of livestock have pastures in the mountains and use them to graze their livestock in the summer.

Another part of local residents is not interested in farming activities; they use their backyard plots to grow flowers and trees to provide shadow and improve the landscape in their backyards.

Those households that live in the high-rise houses have very limited opportunities for backyard farming. From this perspective, living in a rural area in high-rise housing without a backyard garden plot appears to be less attractive than living in a traditional single-storey rural house.

A very special situation exists in the former Pioneer settlement (Annex 17.2). All local households are linked to the mine one way or another (they either worked at the mine or were involved in the mine development). Despite extremely limited incomes, many households do not have backyard farms. The only exception is a family grazing livestock (both their own and neighbour's). During the household survey, these people explained that they do not keep backyard gardens because of the lack of water and hard soil.

In Kuttykozha, a significant part of local residents are engaged in agriculture including livestock farming as their key activity. In many cases, local farmers keep their livestock on distant pastures. The Kuttykozha residents have traditionally maintained good farming skills. Many of livestock keepers who now live in Shalkiya settlement moved there from Kuttykozha. Part of the Kuttykozha residents works or used to work at the mine. Some households moved to Kuttykozha from other areas; not all of them are engaged in backyard agriculture.

7.4.7. Public Healthcare System

There is a clinic in Shalkiya and a rural health station in Kuttykozha. A children's recreation camp "Tau samaly" operates in the aul district. There is a 200-bed sanatorium for rehabilitation of latent tuberculosis patients (**Figure 67**).

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[180] This section has drawn on and referred to the household survey data (Annex 17) and focus group results (Annex 14.5).

Figure 67: Tuberculosis Sanatorium

It should be noted that the sanatorium occupies one of high-rise buildings specially renovated for this purpose. Currently, not only does the sanatorium provide effective rehabilitation services to its patients but it also is a significant employer at the settlement level.

7.4.8. Education

In Shalkiya, there is a secondary school №86 for 1200 seats (currently there are 350 students). There are also 1 state and 1 private kindergartens there.

The new building of rural school №164 for 200 seats was also built in Kuttykozha. The old school building is planned to reconstruct into a kindergarten. A children’s playground was also built. Construction of the club house in the settlement is one of the priority tasks for 2015.

7.4.9. Culture and Religion

The Shalkiya Okrug has no recreational centre. All major public events are held at the school hall. There is a small football field and a sports ground.

In the Shalkiya Okrug, Muslims make up the majority of the population. In the recent years, local community members have begun to revive the Islamic and Kazakh national traditions and reintegrate them into their everyday lifestyles. Almost at every holiday there is a mullah, and/or the residents perform Muslim rites by themselves. Kazakh folklore and Kazakh national traditions are present at the family and public holidays.

The survey results indicate that there are no ethnic groups and/or settlements where indigenous people live compactly and maintain cultural traditions or lifestyles that may be affected by the project.

7.5. <u>Birlik and Jalyima Settlements</u>

Birlik and Jalyima are settlements that can be potentially affected by the social impacts of the Project.

Birlik is an aul in Zhanakorgan District, the administrative centre and only village in Akkuik aul District, located approximately 17 km east of Zhanakorgan village, the administrative centre of Zhanakorgan District.

Birlik has a population of 2583 people (409 households).

Jalyima is a village with 1438 residents (206 households) whose main occupation is farming. Some residents work at the Mine.

7.5.1. Transport, Communication, and Public Utility Services

Shalkiya Aul Okrug is located near the Western Europe-Western China highway that significantly improves the communication between the settlements of the district and the capital of the region. At the same time, the local traffic is tied to Zhanakorgan-Kuttykozha and Shalkiya-Kuttykozha local roads. Local roads are not of high quality and require repair. There is schedule bus service connecting Zhanakorgan with Shalkiya and Kuttykozha settlements.

The Zhanakorgan-Kuttykozha road (18 km) and internal roads in Kuttykozha were repaired in 2014. It is planned to pave the Shalkiya-Kuttykozha road with asphalt. In addition, JSC “ShalkiyaZinc LTD” filed a request with the local executive authorities regarding the allocation of 15 hectares of land in Zhanakorgan and Shalkiya for the construction of accommodation camp for mine staff.

Shalkiya settlement has an automatic telephone station for 256 numbers, while wireless satellite communication service is available in Kuttykozha. Around 60 people are connected to Internet.

The degree of wear and tear on existing electricity network is 78%.

The centralized water supply service in Shalkiya covers 63 houses. Significant part of local households also use water from wells and artesian boreholes. The well water is not suitable for drinking purposes. Local residents have expressed concerns over the quality of water they have to use. It is planned to renovate and repair water supply networks under the Ak Bulak State Programme in 2017. It is anticipated that all local residents will have access to good quality water as a result of this renovation.

7.6. <u>Cultural Heritage</u>

7.6.1. Tangible heritage

Cultural and Historical Background

The Project area is very interesting from a cultural heritage perspective and has a rich history. The Sauyskandyk canyon rock engravings in the Shieli district and the Maidamtal and Besaryk engravings in Zhankorgan district are part of the historical and cultural heritage concentrated along the Karatau mountain ridge where ancient nomadic people had their encampments.

The territory that is currently occupied by Zhanakorgan district used to be part of the Silk Road. In the Middle Ages, the Silk Road represented an extensive network of trade routes connecting various settlements and towns. From that era, Zhanakorgan district inherited a number of important cultural heritage assets of national significance. These include:

- Ancient settlement of Syganak (6-19 centuries) in Zhanakorgan district, 2 km north west of Sunakata village.

- Kara Sopy Mausoleum (18-19 centuries) in Zhanakorgan district, 5 km south east of Zhanakorgan village.
- Aykozha Mausoleum (18-19 centuries) in Zhanakorgan district, 6 km south of the Besaryk railway station.
- Aktas Mosque (1884) in Zhanakorgan district, 6 km south of the Besaryk railway station.

All these sites are located at significant distances from the Project site. There are no World Heritage sites in the Project area.

Past Archaeological Surveys

The first accounts of archaeological finds and monuments discovered in the study area were presented by the surveyor of the Turkestan Department of the Imperial Russian Geographical society, M. A. Kirchhoff. The first publication appeared in 1906[181]. Numerous archaeological surveys have been carried out in the region after the WW2 and till the present time.

In 2004-2008, the Karatau team of the Khoja Akhmet Yassawi *International Kazakh-Turkish University conducted a* large-scale archaeological survey in the territory of Zhanakorgan and Shieli districts in Kyzylorda Region in order to prepare maps of archaeological sites. This work involved the discovery and exploration of 195 new archaeological monuments[182]. Among the other areas, the survey covered Shalkiya village and Karasuyir (Ungirli) site. The identified sites located closest to the mine site are presented in the schematic map (**Figure 68**).

[181] Reports of meetings and communications of the members of the Turkestani archeology fan club. Historical and cultural monuments of Kazakhstan / Authors of the foreword Eleuov M., Baktybaev M. M. – Turkestan, 2011. – S. 359-365.

[182] 1) Eleuov M., Kaliev S., Akymbek E., Malabaev S., Alzhanov R., N. Kalymbetov D., Archaeological research expeditions in 2004 in South Kazakhstan region "Turan" (intermediate) research. – Turkestan, 2005. – 192-page. / ICGS AT archive, inv.№4. No. 212, p. 73; 2) 17 Eleuov M., Murgabaev S., Kaliev S., Akymbek E., Kataeva G., Alzhanov R. Preparation for the edition of the code of monuments of history and Kyzylorda region (intermediate) of research. – Turkestan, 2005. - 184 b. / ICGS AT archive, book No. 5.; 3) Eleuov M., Murgabaev S., Kaliev S., Akymbek E., Kataeva G., Alzhanov R. Preparation for the edition of the code of monuments of history and Kyzylorda region (conclusion) about research. – Turkestan, 2005. - 115 p. / ICGS AT archive, inv. No. 7. No. 92, p. 53; No. 17, p. 12; 4) 19. The code of historical monuments and culture of the Republic of Kazakhstan. Kyzylorda region. – Almaty: Aruna, 2007. – 376 p.

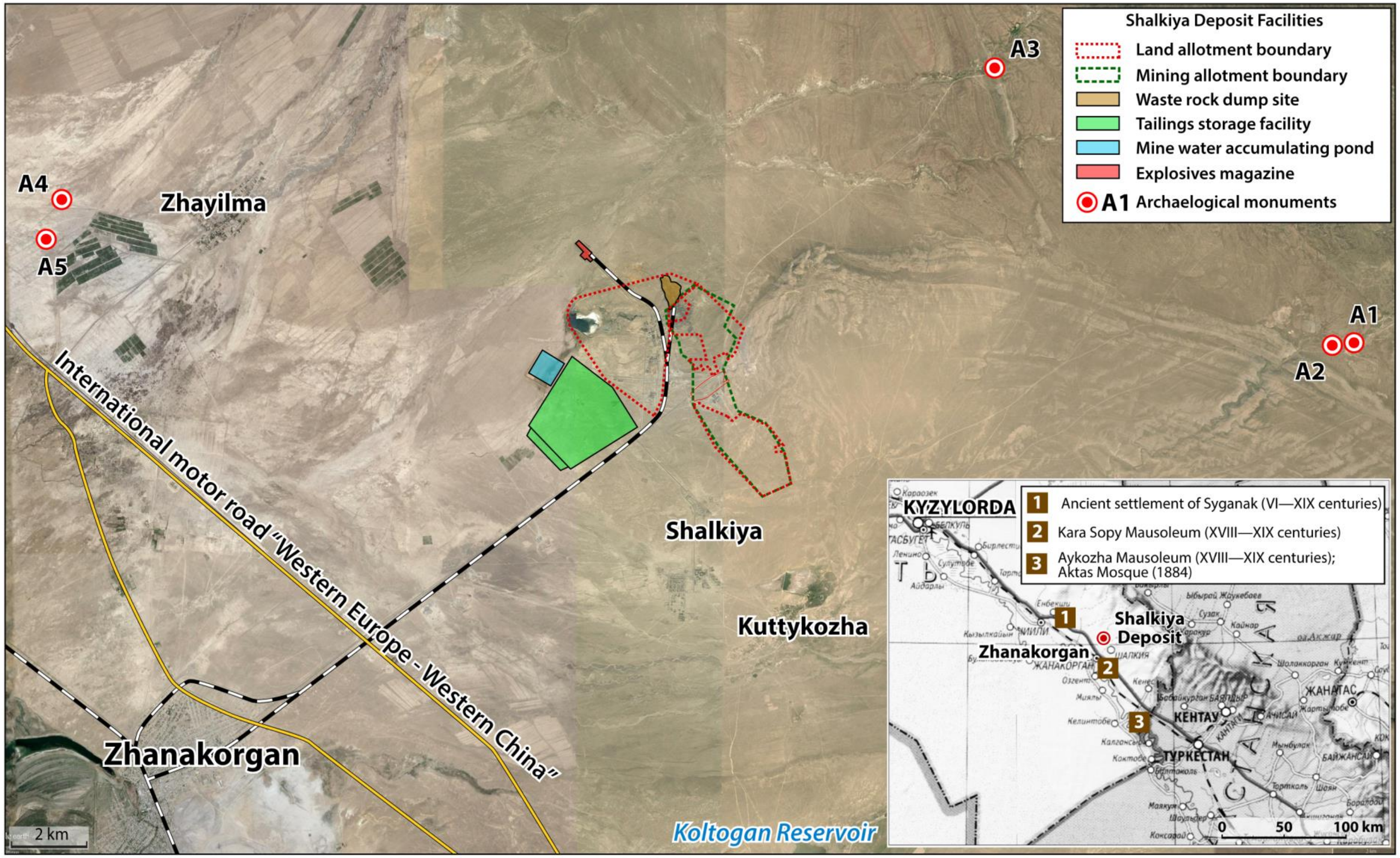

***Figure 68**: Archaeological Sites Located Closest to the Shalkiya Mine*

The figure shows the following sites:

- A1. Petroglyphs Karasuyir. Located 18.5 km northeast of village Shalkiya, on the southern slopes of the hills. Geographic coordinates: 440 00 '36 "N, 0670 37' 49" E;
- A2. Karasuyir burial mounds. Located 19 km north-east of Shalkiya village, on the shore of the unnamed spring. Geographic coordinates: 440 00 '37 "N, 0670 38' 14" E;
- A3. Usenbaev group mounds. Located 15.7 km northeast of Shalkiya village, on the left bank of the Shalkiyasu River. Geographic coordinates: 440 04 '29 "N, 0670 31' 16" E;
- A4. Zhayylma 2 burial mound. Located 3.78 km west of Zhayylma village. Geographic coordinates: 440 02 '38 "N, 0670 12' 56" E; and
- A5. Zhayylma 3 burial mound. Located 4.12 km west of Zhayylma village. Geographic coordinates: 440 02 '05 "N, 0670 12' 37" E.

The figure shows that these sites are situated quite far from the mine (i.e., at a distance of 10 km or more). Their safety will not be threatened by the planned activities.

The Project area as such has not been surveyed previously. The historical and cultural investigations at the planned construction sites were carried out from November 2015 to June 2016 as was recommended by the Consultant and directly requested by the relevant authority (Annex 11). These investigations were conducted by Archeo-Service LLC, an appropriately licensed organization.

The following sites where key Mine facilities are planned to be located have been investigated:

- The planned Yuzhny (Southern) and Ventilation shaft sites occupying a total area of 11.2 ha.
- The planned Processing Plant, Conveyor Belt, CCGT-TPP sites occupying 9.7 ha.
- The planned Tailings Storage Facility site occupying 180 ha.
- Sites for future facilities auxiliary production and infrastructure – 281 ha.

The map of archaeological investigations conducted in the Project area as of June 2016 is presented in figure (Figure 69). As can be seen from this map, sites occupied/planned to be occupied by key process facilities of the Mine have been investigated. Areas remaining to be surveyed include planned locations of infrastructure/utilities and generally those parts of the Mine’s land allotment area which are not currently planned to be used for construction purposes and/or those already occupied by facilities/activities that leave little or no chance of discovering unidentified archaeological assets.

It is good practice for the Company to conduct at least a screening survey of these areas to enable the identification of the most likely locations where archaeological resources might be present. This survey could be conducted using only visual methods without having to finance costly research activities. Based on the results of this screening, the archaeological zoning map could be prepared.

2015-2016 Archaeological Survey Results

The archaeological survey was conducted in November 2015 and May-June 2016 and involved three stages. As a result, three historical and cultural review conclusions were obtained (Annex 11).

Key Findings

1. During the survey of the proposed Southern shaft site, the review team has discovered and examined a burial site comprising two burial mounds, which has been classified as a site of historical and cultural value. The identified and examined site is located within the buffer zone of the Project area.

2. During the survey of the proposed Ventilation shaft site, the review team has observed existing mine haul roads and an overhead power line that have affected the integrity of local landscape. No sites of historical and cultural value have been discovered.

3. No indication of any cultural and historical resources was found during the survey of other sites (TSF, PP, conveyor belt, and CCGT).

To summarise the above, a total area of 472 ha was surveyed during two field seasons in 2015–2016, which is about 70% of the total land allotment area (670 ha). Taking into account the ongoing development of the Project area and existing structures/facilities, 50% of the total land allotment area has been surveyed. As was already mentioned, it is good practice (and indeed the EBRD requirement) to conduct at least a screening survey of the entire Project area. This means that a detailed survey of sites to be used for the development of mine infrastructure would be required. Archaeological investigations should therefore continue in line with the Cultural Heritage Management Plan to cover the entire area of the Mine's allotment.

To facilitate the historical and cultural investigations across the entire area of the Project's **land allotment,** it is recommended to undertake the archaeological zoning to rule out areas disturbed by industrial activities and those that are considered to have the least potential for finds. This zoning would help reduce cost estimates for further investigations.

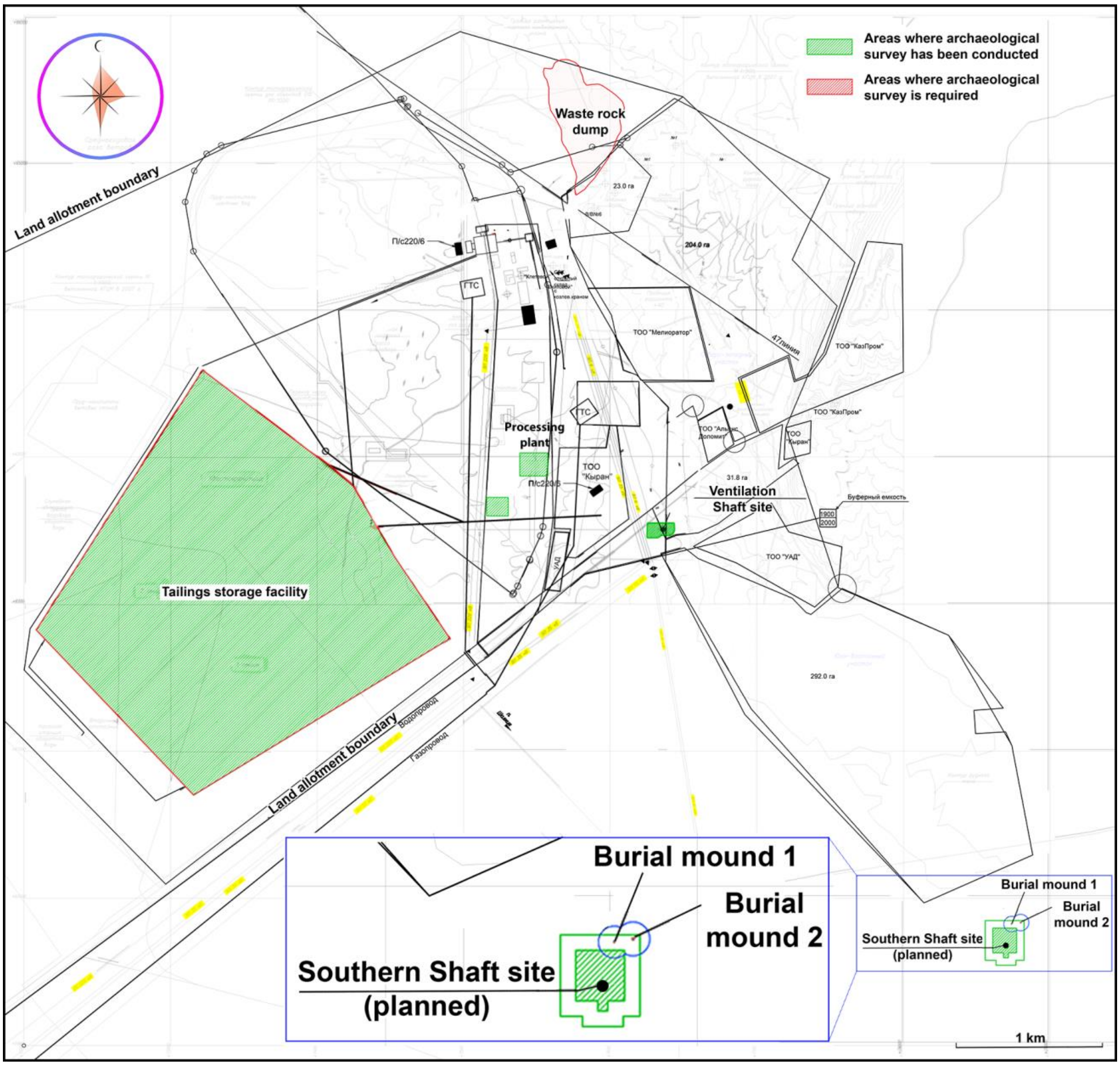

***Figure 69**: The results of the 2015-2016 archaeological survey of the Project area*

7.6.2. Intangible Heritage

The survey conducted as part of the ESIA identified no ethnic groups and/or indigenous communities, whose cultural traditions or lifestyles may be affected by the project. The community keeps the national Kazakh traditions in their everyday life. This can be strengthened by the Project: the personnel and the contractors have demonstrated that they organize social events based on the national traditions, with due respect to the traditions of other nations involved into the business process. The support of the community events that relate to the national traditions could provide the positive social effect (this will be considered further and specified in the ESAP).

8. PROJECT ALTERNATIVES AND ASSESSMENT

8.1. Introduction and scope

In this section alternatives for certain major components of the Project are described and analysed in the context environmental and social, and where possible, economic and technical factors. It should be noted that for mining projects, alternatives are often limited due to the local conditions, such as topography and geotechnical factors, or economic factors, such as the cost of hauling waste rock or ore over long distances. This is even more so given nature of the Shalkiya Project as an expansion of an existing mine. To this end, the following feasible options and alternatives pertaining to major project components were formulated together with the Owner and Hatch, and evaluated, as discussed in more detail below:

- Processing Plant (operation configuration);
- Power sources;
- Ore haulage methods;
- Tailings management methods including dewatering, disposal at the tailings storage facility and use as backfill; and
- Waste rock storage location.

- In addition, the ‘no project’ alternative was considered.

A number of major project decisions cannot be assessed as alternatives as they were predetermined by the location of the existing facilities and / or the above-mentioned local conditions. These included:

- Project site location: the selected site contains the location of the lead-zinc ore body and existing mine infrastructure and has many advantages particularly related to environmental and social impacts given its remote location from human settlements. As such, the existing Project location is considered to be appropriate, and thus no investigation of other potential locations has been undertaken;
- Water supply: the Project facilities will receive water from the existing Kuttykozha water intake (intended for domestic and potable use), the Zhanakorgan water intake (comprising a group of wells and intended for industrial use), mine water drainage collected in the mine water pond, and rainfall precipitation. It is planned that, as the Mine develops, water from the Syr Dariya could be used as a backup water source at some future date;
- Location of Mine staff accommodation at the Mine site: engineering and technical staff and workers will be accommodated in the existing and to-be-build residential buildings on site and in the buildings to be constructed / rehabilitated on land within the Shalkiya settlement which was historically created to accommodate the mine personnel but ceased to be part of assets owned by the Mine after the suspension of mining operations and abandoned (refer to Social Baseline).

8.2. Method

The analysis of alternatives for each of the above-identified component was performed in several steps:

1. Description of alternatives to be compared (**the option accepted as a case base for engineering is marked in bold**).
2. Identification of criteria that can be used to compare the alternatives. These included:
   - Environmental criteria that related to key physical (e.g. air pollution, noise impact, water consumption) and biological (e.g. impact on biodiversity) impacts that could influence the selection of one alternative over another;
   - Social criteria that pertained to key socio-economic and cultural resource factors, land use and the potential for relocating people/displacing legal entities and individuals; and
3. Analysis (comparison of options); and
4. Presentation of the preferred alternative.

The economic analysis is presented in the Project Feasibility Study (transportation costs, raw materials, purchase of equipment etc.). An important requirement to defining the criteria was that they should be distinct and bear significance for a project component under consideration. A set of more general criteria was developed for comparing the ‘project’ and ‘no-project’ alternatives.

8.3. Processing plant (operation configuration)

8.3.1. Description of options

Option 1: Construction of the new Processing Plant in the northern part of the site, Option 1

This is the option considered as the base in the Feasibility Study. **Figure 70** depicts this option, as well as the below Option 2.

Option 2: Construction of the new Processing Plant on site – to the north-west of the Ventilation Shaft site, where the old boiler house is located (Option 2)

The Owner is also considering the second location option for the construction of the Processing Plant on site using, to the extent possible, the existing buildings and facilities.

Option 3: Construction of new Processing Plant at the Mine site, Option 3

Option 4: Modernisation and resuming the operation of old processing plant in Kentau

As was already mentioned, during the previous periods when the mine was operating, the entire run-of-mine ore was transported by rail from the mine to the Kentau Processing Plant located in Kentau town, 165 km away from the Shalkiya Mine. The Kentau Processing Plant is not currently in operation. To be brought back to operation, it should be significantly modernized and retrofitted. Further, the Plant currently has no tailings storage facility (this facility was transferred to a third party when the Plant was put into care and maintenance).

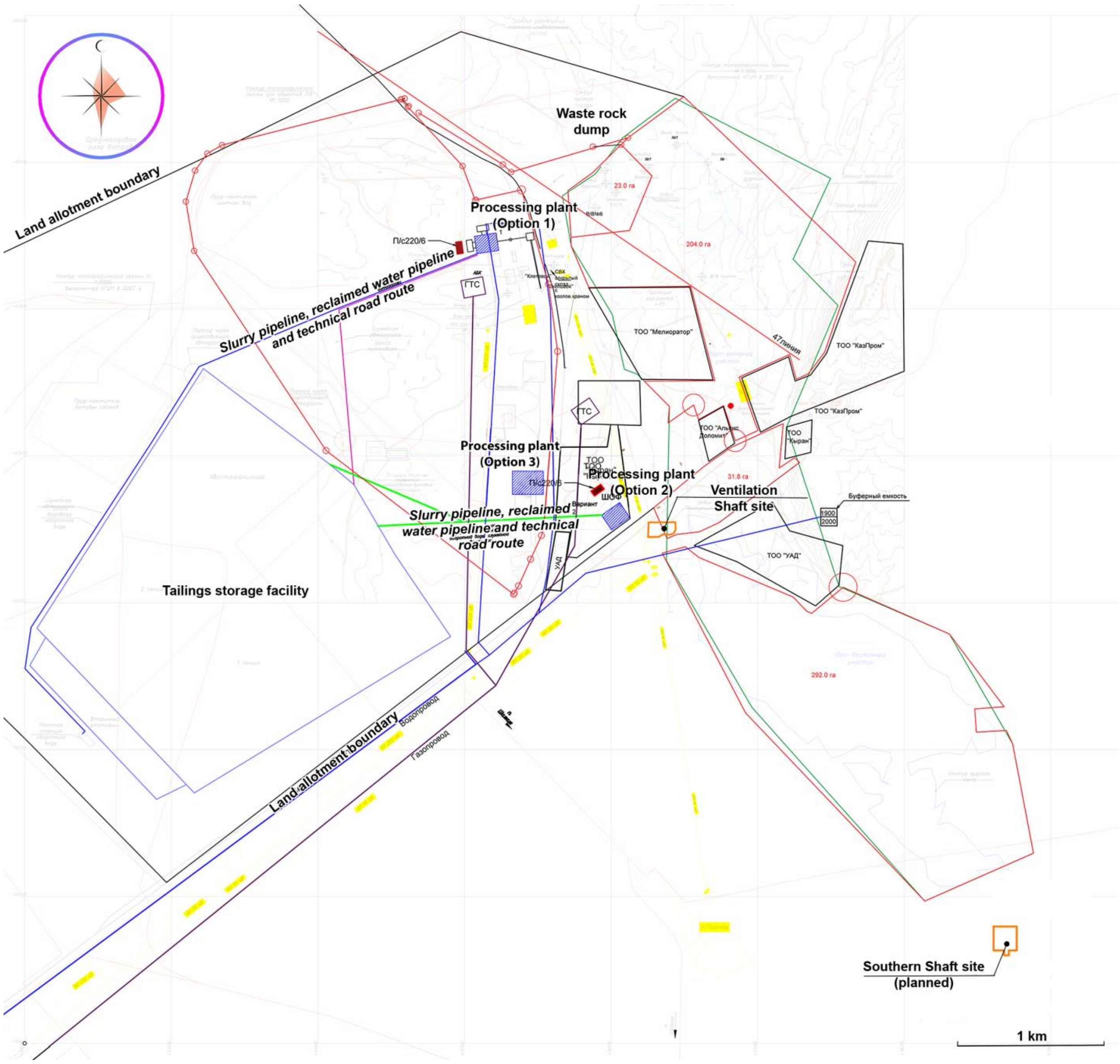

Figure 70: Options Featuring the Processing Plant Located at the Mine site

8.3.2. Criteria

The criteria used to evaluate the alternatives for configuring the project set up are presented in the left hand column in **Table 55**.

8.3.3. Evaluation of options and selection of the preferred option

Table 55 Comparison of the processing plant operation configuration

	Criterion	Option 1	Options 2 and 3	Option 4
Environment al	Air emissions related to / from the Processing Plant should affect as few local inhabitants as possible	Regular construction-related impacts Short haul distance	Regular construction-related impacts Shorter haul distance, processing plant located closer to	Impacts related to modernization Larger traffic-related emissions due to long haul distance The construction

	Criterion	Option 1	Options 2 and 3	Option 4
	GHG emissions		the shafts, existing railway and TSF than Option 1	of new road or repair of existing road might be required
	Noise and vibration from the Processing Plant should affect as few local inhabitants as possible	Regular construction impacts	Regular construction impacts	Impacts related to modernization Traffic-related impacts due to long ore haul distance
	Effects on surface water quality and quantity should be minimized	Regular construction impacts	Regular construction impacts	Impacts related to modernization
	Loss or alteration of natural habitats/ biodiversity should be minimized	Already disturbed baseline condition of larger habitat areas due to mining operations or agricultural activities (livestock grazing)	Already disturbed baseline condition	Already disturbed baseline condition
	Need for restoration after the mine closure should be minimized (or the power source could be decommissioned or used for alternate purposes)	Should be reinstated upon closure	Should be reinstated upon closure	Should be reinstated upon closure
	The overall footprint of the Processing Plant should be minimized	The footprint is limited to the site area	The footprint is limited to the site area	Kentau town will fall within the Area of Influence of this option
	Resource use – energy generation.	Equivalent resource use requirements		Significant additional energy resources required
Social	Land take (including agricultural lands)	The required land is owned by the Mine	Land acquisition is required	Land is to be acquired for a new tailing

	Criterion	Option 1	Options 2 and 3	Option 4
	should be minimized			storage facility or existing TSF to be used/operated jointly with its current owner
	Loss of cultural resources should be minimized	Located about 5 km away from the identified burial mounds	Located a 3 km away from the identified burial mounds	Located about 170 km away from the identified burial mounds
	Creation of jobs	Jobs are created during the resumption of underground mining operations at the main development stage Temporary employment during construction Jobs will be created during the operation stage. Former Kentau Plant employees that currently work at other facilities could be invited to work at the Mine		Temporary employment during reconstruction Operating staff is there
	The potential for danger to the local communities should be minimized.	Minimal disturbance during ore haulage The nearest residential area is Shalkiya North (former Pioneer settlement) located 4 km from the Mine site		Impacts would occur along the haul route through noise, vibration, dust and risk of traffic accidents
	The visual impact on the landscape should be minimized	A visual impact from the existing mine infrastructure is already there		Visual impacts limited to modernization

As the analysis in the above table shows, Options 1, 2 and 3 are more favourable than Option 4 from the environmental and social perspective. Options 2 and 3 are more preferable than Option 1 as they entail less air emissions but both receive the same ranking based on the environmental criterion. Option 3 has been finally selected based on a suite of factors.

8.4. Power source

8.4.1. Description of options

- ***Option 1: Electricity supply from the centralised electrical grid***

  The site currently has the existing infrastructure to use power from the grid operated by the Kazakhstan Electricity Grid Operating Company. This option will require the construction of a new substation or modernization of the existing one.

- *Option 2A: Construction and use of a Combined Cycle Gas Turbine Power Plant (CCGT) instead of the electricity from the grid.*

The design and construction of a gas turbine is currently being considered at the conceptual level as an alternative option. CCGT Plant will supply electricity to the Mine and Processing Plant, as well as other facilities. It can be constructed either on the territory of the site or on the adjacent land.

- *Option 2B. Construction and use of CCGT Plant as a back-up for grid electricity*

  The study is such that the base case power is from the grid, while CCGT is used as a backup source of energy.

- *Additional Option 3. Construction and use of renewable energy facilities as additional (heating) source*

  Alternatives such as the use of renewable generation (e.g. wind, solar or a combination thereof) are not considered to be reliable given the need for 24-hour secure power and heat supply. Use of non-intermittent renewable generation (e.g. biomass) is not feasible due to lack of available and reliable fuel source. However, it is suggested to consider this Option (especially, wind energy) for thermal power generation and facility heating in the later stages of the Project implementation. A combined power supply option is often considered where the alternative energy sources are used to supply power to the onsite power grid; the electricity supply from the centralised grid is thereby reduced.

  The use of alternative energy sources could be linked to the implementation of the Energy Efficiency 2020 Programme of Kazakhstan adopted in 2013. This option is not analysed in this study.

8.4.2. Criteria

The below criteria were used to evaluate the alternatives for power supply (refer to the left hand column in **Table 56**).

8.4.3. Evaluation of options and selection of the preferred option

Table 56 Comparison of power supply alternatives

	Criterion	**Option 1**	**Option 2A**	**Option 2B**
Environmental	Air emissions related to/ from the power source should affect as few local inhabitants as possible	Impacts related to construction/modernization of a substation and connecting line Negligible operation air impact Indirect impact of pollutant and GHG emissions released by the power generating facilities that are	Greater impacts related to the construction of CCGT Plant GHG emission quotas should be obtained	

		part of the national energy system		
	Noise and vibration from the power source should affect as few local inhabitants as possible	Slight operation impacts	More significant construction and operation impacts compared to Option 1	
	Effects on surface water quality and quantity should be minimized	Negligible impacts	Water treatment system will need to be arranged to prevent water and soil contamination Risk of spillage of mazut and diesel fuel (backup fuel) and oil	
	Loss or alteration of natural habitats/ biodiversity should be minimized	In case the construction of a new substation will be favoured, minor impact on biodiversity can be expected	Regardless of the Plant location, the scale of alteration can be assessed as negligible.	
Social	Land take (including agricultural lands) should be minimized	No new land is required regardless of the decision whether to modernize or construct a substation	Land acquisition might be required	Land acquisition might be required
	The visual impact on the landscape should be minimized	A visual impact from the existing power facilities is already there	Visual impacts will be higher than for Option 1	

As can be seen from the table, both options requiring the construction of new CCGT Plant might result in higher construction and operation environmental and social impacts than Option 1. Therefore, it is considered that the Project has selected the most appropriate source of electricity supply, which relies on the electricity supplied through the electrical grid from the current Kazakhstan Electricity Grid Operating Company. The use of two autonomous electricity supply lines from Shymkent and Kyzylorda would reduce the risk of disruptions in electricity supply if one of these lines goes out.

8.5. <u>Ore haulage method</u>

8.5.1. Description of options

Option 1: Use of vertical conveyors in the opening of the mine and ore transportation to the surface

A review of the proposed Mine Access and ore haulage methods for the Shalkiya Mine was completed. Between shaft hoisting, an inclined conveyor to surface, and a vertical conveyor, the vertical conveyor was recommended as the preferred option by Hatch and the Kazakhstan Head Design Institute (KHDI). The Hatch review indicted that the vertical conveyor is operationally the preferred option.

Option 2: Applications of hydrotransport of ore instead of vertical conveyors in the opening of the mine and ore transportation

As an alternative to the vertical conveyor, hydrotransport of ore from the underground to surface is being considered by the Owner and will be determined technically and economically viable or not at a later stage in the study.

8.5.2. Criteria

The criteria that were used to evaluate the alternatives for ore haulage are given in the left hand column in **Table 57**.

8.5.3. Evaluation of options and selection of the preferred option

Table 57 Comparison of ore haulage alternatives

	Criterion	**Option 1**	**Option 2**
Environmental	Air emissions from the facility should affect as few workers as possible	Air emissions will be higher for dry ore transport	Air emissions will be less for hydrotransport
	Noise and vibration from the facility should affect as few workers as possible	Noise and vibration will be higher for the vertical conveyor	Noise and vibration will be less for hydrotransport
	Effects on the quality and quantity of groundwater and surface water used should be minimized	No additional water impacts	Large volumes of water will be required for the hydrotransport option but these would be industrial water requirements
Social	Impact on staff should be minimized (improved working conditions)	Great risk of dust exposure from vertical conveyor	Dust exposure reduced

From the table it can be seen that the advantage of hydrotransport is reduced dust generation resulting in reduced worker exposure. The downside of hydrotransport is the additional water required. In the absence of a quantification of the amount of water required it is not possible to provide a direct comparison of impacts but human health effects would be considered more significant than additional water use. The hydrotransport option should be further investigated to ascertain whether it could compare operationally to the vertical conveyor option.

8.6. Tailings disposal and use as backfill[183]

8.6.1. Description of options

Option 1: Conventional tailings disposal and storage at the TSF

The proposed solution in the Feasibility Study is a conventional tailings disposal and storage of thickened tailings at 55-60% solids. The tailings would be transported in the form of slurry via pumps and pipeline from the Processing Plant to the TSF. The slurry would be discharged into the operating cell by a network of spigots distributed on the perimeter dam crest. The entire volume of tailings generated will be disposed of at the tailings storage facility (100% disposal).

Option 2A: Application of technology for paste thickening of tailings from the processing plant and the use of tailings as backfill

Option 2B: Application of technology for paste thickening of tailings from the processing plant and storage of tailings in the TSF

A conceptual backfill study was completed to determine a high level design and associated capital cost estimate. The placement of backfill will enable some pillar recovery and increase the overall extraction of the resource. This can be done by using either cemented rockfill containing tailings or pastefill containing thickened tailings. For the rockfill option, it will likely require quarrying of material or purchasing material because there will not be enough rock from the underground development over the life of mine. For the paste fill options, the tailings would be used. The study will have to explore whether more zinc ore is recovered by using tailings as fill to recover more intact ore/pillars. It is known use of tailings as backfill is required to ensure more complete and safe ore recovery and reduce environmental burden associated with the disposal of tailings, however additional study will be required to clarify which type of backfill is to be used.

The studies conducted to date included:

- Analysis of types of backfill applicable for use at the Shalkiya deposit: namely cemented rock fill or tailings paste.
- Type of tailings and other backfill material available at site otherwise looking to source out additional materials
- Optimizing the location of the backfill plant.
- Rock Mechanics data (existing) – for fill strength requirement – This will only entail a cursory review of the rock mechanics information to determine the required strength of the backfill.

From this study, it was concluded that the placement of backfill in the underground mine voids will enable more complete recovery of some pillars and increase the overall extraction of the resource so may be worth exploring. This could be achieved by using either cemented rockfill or pastefill as backfill. The proposed backfill plant will be located near the processing plant in order to receive mill tailings as the source of paste material. The remaining tailings will go to the TSF, thus reducing the surface footprint of the TSF.

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[183] This section draws on the presentation “Section v. Justification and Selection of an Optimal Tailings Disposal Option. Section v. Estimated Loss of Ore in Pillars due to the Use of Tailings Backfill”, Engineering Dobersek GmbH Anlagenbau, January 2016.

Option 3A. Storage of dewatered tailings in the TSF

Option 3B. Storage of dewatered tailings in the TSF and use of tailings as backfill.

For these options, the technology line for paste thickening of tailings will need to be supplemented with dewatering system, as well as the tailing hydrotrasportation system (Option 3A).

8.6.2. Criteria

The below criteria were used to evaluate the alternatives for tailings disposal, storage and use (refer to the left hand column in **Table 58**):

8.6.3. Evaluation of options and selection of the preferred option

Table 58. Comparison of alternatives for tailings disposal, storage and use

	Criterion	**Option 1**	**Option 2 and 2A**		**Options 3 and 3A**	
Environmental	Air emissions should affect as few local inhabitants and Mine workers as possible	The largest emission source at the Mine site The larger the area occupied by TSF, the greater the area of exposed tailings beach zones where dust is generated	Lower operational risks due to smaller area occupied by TSF	Lowest operational risk due to the smallest area occupied by TSF	Lower operational risk than in Option 1	
	Noise and vibration should affect as few local inhabitants and Mine workers as possible	Major impact during construction due to large area occupied by TSF	Lower construction impact	Lowest construction impact due to the smallest area occupied by TSF	Lower construction impact than in Option 1, but higher than in Options 2 and 2A	
	Effects on underground and surface water quality and quantity should be minimized	Makeup water is required	Both options meet the processing plant's return water demand with no external water supply sources required		Both options meet the processing plant's return water demand with no external water supply sources required	
	Total surface disturbance should be minimized	TSF occupies 3,440 m^2	TSF occupies 2,043 m^2 assuming that 100% of	TSF occupies less than 1,000 m^2	TSF occupies 1,875	TSF occupies 1,025 m^2

<table>
<tr><th></th><th>Criterion</th><th>Option 1</th><th colspan="2">Option 2 and 2A</th><th colspan="2">Options 3 and 3A</th></tr>
<tr><td></td><td></td><td></td><td>tailings is thickened and disposed of at the TSF using the cone-shaped method</td><td>assuming that 54.8% of tailings is disposed of at the TSF using the cone-shaped method</td><td>m²</td><td></td></tr>
<tr><td rowspan="3">Social</td><td>Land take (including of agricultural lands) should be minimized</td><td>New land allotment is required</td><td colspan="2">New land allotment is required</td><td colspan="2">New land allotment is required</td></tr>
<tr><td>Loss of cultural resources should be minimized</td><td>A larger area will have to be surveyed</td><td colspan="2">A smaller area will have to be surveyed</td><td colspan="2">A smaller area will have to be surveyed</td></tr>
<tr><td>The visual impact on the landscape should be minimized</td><td>The largest size and height of the TSF dam will result in a relatively higher visual impact</td><td colspan="2">Lower impact due to smaller size and height of the TSF dam (impact is lowest in Option 2A)</td><td colspan="2">Lower impact due to smaller size and height of the TSF dam</td></tr>
<tr><td rowspan="2">Economic</td><td rowspan="2">The highest operating and discounted costs</td><td colspan="3">Options 2 and 2A consume 26% more electricity than Option 1</td><td colspan="2" rowspan="2">Operating and discounted costs are 2 times higher than in Options 2 and 2A</td></tr>
<tr><td>Higher capital costs (by 19%) than in Option 2A</td><td colspan="2">The use of tailings as backfill will help reduce ore losses during the mine development</td></tr>
</table>

As can be seen from the table above, Option 1 could entail the most significant and social consequences including additional water consumption from external sources to provide makeup water and larger space requirement for TSF. In addition, estimates produced by the Engineering Dobersek GmbH Anlagenbau (2016) indicate that Option 1 has the highest operating and discounted costs. In general, this Option is not recommended to be pursued.

Options 2, 2A, 3 and 3A require little or no makeup water from external sources (Engineering Dobersek GmbH Anlagenbau (2016)). However, Option 2A features the TSF occupying the smallest area, which implies lower impacts, associated with the TSF construction and operation. The study conducted by the Engineering Dobersek GmbH Anlagenbau (2016) further indicates that the capital, operating and discounted costs in Options 3 and 3A are almost twice as high as similar costs in Options 2 and 2A. Option 2A, in its turn, appears to be more resource-efficient. Overall, based on both environmental/social and economic criteria, Option 2A is preferred.

The evaluation of options has not involved the consideration of impact on mine water quality that could caused by the use of thickened tailings paste as backfill due to the modified geochemical and chemical properties of tailings, toxic compounds being more readily available for leaching and entering the mine water, and flotation reagents present in residual quantities. These issues have to be addressed in more detail as the design development process is moving ahead.

8.7. Waste rock storage

8.7.1. Description of options

Option 1: Temporary storage waste rock at the dump site with subsequent transfer to third parties for the production of construction materials

The Owner used to transfer overburden material to stone crushing plants for recycling. Currently, the possibility is considered to use waste rock for cement production. To this end, the Mine is in the process of obtaining a sanitary certificate that would confirm the suitability of the waste rock for use in the cement or other production. The Owner intends to study the economic feasibility of this option, and, if it proves to be feasible, to transfer part of waste rock to third parties for recycling. Another possible option considered at the conceptual level is organizing the onsite production of construction materials to recycle waste rock generated during mining..

Option 2: Temporary storage of waste rock and its use as backfill

This option is considered as the base case for the Feasibility Study. In accordance with the design decisions, for the first 2-3 years of the resumed underground mining operations, waste rock will be brought to the surface. Once in full operation, the plan is to fill underground mine openings or voids with all new waste rock instead of moving it to surface. Part of the initial waste rock that is brought to surface would be stored in an engineered waste rock stockpile. As it is anticipated that waste rock could be used for the production of construction material, the area occupied by waste rock dump is not expected to be significant. Waste rock disposal in the stockpiles is subject to environmental charges.

8.7.2. Criteria

The below criteria were used to evaluate the alternatives for waste rock disposal (refer to the left hand column in **Table 59**).

8.7.3. Evaluation of options and selection of the preferred option

Table 59. Comparison of waste rock disposal/storage alternatives

	Criterion	Option 1	Option 2
Environmental	Air emissions from the facility should affect as few workers as possible	Lower emissions due to a smaller waste rock surface area Risk that waste rock would be stockpiled onsite for a long period of time due to the absence of parties willing to purchase it the material	Lower emissions due to a smaller waste rock surface area

	Criterion	Option 1	Option 2
	Effects on underground and surface water quality and quantity should be minimized	The water and soil will be protected by a reinforced bottom with a waterproofing clay layer However, the larger the area occupied by waste rock, the greater the risk of impact	Water resources and soil will be protected against impact by reinforced bottom lining comprising impermeable clay layer However, the larger the area occupied by waste rock, the greater the risk of impact
	Impact on subsoil should be minimized or offset	Impact on ground stability (rock excavation) will not be offset	Impact on ground stability will be partly offset (less voids)
Social	Visual and landscape impacts should be minimised	Visual impact will be significant	Visual impact will be minor

8.8. <u>'No Project' Alternative versus the Project</u>

The 'no Project' option describes the situation when the decision is made to not implement the proposed Project

8.8.1. Criteria

The below criteria were used to evaluate the 'no protect' and Project alternatives (refer to the left hand column in **Table 60**).

8.8.2. Evaluation of alternatives and selection of the preferred option

Table 60. Comparison of 'no project' option with 'with project' option

	Criterion	'No project' option assessed against 'With project' option
Environmental	Change in air quality (effects of emissions including dust) GHG emissions	Though baseline air quality data is insufficient, it can be assumed that 'no project' option is unlikely to cause adverse change in air quality. The significance of this impact under 'With project' option is minor (corrective action is required)
	Noise and vibration should affect as few local inhabitants and Mine workers as possible	The study results indicate that key noise and vibration sources at the mine site and in the adjacent areas would include operating equipment, vehicle traffic, mobile plant, blasting operations conducted by the Mine and neighbouring plants. It can be assumed that no adverse change would

	Criterion	'No project' option assessed against 'With project' option
		occur. During the processing plant operation crushing and grinding processes will generate noise, vibration and emissions. During the mine closure, the physical impact levels would show a short-term increase followed by a decrease
	Effects on underground and surface water quality and quantity should be minimized	Existing facilities will continue generating impact
	Loss or alteration of natural habitats/ biodiversity should be minimized	No impact or minor impact under 'with project' option
	Need for restoration after the mine closure should be minimised	Restoration would be still needed even if the Project does not go ahead
	Overall footprint area should be reduced as much as possible	Minimal area
Social	Land take (including agricultural lands) should be minimized	No land take required
	Loss of cultural resources should be minimized	No impact (a survey and mitigation actions are required under 'with project' option)
	Creation of jobs, professional growth / training opportunities	No jobs created while the implementation of the Project would provide these favourable opportunities
	Potential hazards for local communities should be minimised	No impact (mitigation is required under 'with project' option)
	Visual and landscape impact should be minimised	No impact, but this impact is considered to be not significant because the mine site is located 5 km away from the nearest residential settlement
Economic	Economic benefits at the national and regional level	No benefits while the implementation of the Project would provide these favourable opportunities
	New development opportunities for small businesses and local communities	No benefits while the implementation of the Project would provide these favourable opportunities

The 'no project' option considers the position if the ore reserves from the Shalkiya site are not used for the purposes of the Project, or for any other commercial enterprises. It assumes that no further development or expansion would take place and the existing baseline situation would remain in its existing state.

The Project site has plant and animal species that could be included in the Kazakhstan Red Data Book (please see section on biodiversity) and some have been identified on occasion within the Project's zone of influence (i.e. saxaul jay) although it is not considered that the Project will have a significant effect on them.

Air quality will not change significantly compared to the baseline conditions and will not cause significant impacts at any nearby sensitive receptors. The nearest settlement, located towards south-east of the Mine is the Shalkiya settlement, especially the northern part of the settlement known as Shalkiya North.

The development of the Project also promotes economic diversification, which can be seen as important in achieving sustained economic growth. Strengthening and diversification of the local economy can also play a role in assisting the region to combat any severe economic difficulties experienced within any one industry. The Project would also be expected to have a positive effect upon supply chain businesses. Producing lead and zinc concentrate in Kazakhstan would offer the potential to further establish trading relationships within the country or with key international markets, in particular China. Enabling the exportation of zinc concentrate will have accordingly, a positive effect on the economy. Not developing the Project would result in the benefits noted above not being realized.

The mine is already a primary employer for many in the immediate vicinity of Shalkiya village and other human settlements. The development of the Project will result in significant job opportunities during the construction phase and approximately 1400 direct new jobs during the operational phase. The Project will provide good quality direct employment and training opportunities for local people as well as other people within the Kyzylorda region. The Project will stimulate secondary economic activity in the form of suppliers and other local service providers that will be supported by the increased income of people working at the Project. As a result of the job creation it is likely that the Project will also encourage inward migration of people into region.

With the ‘no Project’ option, the local residents currently working at the Mine site to restore mine facilities and infrastructure will be unemployed and although the “no Project” options avoids some of the adverse environmental and social impacts, but none of the identified benefits would be realised.

To summarize, the implementation of the Project will provide the following benefits:

- Both temporary and permanent jobs will be created; the former will be provided during the first few years of the construction phase while the latter will be associated with the operation phase when the new enterprise will require about 1400 new employees;
- Development opportunities for Shalkiya village will be greatly improved.
- The Project will increase the national lead-zinc concentrate production by 31% in 2020. The Shalkiya Project will be the third largest producer of lead-zinc concentrates after Kaz Zinc and Kazakhmys.
- A significant improvement in the economic performance of Zhanakorgan district of Kyzylorda region of the Republic of Kazakhstan.
- Shalkiya Project is well positioned from a market opportunity standpoint to supply zinc to China.

The ‘no project’ option will have only minor environmental benefits as the mine already exists and the area around the mine is already transformed. If the Project goes ahead, likely environmental impacts could be carefully managed during the design stage and mitigated during the construction and operation phases through the implementation of the Management Plans developed for the Project. As such the 'no development option' is not further considered.

Summarizing the above, the following alternatives have been selected based on a suite of factors:

- Processing plant location: the new Processing Plant construction based on Option 3 (Figure 71);
- Power supply source: centralized electricity grid operated by the Kazakhstan Electricity Grid Operating Company ;
- Ore haulage method: vertical conveyor selected as a base option; the use hydrotransport continues to be considered;
- Tailings disposal, storage and management: tailings thickening andf use as backfill;
- Waste rock storage: temporary storage of waste rock to be used as backfill material;
- "No project" alternative is not considered further.

9. ENVIRONMENTAL IMPACT ASSESSMENT AND MITIGATION

9.1. <u>The Hazard Properties of Lead</u>

As described variously in this document, lead will be one of the two primary products produced by the mine. Lead constitutes between 0.001 and 0.002% of the earth's crust but has gained notoriety for its potential health effects especially in respect of being used as an anti-knocking agent in petrol (now outlawed in most countries around the world) and in paint. Indeed lead poisoning is one of the most common occupational diseases. As such there are concerns as to the health risks that would potentially be posed by the lead product. The form of the lead that will be produced at the mine is lead sulphide in galena ore (some 85%), which is the primary form of naturally occurring lead, and lead carbonate (some 15%).

A material safety data sheet for lead sulphide highlights some important characteristics. Firstly, the chemical, physical and toxicological properties of lead sulphide have not been thoroughly investigated and recorded. Secondly, and perhaps more importantly, heavy metal sulphides are generally insoluble and as such have little toxic action. The main concern with lead oxide is where it may be heated thus liberating sulphide compounds of which hydrogen sulphide is particularly hazardous from an occupational exposure point of view. Potential health effects of lead carbonate include eye and skin irritation if there is direct contact, gastrointestinal irritation with nausea, vomiting and diarrhoea if ingested and respiratory tract irritation if inhaled.

Given that the processing of lead product at the mine will be purely a physical separation process with no heating or chemical change to the product it is considered here that the lead sulphate product poses no specific hazards but the lead carbonate does. As such it be necessary to ensure that there are strict controls of wind blown lead product from especially the lead product stockpile. The lead stockpile will need to be enclosed so as to prevent mobilisation of the product by the wind and all workers potentially exposed to the product will need to be equipped with suitable personal protective equipment (PPE) including but necessarily limited to:

- Respirators;
- Eye protection; and,
- Skin protection.

On the basis of the dispersion modelling conducted later in this chapter it is highly unlikely that there would be significant transport of lead product away from the mine site to the extent that this would potentially impact on the health of communities in Shalkiya and Shalkiya North. As such the risk posed by lead carbonate is seen to be primarily an occupational exposure risk with the need for apposite controls to minimise worker exposure and thereafter to use PPE. In similar vein the zinc is also a zinc sulphide which is similarly insoluble in water and thus of limited potential health risk. Zinc sulphide is rated as a low to moderate hazard but the major concerns regarding zinc sulphide toxicity are in the event of the product being heated during which time corrosive and/or toxic gases may be produced. There will not be significant heating of the zinc product during the minerals processing and thus the zinc oxide is not expected to introduce undue risk of adverse health effects.

The loss of the product through Aeolian action constitutes an economic loss for the mine and holds the potential to result in negative health effects. As such it is in the best interests of the mine to ensure that there is minimal product loss during product processing, storage, loading and transport and that will also serve to reduce the risk of human health and environmental exposure. At the same time provision will also need to be made for product recovery in the event of an accident that results product being spilled. Shalkiya will need to develop an emergency response that is equal to the risks posed of community exposure and effectively countering the same.

9.2. Greenhouse Gas Emissions and possible impact on the climate change

The total greenhouse gas (GHG) emissions generated in Kazakhstan in 2014 amounted to 283,549.97 thousand tonnes of ***CO_2-eq***. The net GHG emissions after CO_2 removal as a result of land use, land use change and forestry activities were 260,032.07 million tonnes of ***CO_2-eq***[184]. About 80% of GHG emissions in Kazakhstan are generated by combustion processes with power generation facilities accounting for 40.9% of these emissions. Mining industries generate only 4,944.89 thousand tonnes of ***CO_2-eq*** (1.74% of the total).

The Climate Change Coordination Centre (Centre or CCCC) has worked in Kazakhstan since 2002, being the first entity of this type in an NIS country and focusing its activities on promoting the implementation of the UN Framework Convention on Climate Change (UNFCCC). The country maintains a national GHG monitoring and reporting system and a national greenhouse gas inventory. The country also has legislation regulating the industrial sector contribution to the greenhouse gas balance[185]. Kazakhstan regularly submits national reports on

[184] Summary data from the First Biannual National Report on the 2012 RK Emission Inventory based on the electronic tables from the most recent inventory submitted in 2014. Available at: https://unfccc.int/files/national_reports/biennial_reports_and_iar/submitted_biennial_reports/application/pdf/biennial_report_kaz_ru.pdf

[185] http://kazecogroup.kz/ru/content/zakonodatelstvo-reguliruyushchee-vybrosy-parnikovyh-gazov-v-respublike-kazahstan

progress in reducing GHG emissions in line with commitments assumed by the country as a party to UNFCCC[186].

Since 2009, the Kazakhstan Government has focused on the development and implementation of a low-carbon development strategy and establishment of a national emission quota trading system. According to the 2015 National Emission Allowance Allocation Plan (NEAAP), 153 million units were allocated among 166 industries. Under the existing arrangement, emission allowances are allocated free of charge and companies exceeding their emission allowance units are able to purchase emission allowance units required to close the gap through an exchange. National legislation obliges each legal entity emitting GHG to obtain a GHG emission certificate[187].

9.2.1. Actual GHG Emissions from Mining Processes in 2014

The GHG emission accounting techniques and guidelines for fugitive and point sources (vehicles, boilers, metal processing lines etc.) have been developed in line with the international GHG emission assessment practice[188]. The review of available documentation and inspection of the mine site and facilities indicate that the following sources currently generate GHG emissions at the mine site:

- Liquid fuel fired boiler house (KUAT Silver boiler, combustion chamber);
- Fuel and lubricant storage facilities (3 facilities);
- Repair and maintenance shop (gas welding, electric welding, metal processing works);
- Ground motor transport (7 passenger cars with petrol engines and 1 bus with diesel engine);
- Underground transport (7 units including trucks, loading and hauling machines, drilling rig);
- Containerized oil, paint and chemicals storage;
- Sanitary sewage treatment plant (not completed and not commissioned);
- Domestic sewage pond (empty and not operational due to the poor technical condition of the conveying pipeline);

Annual GHG emission reports submitted by the Client only include data for two sources, namely the boiler house and motor transport[189]. The contribution of other sources is minor at this stage when repair works are underway and will be quantified at the operation stage. Data on actual GHG emissions in 2014 is presented in **Table 61**.

[186] National Greenhouse Gas Reduction Commitments Assumed by Kazakhstan

[187] Public Service Standard "Issue and Re-issue of Greenhouse Gas Emission Certificates". Approved by the RK Government Resolution of 3 June 2014 No. 607, Entered on 21 October 2014, 13:58, Modified on 05 November 2014.

[188] Research Assignment Report "Quantify Greenhouse Gas Emissions, Develop Greenhouse Gas Emission Scenarios, Develop the National Kazakhstani Greenhouse Gas Emission Strategy, Facilitate the Establishment of the National Greenhouse Gas Emission Licensing System. Enhance the Greenhouse Gas Emission/Sink Monitoring and Reporting System", KazNIIEK RK MEP, Almaty, 2008.

[189] Greenhouse Gas Inventory Report, Shalkiya Zinc LTD, 2014. Approved on 23.04.2015.

Table 61. Actual GHG Emissions Generated at Shalkiya Mine in 2014

Source	Source Number and Details	Carbon Dioxide Emission, tonnes	Methane Emission		Nitrous Oxide Emission	
			Tonnes	nnes of CO_2**e**	Tonnes	Tonnes of CO_2**e**
Boiler House						
KUAT Silver boiler (combustion)	1 unit	138,9876	004	008	0076	352
Total greenhouse gas emission in carbon dioxide equivalent tonnes			),2308			
Motor Transport						
Underground transport	7 units (with diesel engines)	279,40759	0036	0763	0036	5796
Ground transport	7 units (with petrol engines)	69,0918	0079	165	0008	541
	1 unit (bus with diesel engine)	3,8976	00005	001	00005	036
Total emission from all transport sources in carbon dioxide equivalent tonnes		352,3970	01154	243	00445	156
Total GHG emission from all transport sources in carbon dioxide equivalent tonnes		352,7369				
Total Emission from all Sources						
Total GHG emission from all sources in carbon dioxide equivalent tonnes		491,7				

As can be seen from the Table above, the total amount of GHG emissions currently generated by all sources is **491.7 t CO_2-eq**. The amount of GHG emissions is expected to grow as construction proceeds, mining operations expand and processing plant becomes operational.

The analysis and quantification of the GHG emissions and contribution to the global greenhouse gas balance should take account of the carbon dioxide sequestration potential of the project area.

The Shalkiya Mine is located in the area where the natural ecosystems have extremely low carbon sinking capacity[190]. Due to a thin humus layer and low biological productivity, local landscapes and vegetation cover absorb only about 0.5 kg/ha CO_2 per year. The Mine's land and mining allotments comprise land designated for various purposes (industry, transport, agricultural land etc.) and the area's carbon-sinking capacity is estimated to be **at or below 75 kg CO_2** with little or no capacity to increase this.

9.2.2. Impact Assessment – Climate Change

Climate change is a hugely important global environmental threat and as such the receptor sensitivity must be viewed as ***very high***. Against that backdrop and in the national context, however, the overall contribution of greenhouse gases emissions from the proposed expanded mine and processing plant is relatively small. To illustrate the point the contribution of the mine is currently less than a

[190] http://biology.krc.karelia.ru/misc/atl/ra23b.htm

thousandth of a percent of the total greenhouse gas emissions for Kazakhstan and is way below the typical reporting thresholds of international lenders. As such, the impact magnitude is considered to be ***negligible*** and impact significance accordingly considered ***slight***. It should be borne in mind that the current greenhouse gas accounting here does not include off site electricity generation, which is also a source of greenhouse emissions, albeit indirect, but it seems unlikely that the indirect emissions would materially change the significance rating presented here. It must, of course, be recognized that during the transition to full-scale operation, the Company will be required to acquire greenhouse gas emission quotas, if their annual emissions will exceed 20,000 tonnes of dioxid carbon.

9.2.3. Greenhouse Gas Emissions Mitigation

To meet the national legislation and IFC requirements, the Mine should develop a Greenhouse Gas Management Plan, to be continuously updated to take account of each Project development stage (construction, operation, and decommissioning) and launch of new Project facilities contributing to GHG emissions. This Plan has to include the following indicators:

- Carbon financing (already addressed in terms of Kazakhstan legislative requirements);
- Maximising energy efficiency and associated planned GHG reduction targets. Conducting energy audits to ensure energy savings;
- Reducing GHG emissions through the use of modern vehicles and mobile plant with reduced GHG emission levels.
- Protection and enhancement of sinks and reservoirs of greenhouse gases (although as explained there are very limited options for this approach in the Shalkiya area); and,
- Promotion, development and increased use of renewable forms of energy.

9.3. Impacts on Ambient Air and Mitigation

9.3.1. Overview

A key environmental concern for the proposed mine expansion is the effect the mine will have on prevailing air quality. In order to assess this potential impact, ambient air pollution concentrations were modelled using a Gaussian air pollution dispersion model known as AERMOD, which is an internationally recognized US EPA Regulatory Model. The model requires two broad inputs namely air emissions (sources) and the atmospheric dispersion characteristics of the area and then as a function of the two inputs computes ground level (ambient) concentrations of the emitted pollutants. The predicted ambient concentrations can then be compared to defined regulatory limits to assess the potential impacts on the environment with a particular focus on human health risk.

9.3.2. Emissions Data

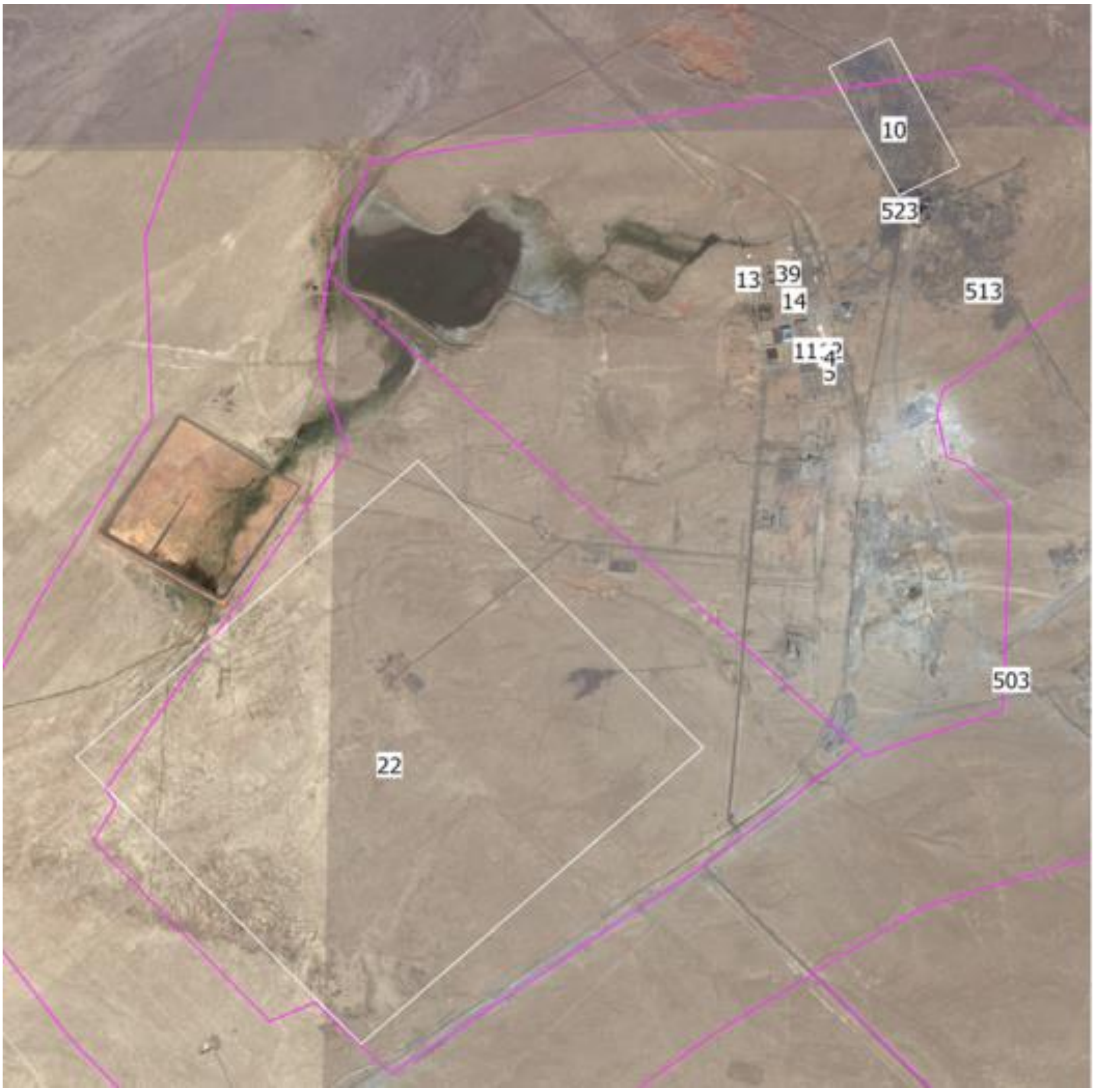

Figure 71: Map of the mining complex showing the different sources of emissions

Air emissions from the proposed mine expansion were determined by characterizing the nature of the facilities and activities and then using emission factors derived from the Australian National Pollutant Inventory, Emission Estimation Technique Manual for Mining (Version 3.1, Commonwealth of Australia, January 2012). Some 18 potential sources were identified as shown in (**Figure 72**), where the black numbers in white rectangles are the source references. Although there are a variety of potential emissions from the proposed mine including sulphur dioxide, nitrogen oxides and carbon monoxide the assessment has been focussed only on particulate matter (dust) as this is deemed to be the only significant emissions source from the mine that may lead to significant environmental impacts. Different dust size fractions were considered namely total suspended particulates (TSP) and then dust sizes less than 10 (PM_{10}) and 2.5 ($PM_{2.5}$) micron.

As part of the source characterisation process emissions from the tailings area (by far the largest source) was also refined to deal with the fact that the emissions are at their maximum during high wind speeds but it is also under those same conditions that dispersion is at its greatest. Similarly, under low wind speed conditions the emissions are at their least but the dispersion is at its poorest. Failure to address this issue would result in an unrealistic over prediction of the ambient concentrations. In addition, corrections were also made for the climatic conditions that prevail during the year such as the tailings dam being covered in snow for 4 months of the year and so forth. These corrections notwithstanding, emissions from the tailings dam, still have levels of uncertainty. The emissions used in the dispersion modelling are summarised in (**Table 62**) together with other characteristics of the source. The reference numbers in the table match those in **Figure 71.**

9.3.3. Receptor Areas

To facilitate interpreting the model outputs the mine area was divided into receptor areas namely ‘north, west, neighbourhood, tailings, south, south east, northern part of Shalkiya settlement (Shalkiya North or former Pioneer settlement), north east and production area’ as shown in **Figure 72**. The small settlement at Shalkiya North (former Pioneer settlement) is obviously a key concern as an off site community that could be affected by emissions from the mine. Topographic data were obtained to detail the relief of the receiving environment so that the relative heights of the sources and the receptors are considered in the modelling.

Figure 72: Map showing demarcation of receptor areas

Table 62. Emission sources used as inputs to the dispersion modelling

Operation and EM#	Number	Type	TSP (tpa)	PM10 (tpa)	PM2.5 (tpa)	TSP g/s	PM10 g/s	PM2.5 g/s	Hours/ year	Height, m	Diameter, m	Airflow m3/s	T, oC
Con trans pt EM-05	5	Area	6.00	2.20	0.00	0.18	0.06	0.00	8147	2			20
Con trans pt EM-06	6	Linear	6.00	2.20	0.00	0.12	0.05	0.00	5694	2			20
Mat hand waste rock EM-10	10	Linear	0.35	0.16	0.02	0.01	0.01	0.00	8760	2			20
Mat hand ROM EM-11+12	1112	Area	7.73	3.65	0.55	0.23	0.11	0.02	8147	2			20
Con trans pt at ore bin EM-13	13	Area	6.62	2.43	0.00	0.20	0.07	0.00	8147	2			20
Crushing EM-14	14	Point	18.53	7.72	0.00	0.55	0.23	0.00	8147	46	1	10	20
Tailings wind erosion EM-22	22	Linear	400.19	200.10	80.04	12.69	6.34	2.54	8760	2			20
Loading con trans pt EM-39	39	Linear	0.38	0.14	0.00	0.01	0.00	0.00	8147	2			20
Con trans pt EM-04	4	Point	6.00	2.20	0.00	0.18	0.06	0.00	8147	10	2	50	20
Blast hole drilling EM-50	501	Point	1.44	0.75	0.75	0.05	0.02	0.02	8760	10	2	50	20
Blasting EM-50	502	Point	5.90	3.07	0.18	0.19	0.10	0.01	8760	10	2	50	20
Crushing EM-50	503	Point	10.15	4.34	0.00	0.32	0.14	0.00	8760	10	2	50	20
Blast hole drilling EM-51	511	Point	1.44	0.75	0.75	0.05	0.02	0.02	8760	10	2	50	20
Blasting EM-51	512	Point	5.90	3.07	0.18	0.19	0.10	0.01	8760	10	2	50	20
Crushing EM-51	513	Point	10.15	4.34	0.00	0.32	0.14	0.00	8760	10	2	50	20
Blast hole drilling EM-52	521	Point	1.44	0.75	0.75	0.05	0.02	0.02	8760	10	2	50	20
Blasting EM-52	522	Point	5.90	3.07	0.18	0.19	0.10	0.01	8760	10	2	50	20
Crushing EM-52	523	Point	10.15	4.34	0.00	0.32	0.14	0.00	8760	10	2	50	20

9.3.4. Meteorological Input Data

Meteorological data is prepared using a processor called AERMET that combines hourly time series surface meteorology and the vertical (upper air) profiles obtained twice a day by radiosonde at 0 and 12 GMT. Surface meteorology was sourced from Shieli station (WMO 38069) namely, wind velocity (at 10 m above ground level), air temperature cloud cover and height. Radiosonde data were sourced from KyzylOrda station (WMO 38064) for 2014. Additionally, AERMET uses the surface cover parameters roughness, albedo and Bowen ratios, which are, are key determinants of atmospheric dispersion and these are processed together with the meteorological data. Correct meteorology is crucial for dispersion modelling, so the meteorological output from AERMET has been critically reviewed to ensure that it is a valid representation. Wind velocity characteristics for the site that have been used in the dispersion model are shown in **Figure 73**.

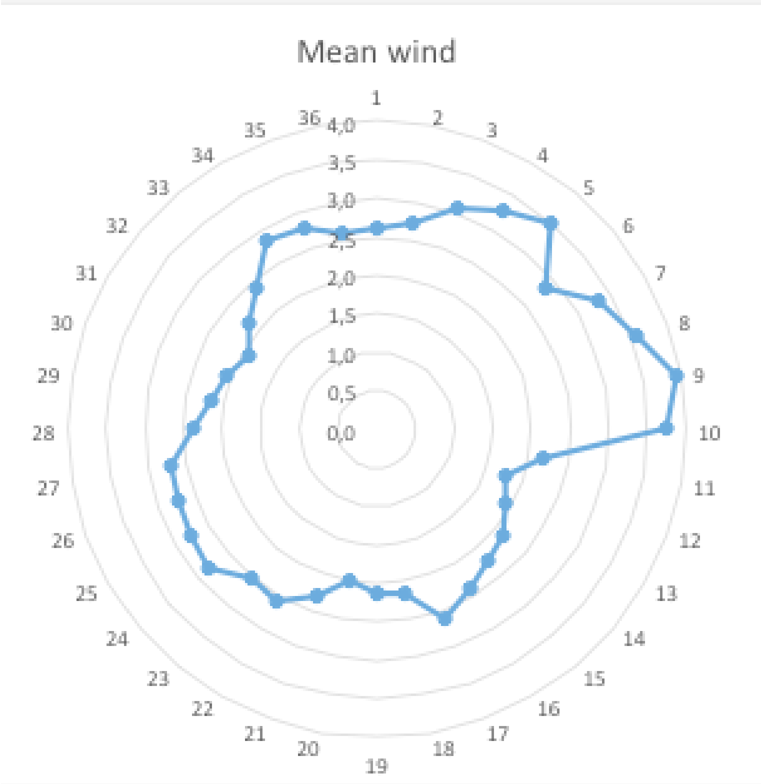

Figure 73: Wind velocity characteristics derived from the AERMET processor and that have been used as input into the dispersion model

In the absence of a state weather station near the Mine site, air dispersion modelling estimates and short-term ambient air quality forecasts for the adjacent residential areas could be refined using an automatic weather station were it available at the Mine site. However, the installation of an automatic weather station that could be integrated in the existing monitoring network maintained by KazHydroMet is currently not an option for the Mine for economic reasons. Nonetheless, for the Mine it is worth considering a less expensive professional weather station capable of automatically measuring temperature, wind direction and speed, moisture, precipitation etc.[191]

9.3.5. Ambient Air Quality Limits

Once the dispersion model has predicted ambient air quality it is then necessary to compare the predicted values with defined air quality limits or reference concentrations. Limit values are concentrations that serve to define (as a function of typically human health based responses) tolerable ambient concentrations. For the purposes of this assessment, the ambient air quality limits of the World Health Organization (WHO) have been used as reference concentrations. The WHO limits form the basis of many defined air quality standards around the world and indeed are used by the IFC of the World Bank. The WHO ambient air quality guidelines do not however include limits for all referencing periods and so additional limits have been included in the assessment to ensure that there is a reference concentration for all the averaging periods for all the pollutants considered in this assessment. These reference values are shown in **Table 63**. Ambient quality standards for particle matter from different authorities, µg/m3.

Table 63. Ambient quality standards for particle matter from different authorities, µg/m^3

Pollutant, averaging period	Authority, year			
	IFC, 2007a	WHO , 2005 b	Russia, 2010 d	U.S. EPA, 2012 f
TSP 1hr			500	
TSP 24hr			150	150 h
TSP year			75	60 g
PM10 1hr			300	
PM10 24hr	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)	50 c	60 e	150 i
PM10 year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)	20	40	50 k
PM2.5 1hr			160	
PM2.5 24hr	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)	25 c	35 e	35 j
PM2.5 year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)	10	25	15 k

[191] A professional weather station like Coastal Environmental Systems WeatherPak-2000, Davis Vantage Pro 2 – 6152 or other type

[a] IFC Environmental, Health, and Safety Guidelines, 2007
[b] Air Quality Guidelines, Global Update 2005
[c] Not to be exceeded more than 3 days per year
[d] [RF]
[e] 99% quartile
[f] [EPA]
[g] Annual geometric mean
[h] Not to be exceeded more than once per year
[i] Not to be exceeded more than once per year on average over a 3-year period
[j] 98th percentile, averaged over 3 years
[k] Annual arithmetic mean, averaged over 3 years

9.3.6. Configuring the Dispersion Model

Dispersion models can be configured in many different ways and it is beyond the remit of this assessment to present in detail how the model was configured for this study other than to highlight a few important parameters. An important part of the configuration is defining a receptor grid namely the points at which the model will provide calculated ambient air quality concentrations. The receptor grid around the mine complex covered an area of 100 km2 (10 x 10 km) which was divided into ~1000 receptor cells at a resolution of 350 m each. AERMOD was used with the following options.

- Hours with wind speed less than 1 m/s were excluded, as recommended by EPA.
- Topography was taken into account;
- Dust settling was taken into account;
- As a non-regulatory option, wind speed corrections were applied where required; and
- Wet scavenging was not taken into account because it was deemed not applicable to this arid region.

In the latest version of AERMOD there is an option to apply a correction factor for low wind speeds. Although this is still an experimental option the decision was made to run the model both with and without the low wind speed correction option and to present as a final output the geometric mean of the two. This approach was deemed to provide the least amount of uncertainty in the predictions, recognizing that dispersion models always have some degree of error. The area around the mining complex is relatively flat but further east is a ridge of ~200 m higher than the mining complex. Such a ridge would affect a plume from the mine and so this was taken into account in the modelling. Dust settling, viz the rate at which dust 'falls out' of the atmosphere was also considered for the different particle size fractions with the larger particles obviously settling in closer proximity to the source than the smaller particles.

9.3.7. Model Predictions

The predicted ambient concentrations are presented in two ways in the sections that follow. Firstly, the predicted concentrations at each grid point have been averaged for the receptor areas that were defined (**Figure 72**). These receptor area averages are shown for annual, daily and hourly concentrations in **Table 64, Table 65,** and **Table 66,** respectively, relative to the strictest limit values presented in **Table 63**. It can be seen from the tables that there are no predicted exceedances of limit values for any of the receptor areas. The highest average concentrations are shaded in the tables for ease of reference.

Table 64. Predicted annual average concentrations for the three dust fractions by region (in µg/m³)

	TSP	PM_{10}	$PM_{2.5}$
Strictest limit value	75	20	10
North	0,28	0,12	0,031
West	0,4	0,18	0,074
Neighbourhood	2,6	1,2	0,27
Tailings	5,3	2,6	1,2
South	0,61	0,25	0,1
South-East	0,34	0,15	0,039
Shalkiya North	0,78	0,28	0,093
North-East	0,087	0,044	0,0089
ProductionArea	**6,2**	**3**	**0,47**

Table 65. Predicted maximum daily average concentrations for the three dust fractions by region (in µg/m³).

	TSP	PM_{10}	$PM_{2.5}$
Strictest limit value	**150**	**50**	**25**
North	4,2	1,9	0,44
West	5,1	2,3	1,2
Neighbourhood	26	12	3,2
Tailings	44	21	10
South	7,1	2,8	1,6
South-East	5,1	2,3	0,75
Shalkiya North	9,8	4	0,95
North-East	1,7	0,84	0,3
Production Area	64	31	5,4

Table 66. Predicted maximum hourly average concentrations for the three dust fractions by region (in µg/m³).

	TSP	PM_{10}	$PM_{2.5}$
Strictest limit value	500	300	160
North	16	7,8	3
West	18	8,3	5,2
Neighbourhood	78	36	11
Tailings	100	48	25
South	22	10	6,2
South-East	18	8,6	3,7
Shalkiya North	23	8,6	3,8
North-East	11	5,3	2,7
Production Area	190	92	20

The second way in which the modelling results have been presented is to show the individual concentrations at each of the grid points. This form of presentation is shown on maps in **Figure 74, Figure 75,** and **Figure 76** for annual average, maximum daily average and maximum hourly average values, respectively. It should be noted that this form of presentation must be interpreted carefully as the maximum grid point concentrations do not necessarily occur at the same time for the daily and hourly averaging processes. In other words, the maximum concentrations shown at each point are the highest concentrations for that point at any time of the year. The receptor points are colour-coded to show the predicted concentrations as a percentage of the relevant limit values.

9.3.8. The Results

The highest predicted concentrations are seen for $\mathbf{PM_{10}}$ in the Production Area. This receptor area has the highest daily average concentrations at 62% of the strictest limit value (**Table 63**) and individual receptors that are up 3.3 times the limit value (**Figure 75**). The area of exceedances is some 1 km2, with a smaller area of exceedances covering some 0.5 km2 at the southern edge of the region. Maximum hourly values for $\mathbf{PM_{10}}$ are somewhat less intense where exceedances are evident at the same point but with a smaller spatial area and exceeding the limit value by some 2.5 times (**Figure 76**). The predicted annual ambient PM10 averages have a single exceedance point with a value that is some 2.1 times the limit value. Elevated concentrations of $\mathbf{PM_{10}}$ are also evident in the “Tailings” area although no exceedances are predicted of the limit value (**Figure 74**).

Predicted **TSP** concentrations are also seen to be relatively high in some areas, also in the production area specifically with the maximum daily average concentrations of 43% of the limit value being evident (**Table 63**). Individual receptors are seen to be some 5 times the limit value also in the production area (**Figure 75**). In general, the areas in which exceedances of the limit values for TSP are evident are spatially smaller than for $\mathbf{PM_{10}}$ at some 0.5 km^2. The maximum predicted hourly average concentrations are seen to exceed the limit values for an area of some 0.3 km2, although again predicted values are seen to be up to 5 times the limit values at individual receptors (**Figure 76**). Predicted annual average values are considerably lower relative to the limit value with only a single exceedances point where the predicted concentration is some 1.5 times the limit value (**Figure 74**).

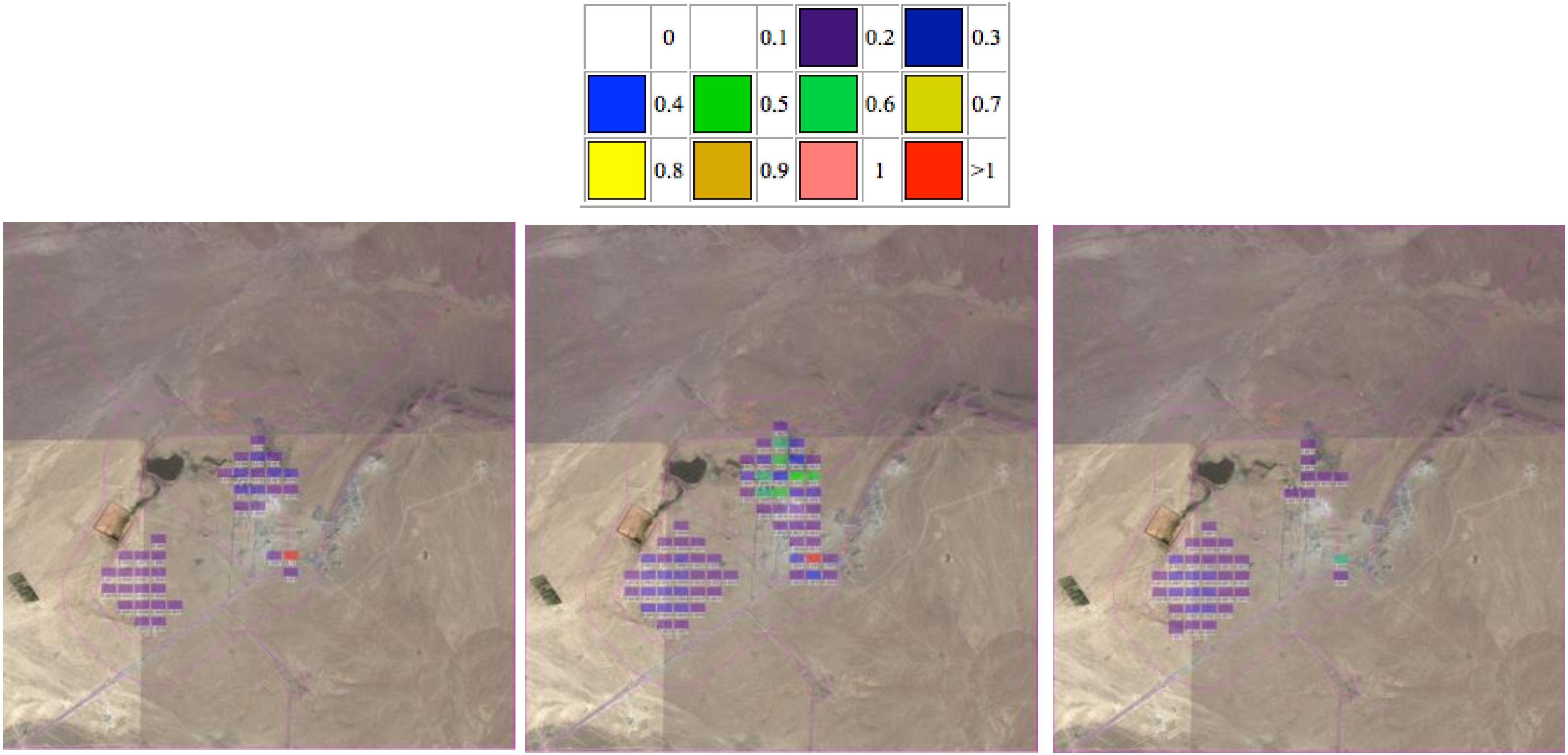

Figure 74: Predicted <u>annual</u> average concentrations for TSP (left), PM_{10} (middle) and $PM_{2,5}$ (right).

The colour coding at the top of the picture indicates the predicted concentrations as a percentage of the relevant limit value and where the limit value is predicted to be exceeded.

	0		0.1		0.2		0.3
	0.4		0.5		0.6		0.7
	0.8		0.9		1		>1

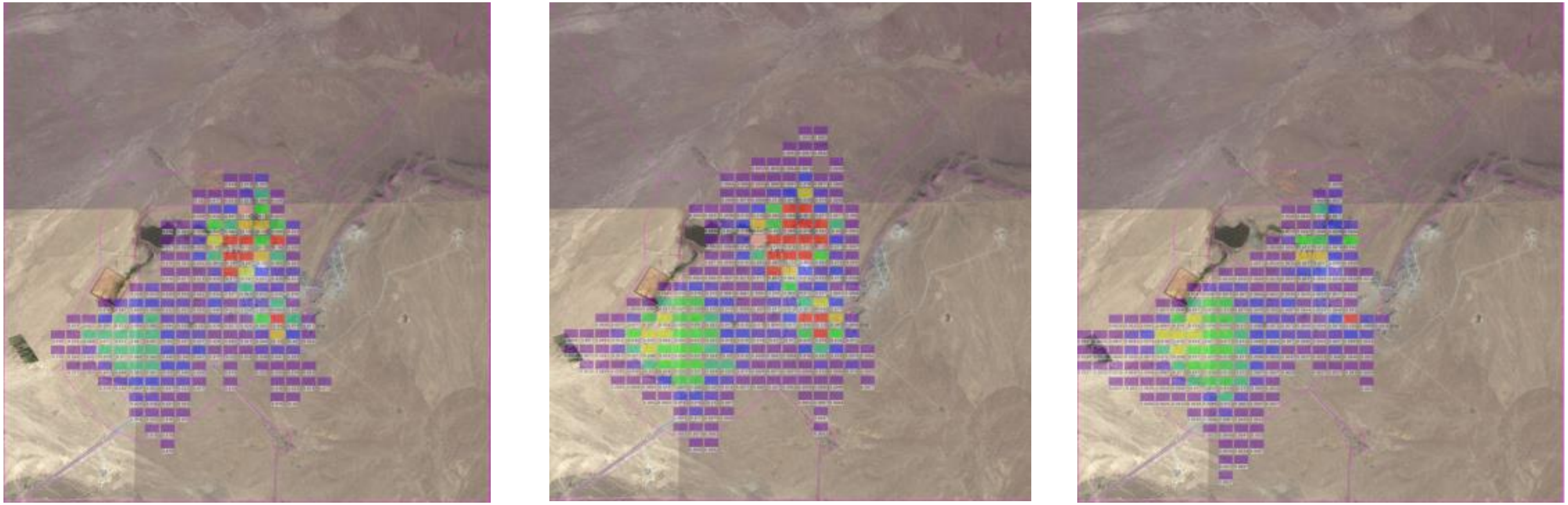

Figure 75: Predicted maximum <u>daily</u> average concentrations for TSP (left), PM$_{10}$ (middle) and PM$_{2,5}$ (right).

The colour coding at the top of the picture indicates the predicted concentrations as a percentage of the relevant limit value and where the limit value is predicted to be exceeded.

	0		0.1		0.2		0.3
	0.4		0.5		0.6		0.7
	0.8		0.9		1		>1

Figure 76: Predicted maximum <u>hourly</u> average concentrations for TSP (left), PM_{10} (middle) and $PM_{2,5}$ (right).

The colour coding at the top of the picture indicates the predicted concentrations as a percentage of the relevant limit value and where the limit value is predicted to be exceeded.

9.3.9. Impact Assessment – Air Quality

Predicted **$PM_{2.5}$** concentrations follow a similar pattern to that seen for **TSP** but here the focus is in the tailings receptor area which has daily average concentration at 40% of the limit value (**Table 65**) and individual receptors up to twice the limit value although these receptors are in the production receptor area (**Figure 75**). Maximum hourly concentrations are seen to have 2 exceedances points in the production receptor area where the predicted values are slightly above the limit value and an area mean value of 16% of the limit value in the tailings area (**Table 66**). Predicted annual average **$PM_{2.5}$** concentrations are even lower with individual grid points being no more than 30% of the limit values (**Figure 74**).

For the mining area as a whole the maximum predicted daily averages are the highest relative to the limit values for **TSP, PM_{10} and $PM_{2.5}$.** The lowest predicted concentrations relative to the limit values are the annual averages. It is also clear that the production area is the area with the highest concentrations relative to the limit values followed by the tailings area. In respect of the tailings the average concentrations for the entire area are the highest of all the areas for **$PM_{2.5}$.**

The overall assessment is one where receptor sensitivity must be seen as ***very high*** because of the fact that degraded air quality can result in human morbidity. However the impact magnitude is considered to be no more than ***moderate*** given the relatively localised extent of the receptors, which have exceedances of the limit values predicted. It should also be noted that where the limit values are those of the WHO, provision is made for interim target values that are less strict than the guideline value (which were used as the basis of the assessment as a 'worst case' assessment. This implies an overall impact significance of ***large***. The impact significance is however driven more by the receptor sensitivity than by the impact magnitude. Control of dust emissions, as detailed below in 9.2.10, would serve to reduce the impact magnitude to ***minor*** and overall impact significance to ***moderate.***

The closest residential area is a former Pioneer settlement known as Shalkiya North in Tables 51 to 55. There are 12 households living in this settlement. The results of the dispersion modelling indicate predicted concentrations that are less than a few percent, i.e. a very small proportion, of the strictest limit values. As such although the receptor sensitivity would remain ***very high*** (as a result of human morbidity risk) the impact magnitude would be ***negligible*** implying impact significance of ***slight***. That notwithstanding it is still incumbent on the mine to implement the mitigation measures detailed in Section 9.2.10.

9.3.10. Dust Control Mitigation

- Dust suppression techniques (e.g. use of all weather surfaces, use of agglomeration additives) for roads and work areas, optimization of traffic patterns, and reduction of travel speeds. Please note that the water scarcity in the area means that water spraying for dust suppression cannot be considered as a dust mitigation option at the production sites, however, using water is the only option for dust suppression on the roads. Water from the mine water pond could be used for this purpose;
- Exposed soils and other erodible materials (such as banks of the TSF, slopes of waste rock stockpiles) should be revegetated or covered promptly using a clay or polymer clay lining;

- New areas of topsoil cover should be cleared and opened-up only when absolutely necessary;
- Disturbed land surfaces should be re-vegetated or otherwise rendered non-dust forming when inactive;
- Storage for dusty materials should be enclosed or operated with efficient dust suppressing measures;
- Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind;
- Transportation of marketable fine zinc and lead concentrates should be carried out in packed form in order to avoid dusting during loading to and unloading from railway cars;
- Conveyor systems for dusty materials should be covered and equipped with measures for cleaning return belts.

Should elevated concentrations manifest as predicted for the most contaminated parts of the production area, then PPE will have to be issued to ensure that worker exposure is kept below health based thresholds.

9.4. Impact on Local Topography

9.4.1. Assessment

Although changes in topography can sometimes be an important impact that is not believed to be a significant impact for Shalkiya. In the first instance, the general terrain is massively homogenous and extends for hundreds of square kilometres. As such, the receptor sensitivity to the changes in landscape is considered to be ***low***. At the same time, the visual impact on the topography has already happened to a large extent as a result of the previous and existing mine operation, for example the large dam that has been created for the pumped mine water pond is a substantial change to the area. The topography of the area will be further changed by the waste rock stockpile but more importantly by the tailings dam that will be created and which will have a footprint area of 1.87 to 3.4 km^2 (under different design options) and 32 m high at it’s highest point on the south side. The impact magnitude in this case is deemed to be ***negligible*** because the new topographic features will occur in an area where there is a visual impact from the already existing mine infrastructure. This implies an impact significance of ***slight***.

9.4.2. Local Topography Impact Mitigation

- All earthworks should be performed strictly in line with the design provisions and within the boundaries of allocated construction sites;
- No unauthorized access roads should be allowed within the industrial site and in the adjacent areas during the construction, commissioning and operation phases; and
- In order to reduce the areas needed for waste rock dumping the option of disposing of overburden in the mine voids is to be investigated during design works and if feasible implemented in the mining process.

9.5. Impact on Soil

9.5.1. Assessment

High risk environmental aspects that pose a risk to soil in and around the mine complex are land transformation and spillages. By land transformation is meant that the land is changed and so no longer retains its original use or function and from that point of view is 'lost' as a resource. Spillage risk derives from the use and handling of hazardous materials that are used during the mining operation and associated activities with hydrocarbons (fuels, oils and grease), and final product especially lead. Spillage of these materials would result in contamination of the soil and a large-scale spill could also potentially result in a potential threat to underground water.

The risk of significant soil contamination can occur if the tailings dam fails or is damaged due to floodwater. In this case, tailings could be released down the slope terrain. This risk exists not only during mine operations, but also during the mine's post-closure period. This risk must be considered when developing the mine site closure and remediation plan. A similar, yet less significant risk lies in the potential failure of the mine water and treated sanitary wastewater dams. The sensitivity of soil as a receptor sensitivity is low because of the vast homogeneity of soils across the steppe but impact magnitude would be moderate because of the large scale of the dams, especially the tailings dam resulting in an impact significance of ***slight***. In this case, however, the impact is considered to be ***unlikely*** if the design of the dams follows good practice principles for ensuring dam stability.

According to the requirements of national legislation and the IFIs, it is necessary to store the removed topsoil so that it can be used later for the landscaping and restoration of disturbed areas. However, as described the baseline analysis section, the soil conditions in and around the mine have a very thin layer of topsoil and low fertility. As such, it should be recognized that the storage of topsoil is unlikely to be practical and the possibility of returning the soil productivity to what it was pre mining is highly unlikely. Immediate use of the removed topsoil for planting the mine site is seen as a preferred option.

The land areas that will be affected by the mining activities are unlikely to be reversible (except over the very long term). Because of the nature of the soil and the massive homogeneity across the area of the mine, the receptor sensitivity is considered to be ***low***. Impact magnitude would have to be considered to be moderate because of the long period of time that would be needed for the soil to recover, but the relative scale of the disturbance given the expanse of the area would be relatively ***minor*** and as such the impact magnitude is considered to be ***slight***.

Potentially hazardous materials that will be used in the mining and processing operations are listed in **Table 67**. The risk exists that these materials could be spilled during mining and ore processing operations and again, although the receptor sensitivity would be low because of the large homogeneity of the soils, the impact magnitude could be moderate and this would result in an impact significance of slight. Good practice measures to ensure that these materials are safely managed during transport, storage, handling, use and final disposal would serve to reduce the likelihood of the impact magnitude especially the scale of the spill. These measures would need to be supplemented by engineering controls for containing a spill should it happen. Finally, small-scale spills are always possible and as such it will be necessary to ensure that there are adequate countermeasures in place for recovering and remediating a spill and ensuring that any contaminated soil is either treated or safely disposed. Given the quantities of materials involved and the assumed implementation of control measures the impact magnitude of potential spills is considered ***minor*** and this would imply an impact magnitude of ***slight.***

At the same time contamination of soil by lead and zinc product has to be considered as well. Given the controls that will be implemented by Shalkiya on controlling product loss it is not considered that product loss under normal operating circumstances will pose a significant risk to soil quality. If, however, there are upset conditions, especially off-site transport accidents, there could be a large spill of product and Shalkiya needs to make provision for such an eventuality. Shalkiya must develop a spill contingency and countermeasures plan for spilled product to ensure that this is cleaned up as quickly as possible.

Table 67. List of potentially hazardous materials required for the mining operation

Material	Approximate quantities	
Hydrocarbon fuels	3,447.30	m^3/annum
Lubricants	101,325	L/annum
Lime	15	tonnes/annum
Xanthate	2	tonnes/annum
Floatation reagent Aerophine/Aerofloat	200	tonnes/annum
Na_2S	1,2	tonnes/annum
$ZnSO_4$	2,4	tonnes/annum
$CuSO_4$	3,76	tonnes/annum
NaCN	280	tonnes/annum
Frother	440	tonnes/annum
Flocculent	279	tonnes/annum

This assessment should not be viewed as a reason to view soil conservation as a trivial issue and every effort must be made to conserve or improve soil and to minimize disturbance of the soil to the smallest spatial area possible. Despite the large expanse of homogenous soils, the soils themselves are sensitive to impact and are very difficult to remediate.

9.5.2. Soil Impact Mitigation

- Establish hazardous materials management priorities based on hazard analysis of materials (see Annex 1);
- Prevent uncontrolled releases / spills of hazardous materials to the environment using engineering controls (containment, automatic alarms, and shut-off systems) commensurate with the nature of hazard;
- Implementing management controls (internal management procedures, inspections, communications, training, and drills) to address residual risks that have not been prevented or controlled through existing engineering measures;
- The mine must develop a hazardous materials management programmed commensurate with the potential risks present. The main objective of the hazardous materials management programmed should be the protection of the workforce (OHS) and the prevention and control of releases and accidents. These objectives should be addressed by integrating prevention and control measures, management actions, and procedures into the mine's day-to-day business activities;
- Develop hazardous materials management procedures including emergency response to accidental spills (spillage containment) and

appropriate remediation measures for contaminated areas (removal and disposal of contaminated soil at a specialised landfill); and

- Develop a sodium cyanide management procedure including safe cyanide handling arrangements, OHS rules for the Mine staff, cyanide monitoring in air in work areas and in water at the tailings storage facility.

9.6. Impacts on Ground Stability

9.6.1. Assessment

The development of the Shalkiya Mine and mining operations are expected to cause a large-scale impact on subsoil and ground stability. The estimated life of the Mine is 36 years and during this period, the North Western and South Eastern sections will be mined using a series of both existing and planned shafts.

The mining methods to be used depend upon the spatial geometric configuarion of ore bodies, estimated ore losses, and occupational health and safety requirements to be met during mining operations. Several mine development options are being considered to ensure that mining waste (overburden, host rock, and tailing waste) is used as much as possible to minimize the risk of rock collapse and utilize underground voids for waste rock and tailings disposal.

It is quite often that the underground mining operations are planned with no provision for using backfilling. As a result long-term and large-scale underground mining inevitably entail deformation and discontinuity of the rock mass. As the mining operations go deeper, and the void size increases, such movement may reach the surface and manifest as surface subsidence.

The following factors affect the form, nature and parameters of movement of the rock mass and the ground surface during underground mining:

- shapes and dimensions of the mined-out space
- mining depth
- dip angles of ore bodies and host rocks
- physical and mechanical properties of ores and rocks
- the mining methods
- the water content of the deposit.

Thus, developing the Shalkiya deposit will result in discontinuity of the rock mass due to extraction and drainage of the ore field, which will have an adverse effect on ground stability. This impact would potentially manifest as a risk of accidents caused by rock collapse and a loss of integrity of both the underground and surface structures, especially where the surface structures are located above the significant deformation zones. Such accidents were they to occur could result serious consequences for human health and safety, as well as potential financial damage due to the collapse of underground and surface structures, mobile plant and equipment. The receptor sensitivity is therefore considered to be ***very high*** as loss of life and serious injury could result. The impact magnitude can be assessed as ‘moderate’ with impact significance being accordingly ‘large’.

This issue is fundamentally one of mine health and safety and every effort must be taken to reduce the risk of rock falls, flooding or other hazards that could result in loss of life or serious injury among the mine staff. Major earth/rock movement can be prevented using the mitigation detailed below which would serve to render fatality or serious injury ***unlikely*** and reduce the residual impact significance to ***slight.***

9.6.2. Ground Stability Impact Mitigation

- Strictly comply with mine development systems as approved by design decisions;
- Plan, design and conduct underground excavations such that geotechnical risks are appropriately managed throughout the entire mine cycle.
- Apply additional safety requirements to address seismicity and extreme natural events.
- Conduct monitoring and regular review of geotechnical stability data of the rock
- Conduct accurate assessment of worksite safety from rockfall particularly after seismic events and blasting activities. Risks should be minimized by appropriate stope design,
- Modern topographical 3D deformation measurements and related specific processing and evaluation software should be the standard method for stability monitoring.
- Maintain necessary emergency response and rescue equipment; and
- Ensure sufficient number of first aid trained employees to respond to emergencies.

9.7. Radioactivity

9.7.1. Assessment

The Shalkiya ores and rocks may have naturally elevated radioactivity levels. The potential likelihood of this factor requires careful assessment, especially considering the fact that Zhanakorgan district has a large uranium deposit (North Khorasan).

If ores and rocks have elevated radioactivity levels, they could potentially carry the risk that the natural radionuclides may contaminate the environment and work areas and thus pose health hazards. To assess these risks, an assessment of ores and rocks using the regulated radioactivity parameters is required, to include at least the exposure dose rate and specific effective activity.

Because no direct field data have been provided to determine the specific radioactivity of natural radionuclides present in rocks and ores at the Shalkiya deposit, while only limited number of ore samples have been tested (**Table 39**), the effective specific activity can be estimated using the gamma-logging results. Gamma logging measures the gamma-radiation exposure dose formed by contributions of various natural radionuclide sources. In the absence of data on the individual contribution (activity) of each of these sources, the effective specific activity of mined rocks ($A_{eff.}$) can be estimated by following the instructions[192] [193] and using the following relationships:

$$\boldsymbol{A_{eff.}} = \boldsymbol{A_{Ra}} + 1{,}3 \times \boldsymbol{A_{Th}} + 0{,}09 \times \boldsymbol{A_K}, \text{ Bq/kg}$$

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[192] Gamma-Logging Instruction for the Reconnaissance and Exploration of Uranium Deposits. – Moscow, 1982

[193] Temporary Methodological Guidance on the Radiation Safety Assessment of Mineral Deposits during the Geological Exploration of Building Material Deposits. VNIIGeolNerud, 1986

$\boldsymbol{A_{eff.}} = (\boldsymbol{I \times A^{I}_{U(Ra),\,Th,\,K}}) \,/\, (\boldsymbol{K_0} \times 100\%)$, Bq/kg

Where $\boldsymbol{A_{Ra}}$ and $\boldsymbol{A_{Th}}$ are specific activities of $\boldsymbol{^{226}Ra}$ and $\boldsymbol{^{232}Th}$ in equilibrium with other members of the uranium and thorium family, Bq/kg; and $\boldsymbol{A_K}$ is a specific activity of $\boldsymbol{^{40}K}$, Bq/kg;

I – gamma-radiation exposure dose ($\boldsymbol{MD_{ex.}}$) measured along the well axis (**4π**-geometry) using a specified type of equipment, μR/h;

$\boldsymbol{A^{I}_{U(Ra),\,Th,\,K}}$ is radioactivity of 1 gram of radionuclide ($\boldsymbol{A_{Ra}}$ = 3,7×10^{10} Bq/g; $\boldsymbol{A_U}$ = 12,58×10^3 Bq/g; $\boldsymbol{A_{Th}}$ = 4,07×10^3 Bq/g; $\boldsymbol{A_K}$ = 31,45 Bq/g);

$\boldsymbol{K_0}$ – conversion factor used to express the gamma-radiation intensity as a content of radionuclide in μR/h per 0.01% of the equilibrium mixture of uranium (170), thorium (76,5), and natural potassium (340 × 10^{-4}) using a specified type of equipment[194].

Assuming that the radioactivity of rocks can be formed by a contribution of only one radionuclide, the maximum values of $\boldsymbol{A_{eff.}}$ for rocks and ores present in the Shalkiya deposit (based on the maximum values of the gamma-radiation exposure dose) will be as follows:

1. For uranium (radium): (34 × 12,58 × 10^3) / [(170 × 100) / 0,01] = 0,252 Bq/g (252 Bq/kg).
2. For thorium: (34 × 1,3 × 4,07 × 10^3) / [(76,5 × 100) / 0,01] = 0,235 Bq/g (235 Bq/kg).
3. For potassium: (34 × 0,09 × 31,45) / [(340 × 10^{-4} × 100) / 0,01] = 0,283 Bq/g (283 Bq/kg).

The estimated effective specific activity ($\boldsymbol{A_{eff.}}$) of rocks and ores present in the deposit is 283 Bq/kg. All other rock varieties occurring within the boundaries of the ore body will have lower values of $\boldsymbol{A_{eff.}}$

Based on available information and taking into account two radiation parameters ($\boldsymbol{A_{eff.}}$ and gamma-radiation exposure dose), rocks and ores present in the Shalkiya deposit can be classified as those that are *assumed to be safe* but requiring *a prior additional radiation survey for confirmation of whether they are hazardous or not*.

Considering that human health and safety is a primary concern, the receptor sensitivity is considered to be ***very high***. However, based on the results of calculations presented above, the impact magnitude is estimated to be ***minor*** which results in an impact significance of ***moderate***. This is a conservative assessment. The impact significance is possibly higher than what would manifest in reality but the uncertainty involved as a result of the absence of direct measurements must be considered. Proposed mitigation measures are described below.

In terms of the environmental pollution risks, the receptor sensitivity is also considered to be ***very high***, especially considering a sensitivity of the radiation issue for the public. Based on the estimates presented above, the impact

[194] Gamma-Logging Instruction for the Reconnaissance and Exploration of Uranium Deposits. – Moscow, 1982

magnitude is considered to be minor[195]. As a result, the significance of this impact can be assessed as ***slight***.

9.7.2. Radioactivity Impact Mitigation

Ensure radiation safety for the mine staff as mining operations proceed at the Shalkiya Mine site by:

- Compiling a list of facilities (sections, workshops, workplaces etc.) in operation and conduct a one-time initial survey of working areas known to have the highest potential natural radiation exposure levels (underground mine workings, ore crushing/grinding/transportation/storage areas etc.).
- Monitoring the levels of alpha-active gases (radon and thoron) and radionuclide levels in the dust of the workplace air.
- Including both radiation exposure metering at the mine facilities and specific activity levels of naturally occurring radionuclides in ore and rock stripped as mining progresses.
- Formulating, on the basis of the measurements, apposite radiation control and safety measures in accordance with Republic of Kazakhstan regulations.
- Expanding the existing radiation monitoring programme (that is part of the approved 2015-2017 Environmental Monitoring Programme) to include the measurement of specific activity levels of naturally occurring radionuclides in ore and rock stripped in the process of current mining operations.
- Undertaking a radiation safety survey using a specialized organization accredited to conduct this type of survey and produce survey protocols (including a description of sampling locations with geographic coordinates and schematic maps).

9.8. Impacts on Groundwater

The following activities result in potentially significant impacts on groundwater

- underground mining methods and mine drainage;
- ore-hosting rock dump; and
- outdoor ore storage.

The negative environmental aspects of the activities are:

- Use of groundwater as a natural resource, and,
- The risk of contamination of the groundwater through:
  - interaction of disturbed ores and rocks in the mine shafts with mine water;
  - interaction of rocks that are brought to the surface with precipitation and condensation water at the waste rock dump sites, TSF, ore storage and the resulting formation of acidic or neutral drainage water that may flow into the aquifers; and
  - spillages of hazardous substances and material.

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[195] According to existing standards, these materials can be used for construction purposes without limitations.

All of these aspects can result in changes to both the groundwater and surface water characteristics.

Groundwater in this region due to the lack of drinking water is also a valuable resource. During the public hearings (2012) there were expressed some concern on this issue and it was proposed to investigate the use of water of the Syr Darya river.

9.8.1. Minewater Drainage Assessment

The current underground mine workings at the Shalkiya deposit, covering an area of some 0.89 km^2, has caused groundwater drawdown of up to 140 m in the center of the mine area. As construction and working of the mine continue, this drawdown will increase, and the dimensions of the hydrodynamic depression will increase in volume and spatial extent (extending southeastward). By the end of mining operations, the depth of mine workings will have reached 890 m (an increase of 4 times), and the area of the generalized horizontal alignment contour will be 4.9 km^2 (an increase of 5.5 times).

This in turn will increase groundwater drawdown in the deepest part of the depression cone (to 850 m), and the area of the hydrodynamic depression cone, which will still continue to expand. The design calls for drilling 27 observation wells placed around the current mine workings included in the design for construction of the first phase. These wells are intended to observe the expansion of the existing depression cone in order to assess the effectiveness of the groundwater protection measures employed at the mine. The results of the measurements will be used to create groundwater contour maps; and the expansion of the depression cone in different directions will be estimated and predicted as information is accumulated. It should be noted that the presence of impermeable barriers between the mine works (existing and planned), and the aquifers used by the Kuttykozha water intake wells prevents the depression cone expanding from the mine works in the North-Western section of the deposit, from influencing the groundwater quality and regime of the Kuttykozha water intake (Figure 29 and Figure 30).

Northeastward expansion of the depression caused by the development of the South-Eastern section is not predicted due to the presence of the impermeable Tulkubash block of the Eastern thrust fault. This prediction is premised on high-quality sealing of the 27 exploration wells in the area. If the high quality sealing is not achieved, there is a danger of breakthrough of groundwater to the underground mine workings from the top of wellbores that have penetrated the water-bearing zone of the Famennian-Tournaisian rocks of the Akyuk syncline (which has a high transmissivity of 470 m^2/day). If one or more of the aforementioned exploration wells are not properly sealed, when the wellbores penetrate the stopes, rapid drainage of fissure-karst water would result in the formation of a hydrodynamic depression cone that will have an adverse effect on the Kuttykozha water intake. Groundwater drawdown within the water intake could be so significant that the Kuttykozha water intake could be completely shut down.

Based on predictions of water inflows by mathematical modeling, which is the most valid method for the current hydrogeological conditions at the deposit, the normal average annual water inflow to mine workings when development of the deposit has ended (for dryness of the year with five percent probability) was about 480 m^3/h[196]. With allowance for process water planned for use in sinking and stopping processes, the estimated normal water inflow to the sump of the planned mine drainage system near the Southern mine shaft (discharges this water to the surface) is 560 m^3/h.

9.8.2. Assessment of Impacts due to Minewater Drainage

Given that water is an extremely precious resource in the arid climate, where the site occurs, receptor sensitivity is considered to be ***high***. At the same time, the impact magnitude is potentially ***major*** because of the possible impact of the already existing depression cone that will grow during the mine life on the Kuttykozha water intake and this would mean an impact significance of ***large.*** This is not to say that the impact will necessarily manifest simply that there is a risk that cannot be overlooked until there is a greater deal of certainty to ensure that the mine dewatering does not affect negatively water supply to other users.

It should be noted that there is a plan to construct a water supply line to provide drinking water to the Shalkiya Okrug community by 2017 as part of the State Programme on the Provision of Public Access to the Centralised Water Supply. This implies that local public would be no longer reliant on the Kuttykozha water intake as the source of water supply. That said, the Shalkiya Mine will continue to use this water intake to meet its domestic and drinking water demands. Proposed mitigation measures are outlined below.

Minewater Drainage Mitigation

- Establishing and maintaining a water balance (including probable climatic events, such as spring floods and dry periods) for the mine and related processing plant circuit and use this to inform infrastructure design;
- Developing a Sustainable Water Supply Management Plan to minimize impact to natural systems by managing water use, avoiding depletion of aquifers, and minimizing impacts to water users;
- Minimizing the amount of fresh make-up water for the processing plant circuit;
- Reusing, recycling, and treating process water for its use in all technological activities, as feasible (e.g. return of supernatant from the TSF to the processing plant); and
- Fully understanding the potential impact to the water balance prior to commencing any mine dewatering activities.

9.8.3. Ore-Hosting Rock (Wall-rock) Dumps and Ore Storage

Geologically, an ore-hosting rock (wallrock) dump consists of modern loose grus-rock debris-blocky sediments. The large pore size of these sediments and the high porosity value promote high permeability for both air and water. As a result, the large detrital rocks in the dumps have the ability to accumulate the maximum amount of atmospheric precipitation falling on the dumps and condensed moisture from the air[197]. This water will infiltrate through the body of the dump to the bottom, and if there is no waterproofing at its base, the water may enter the

[196] Agafonov, 2006.

[197] Emlin E. F. Technogenesis of Change in Pyrite Deposits of the Urals. – Sverdlovsk: Ural University Publishing House. 1991.

aeration zone of the underlying rocks in time. In this case, the ore-hosting rock dump may become an additional supply source for the underlying groundwater.

Furthermore, favorable conditions will be created for activation of sulfide oxidation processes in the planned dump for wallrock containing dispersed sulfide salts. High concentrations are observed when similar processes occur in technogenic groundwater in the dumps of formerly operating sulfide deposits: dry residue, sulfates, iron, copper, zinc, lead, cadmium and other chalcophile metals present in the ores[198]. The occurrence of a hydrochemical effect resulting in pollution of natural groundwater with harmful substances is likely if the conditions for infiltration of polluted groundwater from dumps to underlying hydrogeological units occurs.

Loose grus-rock debris sediments will be piled in the projected outdoor ore storage, in which the fragments will be smaller compared to dumps. It is assumed that these loose sediments will also accumulate atmospheric precipitation and condensed moisture from the air. As a result, favorable conditions will also be created for activation of sulfide oxidation processes, and high concentrations of harmful substances may accumulate in the water of these sediments. The occurrence of a hydrochemical effect resulting in pollution of natural groundwater with harmful substances is likely if the conditions for infiltration of polluted groundwater from dumps to underlying hydrogeological units are met.

It should be however noted that the impact on groundwater associated with the infiltration of water down through the waste rock and ore stockpiled on the surface for subsequent processing would be significantly reduced due to a widespread distribution of carbonate rocks in the Shalkiya deposit. The geochemical test results indicate that the overwhelming majority of tested rock samples are classified as NAG (non-acid generating) (refer to Section 6.6.2).

In line with the IFC Guidelines (2007), the geochemical testing of ore and rock for assessing the ARD/ML potential is recommended to be conducted on an ongoing basis along with the expansion of exploration and mining activities to the new areas of the deposit. In order to provide a more accurate picture of environmental impacts associated with mine water, it is recommended to include arsenic, cadmium and mercury into the list of monitored parameters. The concentrations of these toxic substances should be measured using high sensitive up-to-date methods enabling the determination of actual concentrations of trace elements with a required accuracy and precision. Waste rock and ore storage facilities should be lined and equipped with a system of storm water drains for diverting floodwater and drainage flows generated during heavy rainfall events. These flows should be diverted to the mine water pond or any alternative storm water reservoir to avoid the mine water pond overflow and dam collapse.

Assessment of Impacts from Ore-Hosting Rock (Wall-rock) Dumps and Ore Storage

Given the scarcity of water in the area the receptor sensitivity is considered to be ***high***. In this case, though there are controls that can be utilized and which are included in the mine design that can be used to prevent both exposure to precipitation and the prevention of infiltration of the potentially contaminated water at the base of the wall rock dump. These control measures, which are

[198] Emlin, 1991.

detailed below would serve to reduce the impact magnitude to ***minor*** with an associated impact significance of ***slight or moderate***.

9.8.4. Mitigation

To avoid the risk of groundwater contamination from surface production facilities it is necessary to include the following in the design:

- Installation of an impermeable clay screen at the base of the projected host-rock dump, TSF and a concrete cover on the ore storage area.
- Construction of diversion ditches for removal of storm and flood water from industrial sites, such as waste rock dumps, ore stockpiles, as well as for its collection and pre-treatment before discharging into the reservoirs for further use;
- Diverting contaminated leachate from the waste rock dumps and ore storage sites to the mine water pond, TSF, etc.;
- Construction of a network of background and monitoring wells to monitor the level of contamination of groundwater in the area of influence from placing waste dumps, ore storage and other facilities (storage pond of mine water, tailings and other);
- The construction of biological treatment plant to treat sanitary sewage prior to the discharge to the domestic sewage pond; impermeable bottom lining in the domestic sewage pond to prevent groundwater contamination by pollutants present in the domestic sewage; installation of impermeable sewer pipes to convey wastewater to the biological treatment plant; and
- The organisation of storm and snowmelt water collection from paved areas and mechanical treatment of this wastewater stream along with process effluents at the surface runoff treatment facility.

9.9. Impact on Surface Waters

There are no permanent watercourses near the mine, and therefore, surface water quality should not be impacted. Impact on surface water quality can occur only during the seasonal replenishment of the streams Kelte and Shalkiyasai during the period of snowmelt and spring rains. Pollution of watercourses may occur due to surface runoff from contaminated or disturbed areas. As watercourses are filled by snow melt water and precipitation, the change of the hydrogeological conditions and the hydrodynamic formation of the depression will not affect the nature of the streams' recharge.

On the first phase of the mine development design solutions for technical water supply are based on the use of water from mine drainage and drinking underground water from of cluster wells of the water intake Zhanakorgan[199] (see section 6.8).

The long-term plans of the mine, associated with an increase in water consumption for technical needs of the plant (2 phase) include the possible use of the waters of the Syr Darya river as a backup source of water supply of technical

[199] Mine got the contract for the subsoil use No. 3483 dated 14 December 2009 and the mining rights and use of groundwater from the catchment Zhanakorgan for technical purposes.

quality. In 2015, the mine agreed with the competent authority on withdrawal of water from the river of 30 000 m3/day[200].

However, this decision is not included in a Bankable Feasibility Study and related to the second phase of the mine development. Currently, technical solutions for construction of water intake and conduit from the Syr Darya river[201] to the mine are not represented, and, therefore, the assessment of impacts is possible only in general terms.

In Kyzylorda region the limit of water intake from the Syr Darya river is 5572,33 million m^3. In 2014 the volume of water used was 5214,6 million m^3 . Estimated annual water abstraction for the needs of the mine is 11 million m^3 (30 000 m3/day) or 0.2 % of the permitted limit. This amount is not significant compared to the total abstraction of water for agricultural and industrial needs. Thus, the possibility of water intake the specified amount was previously agreed upon by the competent authority.

At the same time, there should be taken into account the generally recognized fact - runoff reduction of the Syr Darya river. As a consequence,it leads to degradation of the Aral Sea, which is linked to economic activity of consumers of water. The implementation of the decision about the construction of reserve water intake on the river Syr Darya river will make a contribution (albeit very small) to degradation of the Aral sea. Consequently, this impact should be considered as regional, of low intensity. Taking into account the information provided above (Section 6.8), the sensitivity of the recipient is assessed as very high. Thus, the significance of potential impacts will be moderate. A more accurate assessment at this phase is impossible due to the lack of elaboration of project design. .It should be noted that the reference to the possible use of water from the Syr Daria river is in the interests of disclosure only. Should a decision be made to use water from the river this would have to be the subject of another ESIA as the impact has not been comprehensively assessed here.

On the following design phases it is necessary to return to the issue of technical water supply of the mine and concentrator. In fact, it is necessary to compare and find the optimal balance between the use of two valuable resources of this region: drinking underground water and surface water of the Syr Darya river. Considering specifics of national design, the decisions on the first and second phases will be made in different years and by different competent authorities. Regarding special value of resources and citizens’ concern about the use of underground waters for technical purposes[202], it is recommended on the 2 design phase to conduct an ESIA for the construction of the concentrator .In the framework of the future ESIA, it is necessary:

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[200] The letter to the Republican state institution "The Aral-Syr Darya basin inspection on regulation of use and protection of water resources of the Committee on water resources of the Ministry of agriculture of RK" № 24-07-02-17/113 dated 12 March 2015

[201] According to long-term data, the runoff of the Syr Darya river in the Kyzylorda region in winter period is around 50-60 km3/day

http://e-history.kz/media/upload/1466/2014/06/17/beb39e639d9369790d22dfab4b0c1378.pdf

[202] Minutes of the public hearings on the draft of industrial development of deposits of polymetallic ores of the Shalkiya, 2012, Zhanakorgan

- To compare the risks and impacts associated with use of groundwater and the risks associated with the use of the waters of the Syr Darya river;
- To assess the conformity of the water composition to required indicators in order to be used in the technological processes of enrichment; to provide the necessary methods of river waters purification.

9.10. Impacts on Biodiversity

9.10.1. Overview

The proposed expansion of the mine can impact on biodiversity in the Project and adjacent areas in a variety of ways. For decision-making the concern is whether any rare or sensitive (threatened) fauna and flora will see material reductions in populations and in extreme cases, possible loss of species and their habitats. There are three key mechanisms by which the proposed mine expansion could impact on biodiversity, namely:

- Habitat destruction/fragmentation
- Off-site air and soil pollution
- Noise and light disturbance created by mine activates in the evening and night time due to construction, mining and ore processing operations that would serve to drive fauna away;

In addition, for the area in which the mine is situated, the presence of plague carrying animals is an important consideration.

9.10.2. Habitat Destruction/Fragmentation

Habitat destruction is typically at its greatest during construction and operational activities for mines. The benefit of Shalkiya is that given that it is an underground mine the surface (habitat) disturbance is far less than would be associated with an open cast mine for example. The major changes to the current mine configuration will be the establishment of the tailings facility to occupy from 1,870 to 3,440 m^2 (under different scenarios[203]). There will of course be other infrastructure, most especially the minerals processing plant but this infrastructure will be established within the long-standing production areas of the mine, which has already been disturbed, and thus any remnants of habitat in these areas would be highly transformed already.

The key questions that need to be answered are whether the tailings facility, waste rock stockpiles and other surface structures will impact on priority biodiversity features (such as critical natural habitats, critically endangered or endangered species or impacts on formally protected conservation areas). The proposed tailings facility area and waste rock stockpiles will affect no such areas. It is however still unclear whether any Red Data Book (endemic, rare and endangered) plant and animal species are present/absent in the Project area. No such species have yet been identified but in the absence of a recent detailed survey the precautionary principle must apply and that is to assume that there may be such species until proven otherwise. It should be noted, however, that Kyzylorda Region generally has limited habitat for bird species listed in the Red Data Book and/or involved in global-scale migration. The existing mine water

[203] ShalkiyaZinc, 2016. Section V. The Justification and Selection of an Optimal Tailings Storage Option

pond is used by some nesting riparian birds (heron and some sandpiper species) and seasonally migrating birds (goose and swan). It is also possible that the planned tailings storage facility could be used by migrating and summering birds for resting. But it cannot be considered as a proper ecological habitat because water contained in this technical reservoir may have toxic effect on birds and animals.

As described in the environmental baseline, the area in which the mine is situated is arid with limited vegetation and low land productivity, and without any unique landscape conditions and ecosystems. Such types of areas are abundant in Kyzylorda Region

As such, the receptor sensitivity is argued to be ***medium*** but the impact magnitude is considered ***negligible***. The areas that will be used for the tailings facilities and the waste rock stockpiles will be irreversibly lost as native flora and fauna habitats. Again, however, the area of habitat lost compared to the remaining size of the habitat area that will not be affected is very small indeed. The resultant impact significance is accordingly assessed to be ***slight***.

This significance rating is based on the assumption that the areas affected by the proposed tailings facility and waste rock stockpiles will be carefully surveyed to confirm that there is no flora or fauna that has any conservation status before the start of construction. This means that the survey and identification of flora and fauna species should be conducted earlier before the commencement of construction activity. It is also required to assess the need for restoring/relocating species that have conservation value to areas not affected by the mine taking into account whether these species are endemic or widespread in the adjacent areas.

9.10.3. Pollution of the Mine Site and Adjacent Areas

In respect of offsite pollution the detailed air quality impact assessment in Section 6.3 indicates that currently one of the primary air emissions of concern are the different dust size fractions generated by stone crushing plants that operate in the Project area. But in the future, as the stone crushing operations phase out, construction activities are likely to become the primary source of emissions (dust emissions from excavations, exhaust emissions from vehicles etc.). Air pollution dispersion estimates produced for the operation phase of the mine and processing plant indicate that pollutant emissions will not be significant due to the relatively small scale of their production in respect of the mining activities and the absence of other significant sources of the same pollutants in the area. The air quality assessment indicated that there would potentially be exceedances of the strictest, health based ambient air quality limits most notably for PM_{10} but these exceedances were seen to be highly localized and largely contained to the ore crushing / processing and tailings receptor areas.

As detailed above the direct loss of habitat brought about by the development of additional infrastructure (the tailings dam, waste rock stockpiles etc.) will result in the permanent loss of the directly affected habitats with associated loss of flora and faunal species in the area. The effect of the dust deposition on the topsoil layer and vegetation cover would simply be to extend this area of transformed habitat to a larger footprint area but the difference would be that the habitat would be degraded rather than lost completely. That notwithstanding the principle would still be to assume that flora and fauna in the zone of influence would be negatively affected with the flora potentially dying and the fauna moving out of the area. Again the assessment is one where the relative size of the area affected is a small fraction of the size of the area of similar habitat.

Receptor sensitivity would remain ***medium*** but the magnitude of the impact would also be considered to be ***negligible*** because of the extent of the impact relative to the size of the habitat. The overall impact significance is thus considered to be ***slight***.

9.10.4. Increased Noise and Light

The increased noise and light impacts on the animal species will primarily occur during the large-scale construction and haulage operations.

There can be no doubt that the expanded mine and processing plant operation will result in a greater intensity of noise and light at the industrial site but this would be against a background of the fact that both these impacts already occur, albeit at a more limited scale. The receptor sensitivity would remain ***medium***, but the magnitude of the impact would also be considered to be ***negligible*** as a function of both the low intensity of the change and the relative size of the affected area compared to the overall spatial extent of the habitat. This implies an impact significance of ***slight.*** It is therefore considered that additional mitigation against increased light and noise at the industrial site in the night time would not be required.

9.10.5. Epizootic Risk

As described in the environmental baseline the area around the mine is inhabited by animals that serve as carriers for plague causing bacteria such as *leishmaniasis*, black fever, plaque and so forth. The Mine should take action toward reducing and preventing epizootic outbreaks by for example commissioning the preparation of annual epizootic forecasts, produced by the Zhanakorgan District Medical and Veterinary Services. These forecasts should be prepared in autumn to cover the next epizootic cycle. In addition there should be health awareness raising programs amongst employees as to the epizootic and hazards presented by venomous snakes and insects. The Mine should develop preventative action plans to address unfavourable epizootic forecasts and emergency response procedures for snake and insect bites.

9.10.6. Risks to waterbirds using the minewater storage dam

It is known that water birds sometimes make use of the mine water tailings dam for roosting and potentially also foraging. What is not currently clear is the risk potentially posed to these birds as a result of possible degraded water quality or sediments. To this end it be necessary for the mine to assess the risk of water bird mortality as a result of water quality in the mine water dam and to implement control measures such as bird hazing or similar.

9.10.7. Recommended Biodiversity Impact Mitigation Strategy

- Minimize disturbance to vegetation and soils;
- Conduct detailed pre-construction surveys of flora and fauna across the area that will be directly affected by the tailings dam and rock dumps to identify and potentially remove any conservation worthy species of especially flora (endemic and rare species);
- Implement mitigation measures designed to reduce damage to biodiversity and appropriate for the type of habitat and potential impacts including, for

example, potential post-operation restoration (which may include baseline inventories, evaluations, and eventual rescue of species).

- Avoid or minimize the creation of physical barriers (trenches, structures and roads) to wildlife movement and migration, including migratory birds.
- Identify (based on the survey results) vulnerable areas and plant habitats in the Project area and, if required (in the event if any endemic plant communities occupying small patches are identified), establish buffer areas or implement reintroduction measures;
- Implement practicable soil conservation measures (e.g. promptly use stripped topsoil material for existing site remediation and landscaping). It should be noted however, that the soil productivity is extremely low and that there is very limited likelihood of the topsoil having good restoration/rehabilitation potential;
- Investigate how the mine could be involved in actions planned/taken by relevant local authorities in Zhanakorgan district to manage the risk of epizootic outbreaks and plan preventative actions to address unfavourable epizootic forecasts.
- Include in OHS programmes the hazards presented by venomous snakes, spiders, and natural carriers (mouse, rodent, and canine species) of plaque, pseudotuberculosis, yersiniosis, salmonellosis, pasteurellosis, and erysipeloid. leishmaniasis, black fever and other diseases that may transmit them to humans. Develop appropriate measures to control these hazards.
- Develop preventative action plans to address unfavourable epizootic forecasts and emergency response procedures for snake and insect bites.

9.11. <u>Seismicity impacts</u>

9.11.1. Assessment

As described in the Environmental Baseline chapter, the Shalkiya Mine is located within the boundaries of the Turan Platform between the South Tianshan and Talas Fergana axes of regional seismogenic structures. These transitional areas lying between the mountain structures and platforms form the geodynamic tension zones that are characterized by high seismicity potential. The Karatau Seismicity Generation Zone located close to the Shalkiya deposit also promotes seismic activity in the area. Given that the seismicity risk is high it is necessary to recognise the potential consequences of a seismic event.

A seismic event or earthquake can have potential environmental, social and economic risks. In social terms, a significant seismic event could result in people being injured or killed as a result of the collapse of buildings and other structures including underground structures of the Mine. The economic consequences may relate to the possible involuntary cessation of mining activities due to the degradation of underground infrastructure and associated economic loss as well as the knock on effects for the Mine staff (including local residents) in terms of lost jobs, wages and payments for services. The Mine will have to cover the costs of repairing the mine and associated infrastructure. From an environmental point of view a significant seismic event could bring about a collapse of the tailings dam resulting in a large scale release of tailings but there could also be damage to other chemical storage tanks at the processing plant and fuel storage tanks that would also then potentially result in spillage. In these terms, the receptor sensitivity would be ***very high*** as a result of possible human injury or fatalities and the impact magnitude would be potentially ***major*** resulting in an impact significance of ***very large***. Managing seismic risk is a twofold task, firstly ensuring that all facilities and residential buildings associated with the Project are designed in a manner that takes account of earthquake risk and built to withstand the effects of a seismic event and secondly to ensure that there is an effective emergency response should a seismic event occur. It is worth emphasising the importance of the designer to supervise the construction of key facilities. Should this mitigation be followed the serious potential consequences described above could be prevented which would imply an impact magnitude of ***moderate*** or even ***minor***. In these circumstances the impact significance would reduce to ***moderate***.

9.11.2. Seismicity mitigation

- All Project facilities and structures should be designed and built in accordance with the provisions of the RK Construction Standard “Construction in Seismic Areas” (SNiP RK 2.03-30-2006).
- The designer should supervise compliance with the construction guidelines for seismic areas during the construction of key Project facilities including housing and accommodation for the Mine staff.
- Ensure that a comprehensive emergency preparedness and response programme is developed and implemented that *inter alia* addresses the possible consequences of a significant seismic event.

9.12. Noise and vibration

9.12.1. Assessment

Key noise and vibration sources at the mine site and in the surrounding areas are associated with the operations involving the use of equipment, vehicles and mobile plant and blasting operations performed at the mine site and adjacent industrial sites. Current freight and passenger transport operations on the access road between the M-32 motorway, the Mine and Shalkiya and Kuttykozha villages are also a potential noise source. The increased traffic flows to the mine that would be associated with mine operations especially during the start up phase would obviously result in an increase in noise. Noise measurements conducted for the mine operations show that typical surface infrastructure may result in noise levels of as much as 95 dB(A). As a worst case scenario it can be assumed that the worst combined noise condition at the mine is 110 dB(A). Using the principle of a doubling of distance results in a 6 dB(A) reduction in noise, it can be seen that over a distance of some 4,1 km that the 110 dB(A) would reduce to about 48 dB(A).

Given that Shalkiya village is more than 5 km from the mine it seems improbable that noise from the mine would result in a noise disturbance audible in Shalkiya. Similarly the settlement of Shalkiya North is approximately 4,1 km from the mine centre. This would suggest a possibility of noise being heard from the mine but barely audible. It should also be noted that as a crude calculation soft ground attenuation is not considered which would likely serve to reduce the noise levels. On the assumption that the road creates a noise of level of 80dB(A) 15 m from the source a similar calculation can be done for the effect of the road noise. Shalkiya is more than 3.4 km from the road and Shalkiya North some 1.9 km from the road. In less than a km the road noise would have reduced to some 44dB(A), which would mean that the noise is unlikely to create a noise disturbance at either Shalkiya Village or Shalkiya North.

Vibration is important for the management of the mine but will not pose a risk to the off-site communities. Noise impact significance can be postulated, therefore, as follows. Receptor sensitivity would be considered to be ***medium***. Although the receptors are people, the form of the noise would be generating no more than a possible nuisance effect with no morbidity effects. Impact magnitude would similarly be considered to be ***minor*** at worst resulting in an impact significance of ***slight***. It must be emphasised that the noise assessment presented here does not include the risk of occupational exposure to noise. Occupational exposure is described in Section 9.12.

9.12.2. Noise mitigation

Noise mitigation must be implemented as follows:

- Implementation of enclosure and cladding of processing plants;
- Installation of proper sound barriers and / or noise containments, with enclosures and curtains at or near the source equipment (e.g. crushers, grinders, and screens);
- Optimization of mine related traffic routing especially avoiding deliveries at night.

10. SOCIAL IMPACT ASSESSMENT AND MITIGATION

10.1. <u>Affected Communities and Vulnerable Groups</u>

The social impact assessment has focused on the affected communities and vulnerable groups[204]. Working conditions, occupational health and safety, and stakeholder engagement issues are considered in the sections below.

Affected communities are those that might be affected, directly or indirectly, by adverse environmental or social impacts of the Project. As was noted above (Section 9), the environmental consequences of the planned Project are not likely to cause any direct impact on the residential areas. However, people living in Shalkiya and, to some extent, Kuttykozha settlements have already been hit by adverse consequences of the Mine closure. Similar adverse impacts may arise in the future, for example, due to the eventual Mine closure. For this reason, the Shalkiya and Kuttykozha residents are considered as affected communities.

Vulnerable groups in these settlements include lonely elderly people, single mothers and families with many children. These people will have a more difficult access to the Project's social benefits while may be most affected by its adverse consequences (this issue is discussed below).

As the local people typically live in large families, the well-being of children, elderly people and non-working women is very much reliant on incomes and employment opportunities available for their working-age family members.

[204] The EBRD's ESP defines vulnerable groups as people who, by virtue of gender identity, sexual orientation, religion, ethnicity, indigenous status, age, disability, economic disadvantage or social status may be more adversely affected by project impacts than others and who may be limited in their ability to claim or take advantage of project benefits.

It should be noted that today retired elderly people have a relatively sustainable position; their pensions are comparable with local wage levels and often amount to 30%-50% (and sometimes even more) of incomes earned by employed people (Chapter 7.4.7. and Annex 17). In addition, unlike occasional earnings constituting the primary source of income for many local working-age residents, pensions are paid regularly. In many households, pensions are an important and often main part of the household budget.

10.2. Key Social Impacts of the Project

The most significant social aspects of the Project include the creation of new jobs and career opportunities, improved human resource capacity, procurement of goods and services, development of infrastructure, tax revenues, land acquisition, social partnership programmes, mine wrap up and closure.

These aspects are expected to have significant effects on the socio-economic development of Kazakhstan as a whole and the Project area itself in particular. These effects would be both positive and adverse. Positive effects could be enhanced through a suite of special measures. Adverse effects would require detailed assessment and development of appropriate mitigation measures to prevent and/or reduce them. It is planned to consider how the Project will influence the social environment throughout its lifecycle including construction; operation and closure of Project facilities.

The Project will have multiple effects on the economy and social situation. The following impact categories are examined below:

- Impact on economy (national, regional and local level);
- Creation of jobs (mainly at the district and community level);
- Impacts associated with the purchase of goods and services;
- Labour migration;
- Impact on land use;
- Impact of transport operations (raw materials and finished products);
- Impact of Mine closure;
- Impact on cultural heritage.

10.3. Impact on Economy

Republic of Kazakhstan

In the recent years, the mining and metallurgical industry has been among the most dynamically evolving sectors of the economy. The 2015-2020 RK State Industrial Development Programme adopted by the RK Ministry of Industry and New Technologies of the Republic of Kazakhstan anticipates that Kyzylorda region will become a home region for a metallurgical cluster with ShalkiyaZinc being an important member if it.

The Shalkiya deposit is the largest zinc deposit in Kazakhstan (accounting for approximately 30% of the country's zinc reserves)[205].

Apart from ShalkiyaZinc, the cluster comprises the following major industries operating at the international scale: Tau-Ken Samruk, SPK Baikonur, KazAvtoProm etc.

Overall, the country's mining and metallurgical sector produces 11% of GDP (**Figure 77**)[206].

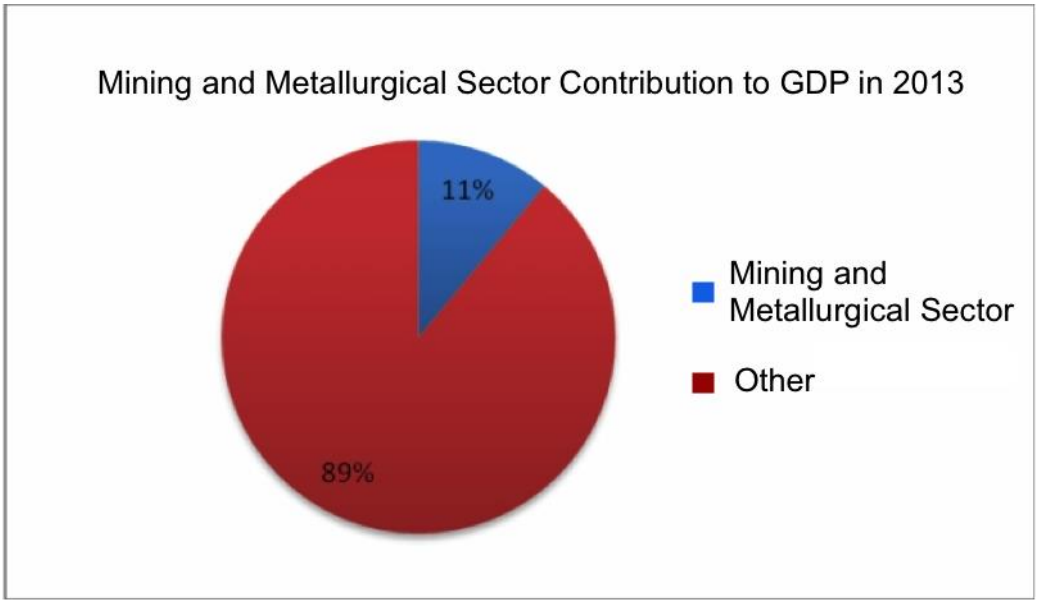

Figure 77: Mining and Metallurgical Sector Contribution to GDP in 2013

Starting from 2013, the Kyzylorda region has hosted a number of investment forums organized to attract investment in the development of the metallurgical cluster. These forums are attended by major Kazakhstani and foreign companies. The Region has also adopted a proactive approach to attract the state budget funds, to finance the development of infrastructure, and establish new industrial zones in Kyzylorda and other districts of the Region.

Considering volumes of attracted investment, development of industrial zones, planned growth of production outputs including the production of high-technology products, the impact of the Kyzylorda metallurgical cluster on the national economy is argued to be positive, with the Shalkiya Mine Development Project to enhance significantly the position of the RK mining and metallurgical sector.

The magnitude and significance of the Project impact on the national economy are considered to be moderate.

Kyzylorda Region

In 2014, the Council for the Mining and Metallurgical Complex under the RK President approved the Kyzylorda Region Mining and Metallurgical Complex

[205] http://www.mining.kz/kz/component/k2/item/20837-metallurgiya-naryadu-s-dobychej-nefti-gaza-i-urana-stanet-bazisom-regionalnoj-ekonomiki-kyzylordinskoj-oblasti

[206] http://www.agmp.kz/page/view/o_gmk_kazahstana

Development Roadmap[207]. The Shalkiya Mine Development Project is considered in the roadmap as being among the top priority regional projects. It is the view of the Kyzylorda Region Administration that metallurgy should become a pillar of the regional economy and key employer for the local people[208]. According to the Roadmap, the Shalkiya Project is seen as a driver for attracting investment to the region. The Project implementation will ensure benefits for the regional economy by:

- supporting the focused development of production and supply chains,
- improving the Region's infrastructure,
- creating new jobs,

With the receptor sensitivity being rated medium, the significance and magnitude of the Project impact on the regional economy can be also assessed as moderate.

Zhanakorgan District

The Project impact on the Zhanakorgan district economy will be even more significant. The Project will significantly enhance the development of the mining sector, generate revenues for the local budget, and help boost business activity in the area. In qualitative terms, the receptor (district economy) sensitivity is considered to be high and the magnitude of this impact is expected to be moderate. Based on this, the impact significance can be assessed as moderate or large.

Shalkiya Aul District

The ShalkiyaZinc Company is the only major taxpayer in the Shalkiya Aul District. While the tax revenue estimation is yet to be completed, it is felt that the Mine will be the major contributor of tax revenues in the forthcoming years. To a significant extent, the life and well-being of two local settlements will depend upon taxes paid by the Mine to the local budget.

In the light of the above, the magnitude of the Project's impact on the local economy is assessed as major with the receptor sensitivity being medium despite the local scale. This results in the impact significance rating of large.

10.4. Impacts Related to Creation of Jobs

Creation of work opportunities is an important benefit associated with both construction and operation of the mine.

The fact that the Project is expected to create 1,000 jobs during construction and 1,488 jobs during operation may have a significant impact on the demographic situation in Shalkiya and Kuttykozha.

As of 1 January 2015, the population of the Shalkiya aul district was 3,056 people including 2,035 residents in Shalkiya and 1,021 residents in Kuttykozha. Only one third of them (less than 1,000) are economically active people. Given that only some of local residents can be hired to work at the Mine, there is an obvious need to recruit and bring external workforce to work either permanently or on a fly in / fly out basis. The exact ratio between the permanent employees and those

[207] http://journal.zakon.kz/4702070-v-kyzylordinskuju-oblast-privlekajut.html

[208] http://www.inform.kz/rus/article/2683091

working on a fly in / fly out basis will be known at later stages of the design process. In any case, there likely to be a significance increase in population number with males to outnumber females.

The extension of the job market may bring the following impacts:

- reduction of unemployment;
- increase in the intensity of labour migration and other migration-related influences (increase of the impact on the social infrastructure, business development, oriented to needs of shift workers); and
- changes in the welfare level of local residents including vulnerable groups.

10.4.1. Decrease in Unemployment

Job creation has the highest value for Shalkiya village. The village was established, specifically in support of the mine so much so that in recent decades, the mine has been the major enterprise for the village. Unfortunately, the associated business was developing inadequately in the village. The suspension of mine operations in 1994 had a negative impact on the community development and the welfare of the residents.

Currently some residents (primarily former employees of the mine and the youth of working age) pin their hopes for the future on the mine development.

Top priority in recruitment should be hiring highly qualified personnel, which is able to implement projects at the world's best practice level. It is obvious that only some of the jobs may be occupied by local residents and part qualified personnel should be attracted outside the region. It is important to maximize the use of existing local capacity.

It is necessary to develop educational programs, advanced training, career guidance for young people aimed at developing abilities, education and advancaed training of local population. Such measures will help to maximize the positive social effect of this impact.

This positive effect will increase with the development of the mine. However, there should be considered the fact that the mine will operate and provide people with work only for 25-30 years. Further, as mine reserves will drop, its capacity will be decreased, and consequently, number of jobs will be reduced as well.

Similar effects will occur in Kuttykozha village. People in this village are also interested on working at the mine. However, a significant proportion of the population of this settlement works in agriculture. In this sense, changes (both positive and negative) in number of workplaces in this settlement of Kuttykozha will be smoothed.

The construction and operation phases of the Project will create jobs and thus help reduce unemployment. The receptor sensitivity is high with the impact magnitude at the Okrug level considered to be major. The impact significance is therefore assessed as being large and positive.

The prospects of the mine closure and associated social impacts are discussed in the following sections. There should be noted the importance of production diversification in the Shalkiya and Kuttykozha settlements. This will help to reduce the dependence of settlements from the establishment of the mine and to provide some stability of the settlement, in terms of changing conjuncture of market dynamics and needs of the Mine labour force at different stages of its development.

10.4.2. Incomes Rise and Increase in Welfare of the Population

Increase in incomes of local residents and people who are coming to work from other regions is a direct result of job creation. According interviews results, desired income in the village, depending on social group, ranging from 50 to 100 thousand tenge per month, which at the time of research was equal to $ 200. To maximize the positive effect it will be reasonable to provide salaries that will not be less than the average for the industry at the every stage of the project development. It wll also help to decrease the staff turmover and to consolodate the key personnel on the Mine.

This impact is considered to be positive. The receptor sensitivity is high (or very high) and the magnitude of impact during the construction and operation phases is considered to be major. The significance of this impact can be assessed as large.

10.4.3. Possible Increase of Expenditures

Improving the solvency of the workers, engaged in the construction/operation of the mine and plant, consumer demand for goods and services will grow, thereby trade and creating conditions for further development of the trading network (public catering, leisure, trade and other services) will increase.

The negative side of this process could be the growth of the consumer price index (primarily for local goods and services) and, consequently, expenses of the population. Incomes of residents, who are not involved in the project, including vulnerable groups (lonely elderly people, families with many children and single-parent families, which do not work at the Mine) may remain at the same level, and their welfare will be reduced through increased expenses. Rise in housing prices may occur as well.

Thus, social differences can be deepened between employees and residents, not involved in the project.

This negative impact is likely to be of minor significance within the district because the market for local products is relatively stable in the district. However, within the settlements of Shalkiya aul district it may be higher. In this case, part of the population, providing local goods and services, can even benefit from this process. Vulnerable groups (lonely elderly people, families with many children and single-parent families) will be most susceptible to this impact.

The receptor sensitivity ranges from low to moderate. Without mitigation, the impact magnitude can be assessed as ranging from moderate to minor with the impact significance considered to be moderate or slight.

This impact can be mitigated by adopting the following measures:

- Preferential use of local workforce

The preferential use of local workforce has already become an ‘unwritten rule’ in the Company. The Company’s Recruitment Policy has now been formulated as a statement but is yet to be approved and disclosed. It is planned to formalize, approve and disclose the Company’s Recruitment Policy in 2016.

It is important to ensure that this Policy not only applies to the Company employees but also to workforce used by contractors engaged to undertake significant amount of works at the Mine site. In the nearest time, the Company plans to engage the EPC contractor to undertake the entire suite of design, procurement and construction works. It is the EPC contractor who will be ultimately implementing the recruitment policy in practice to engage subcontractors. Similarly, the EPC contractor will play a vital role in implementing the Environmental and Social Action Plan and all management plans at least during the construction phase. In this respect, the commitment to implementing the ESAP and Recruitment Policy to at least engage subcontractors should be seen as a key criterion for selecting an EPC contractor. This would help ensure all local community groups in the best possible way and ensure the Project's social sustainability.

It is also crucial to contribute to enhancing the competitive position of local workforce seeking employment on the Project by maintaining the professional orientation and skill development programmes.

- Support local manufacturers through mutually beneficial partnership

Procurement of locally manufactured goods is an attractive opportunity that would promote diversification in the local economy and enhance the sustainability of local communities. It is difficult to predict with certainty what kinds of goods and in what quantities would be purchased for the Project. Even such an obvious option as the procurement of local food products requires further elaboration to consider, among other things, supply frequencies, permitting issues etc. It should be noted that even during limited ESIA consultations conducted in August 2015 through May 2016, new local initiatives emerged to develop the collection and primary processing of agricultural (meat and dairy) products. It is anticipated that these initiatives could provide a basis for cooperation with the Mine.

- Provide focused support to vulnerable groups

Though the Company's' ability to maintain charity activities is currently limited, it is supporting vulnerable groups by providing employment and/or education aid to low income families with many children. It is planned to expand the scope of these activities in the future in order to provide more help to vulnerable people.

Due to mitigation measures the impact significance could be reduced to slight or neutral.

10.4.4. The Creation of New Career Opportunities, and Increase in Human Resources

The project will have particular importance on youth and people of working age, as there is the prospect of stable work and motivation for education.

Currently, many young people move to other regions to study and then find a job, thus contributing to outbound migration flow. This Project could help reduce, if not reverse this adverse trend. New jobs and career opportunities at the company that is part of a major vertically integrated Tau-Ken Samruk Company can be attractive for young and working-age people. Job chances and career opportunities would be significantly enhanced if at least part of young people receives professional training that can be useful for the Project. The assessment of this positive impact is summarized as follows:

- The receptor sensitivity is medium;

- The impact magnitude is moderate without mitigation/enhancement; and
- The impact significance is expected to be slight if no additional enhancement measures are taken.

The significance of this positive impact could be enhanced by taking appropriate measures.

It is recommended to elaborate and implement training/skill development/skill conversion programmes for local candidates seeking employment at the Mine.

An important element of this training program should be career guidance for school pupils and students studying mining.

The Mine's human resource policy should comprise promotion mechanisms and other incentives, including exchange programmes for the most valuable employees to be able to work at other companies within the vertically integrated managing company Tau-Ken Samruk.

One element of this policy could be creating and supporting working dynasties[209]. This tool is now actively used by the company.

This impact is considered to be positive, the receptor sensitivity is medium. The impact magnitude is moderate with the impact significance ranging from slight to moderate. It remain slight if no additional measures are taken but could be enhanced to the moderate level through the implementation of efficient human resource policy (including training component).

10.5. Impacts Associated with the Purchase of Goods and Services

Purchase of goods and services and engagement of contractors is an important aspect of the Project. A detailed assessment of existing local capabilities will be conducted at the design development stage. The active engagement of local businesses within the Mine's supply chain could provide the following benefits:

- Increase in profits for local businesses.
- Increase in sales volume.
- Potential improvement in quality of goods and services and local business practices.
- Potential increase in the number of small businesses and better jobs.
- Decrease in unemployment and improved well-being level.
- These benefits (including an increase in the number of businesses and sales volume) may trigger higher prices on the local consumer market.

These effects could manifest themselves during both construction and operation. Their magnitude may however vary significantly because different goods and services are likely to be required during the construction and operation phases with the development of local businesses being driven by changes in the demand patterns.

Special emphasis should be placed on difficulties that may be encountered in transition from one phase to another, i.e. from construction to operation and

[209] Working (labor) dynasties – members of the same family who are working for the same company for generations. Support of labor dynasties in Soviet times was an important tool to encourage employees. Cultural traditions, based on family values and respect for elders, can work effectively in conditions of modern Kazakhstan

further to restoration and closure. Each transition period would mean that some goods and services are no longer needed and new markets or alternative sources of financial and social support should be sought by providers of these goods and services.

This positive impact is considered to be of minor magnitude during the construction, operation and restoration phases and moderately significant for stakeholder parties.

10.6. Impacts Associated with Labour Migration

At the stage of mine work resumption and Project implementation, it is necessary to attract qualified personnel that is currently lacking or not sufficient in the region. The need in attraction of skilled personnel from outside the district leads to increase in the intensity of migration processes.

There should be found equilibrium. Recruiting local staff (also those who accomplished necessary training) meets the needs and expectations of the local residents. This will give the necessary social sustainability of the project. Thus, the main objective of the company is to ensure an efficient and safe production process. Accordingly, the qualification of personnel is at the highest priority, and the need to attract qualified staff from outside the region (and, perhaps, the country) are the necessary steps that should be carefully planned.

The first important question is the accomodation of workers coming from other regions. For this purpose:

- During the construction phase – construction of temporary settlement;
- At the operation stage – fixed dormitory for workers[210].

Both sites are located on the site. In addition, for employees there are built houses in the Shalkiya village (see section 7.4).

It should be mentioned that recruitment of labour from other regions may pose a number of additional impacts which are discussed below.

10.6.1. Increased burden on social infrastructure

Labour migration will increase amount of temporary population in the district and create, to some extent, the additional load on social infrastructure:

- There is expected increase of load on hospitals. There also should be considered the possibility of moving shift workers on permanent residence in the area and/or settlement. It is necessary to take into account that the increase in the population of Shalkiya village and the relevant infrastructure in the long term (on completion of mining) could pose problem of lack in workplaces.
- Another important infrastructure recipient – dringking water-supply facilities. Presently, in Shalkiya village, there is an acute shortage of drinking water. As part of the state programme, a municipal project aimed at improving the water supply system management is being developed. It

[210] The location of the dormitory within the SPZ of the enterprise is possible only as there are workers who live there during short term business trips (for example, shift workers). Long and continuous stay at this dormitory is contrary to the sanitary regulations of RK and does not meet the requirements of banks

is planned to construct a water pipe in order to supply the residents with the dirngking water from the Talap underground water deposit. This will reduce the dependence of the population on their private water supply sources (wells, boreholes). Thus, the existing water supply pipe that supports JSC "ShalkiyaZinc LTD", and which provides the water supply for the part of the village will be shut down. There should be mentioned the extreme importance of improving the drinking water supply system for the community, because this will not only dramatically improve the level of welfare of the population, but will also reduce a potential (not proven yet) impact of drinking water quality on population's health. It is recommended to support the event, to the extent possible.

Without mitigation, these impacts (i.e. increased pressure on social infrastructure) are assessed as negative, on-going at all stages of project implementation, local scale (village), partly reversible, moderate intensity, probability and significance for stakeholders.

- Preschool and school institutions will also experience additional pressure. It should be however noted that the school and kindergarten in Shalkiya are currently operating at about 30% of their capacity and there is significance space for increasing their capacity utilization without additional capital costs. Additional jobs are also likely to be generated due to the multiplier effect.
- Social infrastructure: the load on the existing leisure centres, libraries, sports and other facilities of the companies, which provide full entertainment and support for a healthy lifestyle.
  - Supporting the development of these facilities and consruction of new ones should be an important part of social programs.

These impacts would be most pronounced during the construction and operation phases of the Project. Their magnitude is considered to be moderate with the receptor sensitivity being medium. As a result, the impact significance can be assessed as moderate.

This impact could be minimized by supporting the development of local infrastructure on the basis of partnership with the Akimat, to focus on the areas of mutual interest. The areas and opportunities for cooperation would be discussed and agreed through dialogue. Depending on the effectiveness of these programs, the importance of negative impacts can be significantly reduced. Moreover, under certain conditions, effective programme of cooperation can lead to positive effects, conncted to the development of the village infrastructure.

10.6.2. Possible occurrence of local conflicts

Attraction of labour force from other regions often provokes conflicts between the local residents and employees outside the region. These phenomena can occur because of alcoholism or use of psychotropic substances; on the basis of economic stratification and/or of reasons of socio-psychological nature.

The possibility of this type of conflicts is reduced, since the population of Shalkiya village has already had an experience of working at the mine. However, one of the probable causes that may provoke conflicts will be competing for jobs at the mine. This issue should be analyzed in detail; open and clear policy of recruitment can be considered as one of the tools for regulation of possible voltages.

This impact is considered to be moderate with the receptor sensitivity being medium. The impact significance can be therefore assessed as moderate.

To prevent and avoid conflicts, it is important to maintain discipline at the Mine and better organize working hours and leisure time for fly-in fly-out workers. It is required to adopt and consistently maintain the alcohol ban. Recreational areas and gyms should be organized at the accommodation camp and dormitories. Various cultural and recreational activities are recommended to be organized from time to time.

10.6.3. Possible increase in the incidence of social diseases

The risk of social diseases (including tuberculosis, sexually transmitted diseases, HIV/AIDS, etc.) is associated with demographic changes and labour migration.

The world practice shows that any migration leads to increased incidence of this category of diseases. Including, any large-scale projects associated with attracting workforce from outside the region can serve as a precipitating factor for increased morbidity.

There has been a downward trend in the social disease incidence levels, except for syphilis. Special emphasis should be placed upon actions designed to prevent syphilis among the Mine employees.

In addition, a very low incidence of HIV/AIDS is recorded in Zhanakorgan district. This low incidence is not typical for a district with such a high level of labour migration. Without questioning the official data, it should be mentioned that there is a rather high reputational risk for the Owner, if the level or dynamics of infection change.

This impact is considered to be negative and the receptor sensitivity is high. The impact magnitude, assuming that it has a low probability, is considered to be minor. The impact significance is moderate.

The following mitigation measures are recommended:

- Annual medical examination for all employees (is already conducted);
- Promotion and support of the disease prevention actions at the Company level.

Other necessary measures will be supplemented and implemented in cooperation with the health authorities.

In terms of the effective implementation of the required mitigation measures significance of residual impacts can be reduced to neutral.

10.7. <u>Land Use Impacts</u>

10.7.1. Design Solutions

The proposed mine development project will require a significant area extension by 1.6-fold for installing new facilities that will occupy 1085,225 ha (Annex 15). Estimated land requirements for planned mine facilities are summarized in **Table 68**.

Table 68. Estimated Land Requirement for New Project Facilities

Mine Facilities	Land Requirement, ha
New facilities	1010
Yuzhny (Southern) shaft	20
Ventilation shaft	28
9.9 km gas supply line	2,1
Water supply line (Syr Darya water intake)	10
11 residential houses in Shalkiya	0,125
Accommodation camp	15
Total land requirement	1085,225

Land areas affected by the Project fall into the following two land use categories: agricultural land and land designated for industry, transport, communication, defence and other non-agricultural uses.

Currently, the Mine is preparing the required land planning and management documentation including the Land Management Plan for the Extended Land Allotment.

10.7.2. Land Use Impact Assessment

The following potential impacts may affect land uses in the Project area:

- Land use change, including the conversion of pastures to mining and relocation of pasture owners to alternative sites;
- Land degradation and contamination in the surrounding areas.

Agricultural Land Use Change

As was already noted, new land allotment affects both industrial and agricultural land. The latter will be re-designated as land used for industrial purposes. Changing the agricultural land use designation (except when agricultural land is re-designated to establish a new protected area) is generally considered as a significant adverse impact.

In the case of the proposed Project, planned mining operations will affect a small area of agricultural land at the District scale. This land use change will not alter the existing land use structure in Zhanakorgan district because only about 0.2% of the total area of agricultural land in Zhanakorgan district will be converted to mining. Even at the local scale of the Shalkiya Aul Okrug this land use change is unlikely to cause a significant impact.

With the receptor’s sensitivity being assessed as high, the impact magnitude is considered to be minor. Consequently, the impact significant can be rated as being slight.

Risks Associated with Unrestricted Access to the Site

At the time of site visit in May 2016, multiple non-compliances relating to the lack of proper site access control/limitation were observed including:

- The Shalkiya Mine land allotment is used for livestock grazing;
- Local residents and children were seen fishing and bathing in the mine water pond;

This situation poses serious risks for the community and Mine security. After discussion with the Mine Management, specific measures were adopted including the Action Plan for limiting unauthorized access to the Shalkiya Mine site, which comprises a suite of actions like site inspection, provision of fencing and warning / banning signs where necessary, awareness raising activities, and interacting with Akimats (Annex 27). Implementation timeframe is set as June to October 2016.

This Plan is also reflected in the Community Health Safety and Security Management Plan.

Economic Displacement

Economic displacement and associated risks represent a major concern for any Project with a significant land acquisition component. In the case of this Project, the land acquired lie adjacent to the pasture areas with only small parts of the Mine's land allotment overlapping with them (Figure 78). Furthermore, part of existing pasture areas may lie within the boundaries of the planned Sanitary Protection Zone of the Mine.

- The north-western part of the Mine site borders and partly overlaps the land owned by the Toleuov Private Enterprise. The land allotment overlap is very small but it may increase by virtue of the Mine's SPZ establishment. At the same time, given that no critical mine facilities will be located in this area, it seems appropriate to consider how the mine site could be optimized to take account of a planned SPZ.
- The agricultural land used to be leased to Myrzakhanov PE was overlapping in a small area with the planned land allotment for the Project. This land would also partly fall within the SPZ for the TSF. In addition, this area is also likely to become part of the SPZ for the Kyran LTD site. Currently, the Akimat is considering the issue of providing a similar site not affected by industrial activities to Kyran LTD. The decision has been therefore now made to allocate a new parcel of land to Myrzakhanov PE (all formalities are being finalised) instead of this one. This site is no longer in use.
- The land parcel held by the Ai Takh LLC has a very unfavourable location. Despite the fact that it would remain virtually unaffected by the Mine emissions (Figure XXX), being squeezed between industrial sites is a serious disadvantage. It was also previously mentioned (Section 7.1, Section 6.3), this site has already suffered from dust emissions generated by existing stone crushing plants.

In the lights of all these circumstances, Akimat and JSC ShalkiyaZinc LTD have organized extensive consultations and discussions at all levels. Akimat identified alternative sites that can be used as relocation sites. The Zhanakorgan District Akimat convened the meeting of land users where official offers regarding the allocation of alternative sites were announced and accepted by land users. The details of this process will be finalized by the Zhanakorgan District Department of Land Relations, with the process itself to be fully completed by the end of 2016.

With the receptor sensitivity being high, the impact magnitude and significance can be assessed as being negligible and slight, respectively, considering the availability of alternative sites and consultations conducted.

Any other agricultural land (if there is any within the planned land allotment) is not occupied.

The receptor sensitivity is considered to be moderate and the impact magnitude can be assessed as minor because of large areas of agricultural land available to offset the land change impact if necessary. Overall, the significance of this impact is considered to be slight.

Grazing Area Contamination

Dust settlement is already an issue despite a very low scale of industrial activity currently taking place at the Mine site. Dust contamination may affect vegetation cover and grazing area quality.

The air pollution modelling estimates (Section 9.2.9) indicate that the level of the Project-related impacts in this area will be within the WHO ambient air quality guidelines The impact magnitude is considered to be moderate with the receptor sensitivity being assessed as low due to availability of vast areas of grazing land available around the Project site. This results in the impact significance rating of slight.

Table 69. Estimated Project-related Air Pollution Levels at the Ai-Takh Land Allotment

Pollutant	Concentration Range, μg/m^3	WHO Guideline, μg/m^3
PM10, mean daily	20	50
PM10, mean annual	2	20
PM2,5, mean daily	5	25
PM2,5, mean annual	1	10

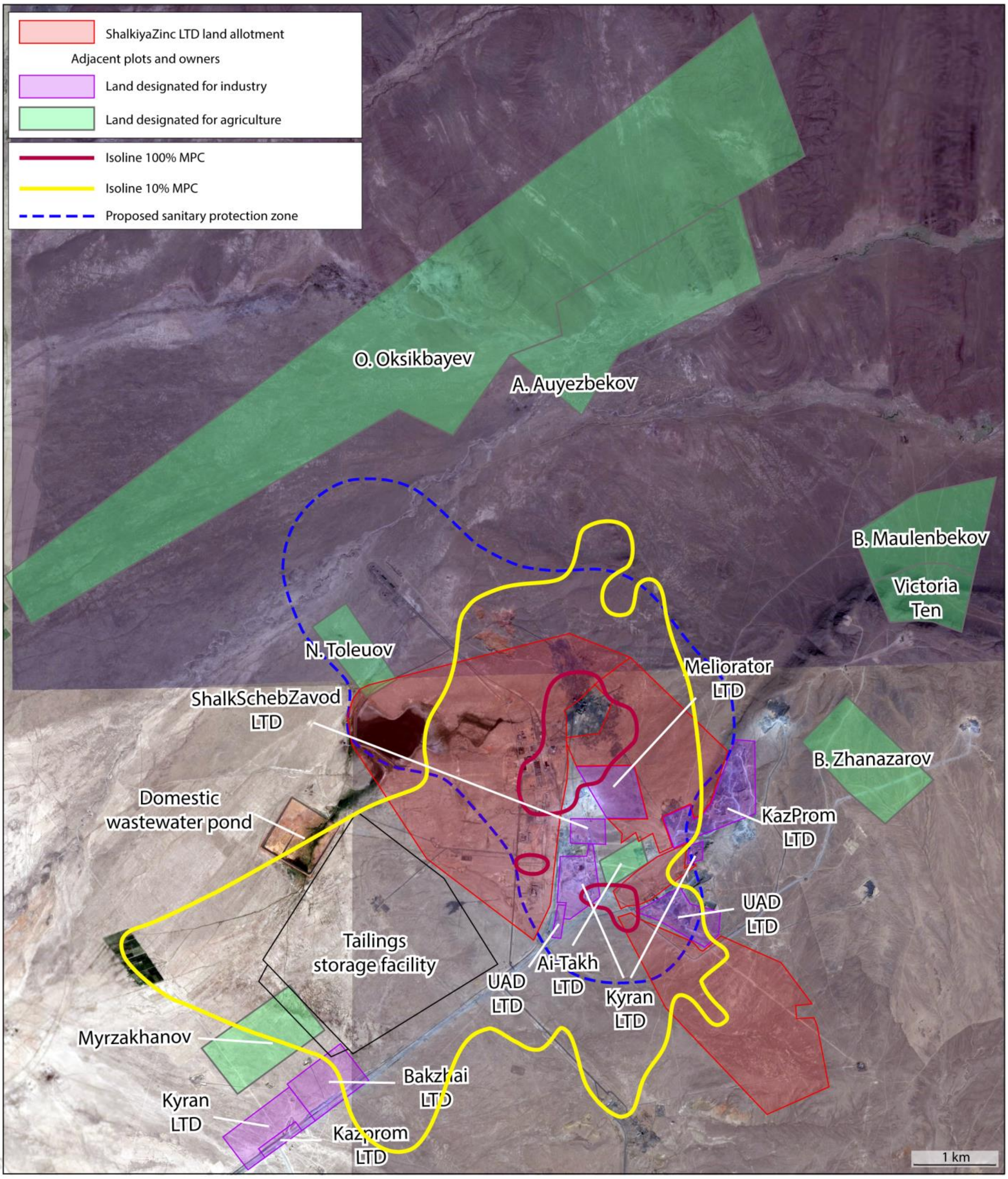

Figure 78. Shalkiya Mine Emissions and Associated Impacts on the Adjacent Areas:

Based on the assessment of impacts associated with the proposed Project, it can be concluded that the Project is unlikely to lead to the economic displacement of neighbouring land users due to the following reasons:

- The Mine-related impacts on the adjacent areas will largely remain within the acceptable limits and relevant guidelines;
- Where the potential exists for these limits and guidelines to be exceeded, land users will be provided with alternative grazing grounds located outside the area of influence of industrial enterprises. This would mean

that affected land users will benefit from improved land use conditions. These land users supported this offer;

- The Project will not involve any physical resettlement.

To further mitigate/prevent any adverse impacts, it is suggested to continue land use consultations as part of the implementation of the Stakeholder Engagement Plan. Once the issue is considered to be finally resolved, JSC ShalkiyaZinc LLC will be required to provide evidence to the Bank that

Overall, it can be stated that the Performance Requirement No. 5 "Land Acquisition, Involuntary Resettlement and Economic Displacement" only applies to the Project's land acquisition plans. While it is important to maintain dialogue with stakeholders, there is no need in developing a Resettlement and Livelihood Restoration Plan for the Project.

With the availability of unoccupied land and the remoteness of the enterprise from human settlements, the sensitivity of the recipient is assessed as moderate. The impact magnitude is assessed as minor with the impact significance being slight.

10.7.3. Recommended Land Use Mitigation

- Implement the Action Plan for preventing/ceasing unauthorized access to the Mine site and facilities (also taking into account recommendations identified in the Management Plan);.
- Continue dialogue with the affected land users;
- Make sure that alternative pasture sites are properly and duly allocated to affected land users;
- Dust suppression (wetting, paving and/or strengthening road surfaces) on the external roads used by the Mine vehicles and running close to the grazing areas;
- Assess the baseline air quality (existing dust levels) before the commencement of the mining operations in order to avoid disputes with other land owners and authorities over the amount of emission fees to be paid.
- Organise and maintain ongoing dialogue with the neighbouring land users on environmental and social issues, to be based on the ESIA Report and future information and reports.

Implementing these measures would help reduce the impact significance to neutral.

10.8. Impact of the Project-Related Transport Operations (Raw Materials, Products and Staff)

The construction and operation of the Mine will involve the need for transporting people and large amounts of freight. Freights will be transported by rail and road. Rail shipments (including raw materials, goods and products) will be delivered directly to the Mine site. It is not planned to use the Zhanakorgan station as a transfer point.

Road transportation routes are schematically presented in Figure XXX. Part of shipments will be transported by road using the major motorway Western Europe

– Western China. Trucks delivering shipments to the Mine site will go around Shalkiya and Kuttykozha villages using a local road that is planned to be repaired with repair works to be financed from the Oblast budget. A special procedure has been developed and approved to manage the transport of hazardous materials, especially explosives.

Unlike freight trucks, vehicles transporting passengers will go through the adjacent human settlements to ensure that transport capacities are used most efficiently. The fly in fly out staff will be delivered to the site twice a month. Local staff living in the adjacent villages will be brought on a daily basis.

Freight and passenger transportation activities associated with the Project of this size could result in increased traffic which is often considered as a major impact. In the context of this Project, potential adverse impacts are significantly offset by the following factors:

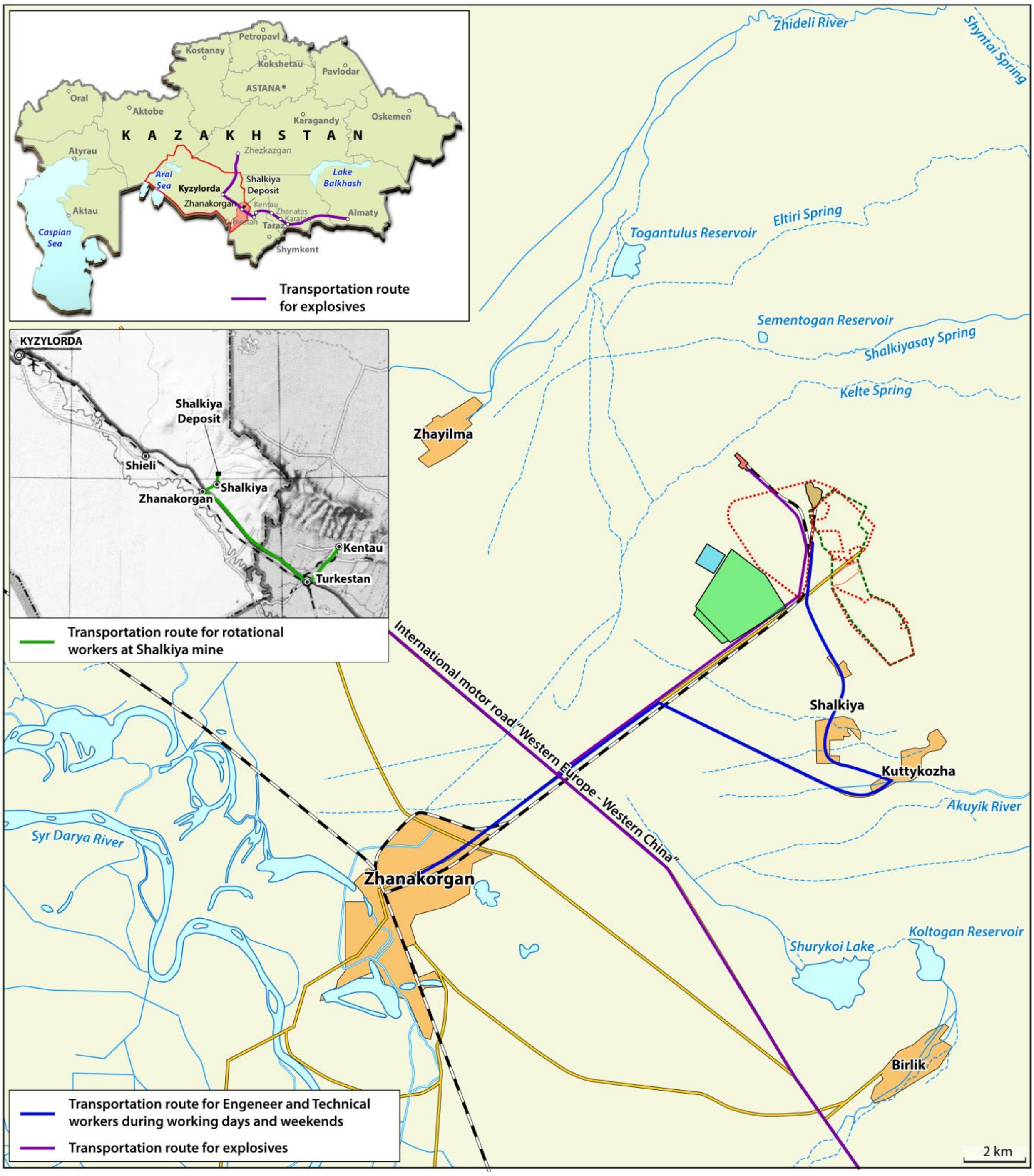

Figure 79. Road Transportation Routes

- The major proportion of freight will be transported by railroad directly to the Shalkiya Mine site.
- Freight trucks delivering shipments to the Mine site will use a major motorway to reach Zhanakorgan; the Project-related traffic represents a very small proportion of total traffic throughput of this route.
- Freight trucks going to/from the Mine site will go round Shalkiya and Kuttykozha villages using an existing road.

It can be therefore concluded that the receptor sensitivity is low (because local communities are located in remote areas) with the impact magnitude and significance being rated as minor and slight, respectively.

The construction-related freight traffic is a separate issue. The rail and road transport of freights should be operated using the same arrangement as one adopted for the operational phase, to result in impacts of similar magnitude and significance.

The following mitigation measures are recommended:

- Adopt the traffic safety policy for freight and passenger traffic, , to be adhered to by the Company and its contractors; require that the specified traffic routes be strictly followed by all Project parties (Company employees, contractors and subcontractors including construction contractors).
- Extra hours on traffic safety rules could be included in the school curricula in Shalkiya and Kuttykozha.

The implementation of measures will reduce the significance of residual effects to neutral.

10.9. Impacts Associated with the Mine Closure

The mine closure is always accompanied with serious social impacts and requires special and early arrangements, so that these impacts can be mitigated. In this case, it has particular importance for the following reasons:

- Shalkiya village was established in its present form specifically to serve the mine; the population’s employment critically depends on the successful performance of the Mine;
- Shalkiya village (unlike the village of Kuttykozha) depends mainly on the Mine production.
- Residents of the Shalkiya village and local authorities twice experienced all the consequences of mine closure.

These factors have created quite a unique situation: the local people have already realized this problem (the Mine closure in the future), it is being discussed, and the people understand that it should be solved.

The receptor sensitivity is considered to be very high and the impact magnitude is major. The impact significance is assessed as large.

This problem (or an expected impact) is long-term and is of very high (critical) significance for the local population. It is advised not to postpone the consideration of this problem to indefinite future, but rather to start studying and analyzing it and searching for possible solutions.

Promoting a vision of the desired future and searching for alternative ways of development of settlements need attention. It is very important at this stage to diversify production. This should be considered during the development and supported any initiatives aimed at diversification. This will increase social sustainability of the Project and will provide for a more sustainable development of the settlement.

At the same time, when developing the infrastructure of the village (housing and necessary social facilities) it is necessary to consider how these facilities will be used in the future. Without such long-term planning, at the end of the Project we will witness effects similar to those that can be seen today in the remnants of Pioneer settlement (Ulan) and abandoned dilapidating multi-storey houses built for the mine employees expected to arrive in the period of intensive development

10.10. Impacts on Cultural Heritage

The archaeological survey has discovered two burial mounds that have historical and cultural value. While the Project is not likely to have any direct impact on these sites, the current national legislation requires that appropriate measures be taken to protect these sites from any potential adverse impact. According to the current legislation[211], the following provisions should be included in the design:

- Establish and maintain a 50 m protection zone around the outer boundaries of a historical and cultural heritage site; a visual range of 200 m from the centre of the protection zone should be maintained;
- The protection zone established around a cultural and historical heritage site should be marked with signs or strips of ploughed land, or fencing, or a row of shrubs. Protection signs indicating the name of a site and size of protected area should be installed on all four sides.

No activities that may adversely affect the site security and value should be conducted within the protection zone.

It is not possible to assess the significance of the Project impact on cultural heritage at this stage because information is not available for a larger part of the Project site. The historical and cultural review has been conducted only for those areas where new Mine facilities will be located; a very small part of the Project site has been surveyed to discover two burial mounds. There is no action plan to deal with conservation/management of these features.

As urgent events (Q2 2016) it is necessary:

- To take measures required to ensure the conservation of burial mounds discovered in the buffer zone as required by the national legislation (delineate the zone and provide warning signs)
- To complete a comprehensive research and the historical and cultural heritage review for the entire Project area in line with the RK legislation

In the short term, immediately upon completion of the research it is necessary:

[211] "Rules for Delineating and Setting the Management Regime for the Protection Zones, Regulated Development Zones and Natural Landscape Protection Zones around the Historical and Cultural Heritage Sites", approved by the RK Government Resolution of 29 December 2014 No. 156:

- To develop the Cultural Heritage Protection Plan in line the EBRD PR8 “Cultural Heritage” and IFC PS 8 “Cultural Heritage”, taking into account the requirements of the RK legislation.
- As part of this Plan, to develop and implement chance-find procedure
- During the construction and operation phases of mine, closely monitor compliance with this procedure during any works at the mine

It will be required to make sure that any initiatives proposed for them are in line with the EBRD requirements.

It is only planned to organize a cultural heritage survey of the rest of new land allotment.

10.11. Mine Health and Safety

10.11.1. Assessment

Mining is a generally hazardous activity with a range of potential hazardous that must be recognised and planned for in the process of operationalizing the mine. The hazards associated with mining include, but are not necessarily limited to, hazardous substances, explosives, live circuits, extreme temperatures, ionising radiation, noise and vibration, fire, explosion, working at heights, confined spaces and oxygen deficient air. All of these hazards would exist during the restarting and operations of the Shalkiya mine. At the same time the hazard properties of especially lead carbonate as a finished product need to be considered. As described previously the lead carbonate presents a number of adverse health risks associated with direct contact to skin and eyes, gastrointestinal effects as a result of ingestion and respiratory tract infection as a result of inhalation. The primary method for reducing potential worker exposure is to ensure that there are control measures in place to limit the formation of lead dust. These controls are especially important for the intermediate product stockpile and the operations of loading the material into bags. Bag failure is also a potential risk during the loading of the rail cars. Over and above the controls to prevent lead dust workers potentially exposed to lead dust must be equipped with personal protective equipment including respirators, eye and skin protection.

10.11.2. Occupational hazard mitigation

Mitigation must take the form of a comprehensive health and safety management plan incorporating the following aspects:

- Detailed identification and prioritisation of hazards
- Preparation of emergency response plans specifically applicable to all mine related activities including the provision and maintenance of necessary emergency response and rescue equipment;
- Ensuring a sufficient number of first aid trained employees to respond to emergencies;
- Implementation of specific personnel training on worksite health and safety management including a communication program with a clear message about corporate management’s commitment to health and safety. The communication program should also include regular meetings such as daily talks prior to initiation of work shifts;
- Integration of behavioural considerations into health and safety management, including on- the-job behavioural observation processes;

- Training of employees on the recognition and prevention of occupational hazards
- Illumination systems must be adequate and safe for the working conditions in travel paths, mine working areas, and within and around surface facilities and dumpsites of mines
- Establishing signage in hazardous and risky areas, installations, materials, safety measures, emergency exits, and other such areas should be in accordance with international standards (including standards of cleanliness, visibility and reflectance in areas of potentially poor illumination or sources of dust and pollution), be known and easily understood by workers, visitors, and as appropriate the general public;
- Where alternative technologies, work plans or procedures cannot eliminate or sufficiently reduce a hazard or exposure, the mine operators should provide workers and visitors with the necessary personal protective equipment (PPE), and provide instruction and monitoring in appropriate maintenance and use (ongoing, to be improved).
- Applicable PPE must include, at a minimum, safety helmets and footwear, in addition to ear, eye, and hand protection devices and in the case of possible lead exposure eye, and skin protection and respirators (not that simple dust masks are not considered to provide adequate protection);
- Provision will also need to be made for laundering of overalls of worker who are potentially exposed to lead dust at the mine facility;
- Wash up facilities must also be provided so that workers can immediately shower after removing their overalls;
- Occupational health assessments should be conducted for employees on a regular basis, based on exposure to risk (ongoing),
- Recording arrangements for incidents and injuries should be improved and brought closer in line with the concept the modern management systems offer; as the implementation of the OHS management system (for example, to OHSAS 18000) moves forward, it is recommended to further enhance the occupational injury recording and reporting system by not only maintaining record of lost time injuries but also reporting incidents with no consequences and near misses;;
- Medical records should be retained for at least 20 years.

10.12. Community health and safety

Community health and safety may be threatened by mine activities in the following ways:

- Catastrophic failures of tailings or water dams with resultant flood and landslide risks;
- Off site pollution impacts;
- Risks associated with vehicle movement; and
- Land subsidence.

10.12.1. Catastrophic failure of tailings or water dams

In the case of the Shalkiya Mine there is a significant distance between settlements and the mine activities, more than 5 km in the case of Shalkiya village and more than 4 km from Shalkiya North. Given that distance and the relatively flat topography a catastrophic failure of either the tailings or mine water dams would not directly effect the two settlements. That notwithstanding the catastrophic failure of either of the dams would have serious economic repercussions and could even result in the mine being forced to close, albeit only temporarily. As such the dams must be built to comply with the safety standards required for all mine dams to minimise the risk of dam failure. Receptor sensitivity is accordingly considered to be low and impact magnitude moderate, which would result in an impact significance of slight. The fact that dam failure is considered to be unlikely would serve to further reduce impact magnitude to negligible with a resultant impact significance of slight. The impact significance notwithstanding the following mitigation must be implemented:

10.12.2. Mitigation to prevent catastrophic failure of tailings or water dams

- Planning, designing, and operating all structures such as open pits, waste dumps, tailing dams, containment facilities and underground excavations such that geotechnical risks are appropriately managed throughout the entire mine cycle. Additional levels of safety should be applied in active seismic areas;
- Systematic monitoring and regular review of geotechnical stability data should be carried out;
- For waste dumps, fills and other containment structures, static safety factors should be established based on the level of hazard for the operational phase of a facility and at closure; and
- Potential change of geotechnical properties in dumps due to chemical or biologically catalysed weathering should be considered. Design of new facilities has to provide for such potential deterioration of geotechnical properties with higher factors of safety. Stability / safety assessments of existing facilities should take these potential changes into account.

10.12.3. Off site pollution impacts

Of the various emissions likely from the operational mine it is only dust that is likely to be generated at concentrations that would potentially result in off-site impacts. The air quality dispersion modelling indicates that the highest predicted dust concentrations would generally not result in exceedances of health based ambient air quality standards. Modelled dust concentrations at Shalkiya North for example show low concentrations of dust and imply that concentrations would be still lower at Shalkiya village itself. As such adverse heath effects associated with dust emissions are highly unlikely to manifest in areas that would result in community exposure. Given the existing rock crushing operations and the dust from the mine it is conceivable that dust could present a nuisance in the form of soiling of clothes, irritation and other similar effects but such an effects is deemed to be unlikely. The mitigation defined in Section 9.2.10 would serve to further limit this off-site dust exposure risk. Given that the receptors would be people the receptor sensitivity is considered ***very high*** but the impact magnitude is considered to be ***negligible*** or even ***no change***. This would result in an impact significance of ***slight*** at worst, if not ***neutral***.

10.12.4. Risks associated with vehicle impacts

The offsite movement of vehicles poses a risk to communities both in close proximity to the mine as well as further away. Impacts can take the form of vehicle accidents with mine dedicated vehicles resulting in death or injury or large scale spills of hazardous chemicals, fuel and lubricants. Receptor sensitivity in the case of vehicle accidents would be very high because of the risk of injury or death and the impact magnitude at least moderate resulting in an impact significance of large. It is also considered that the risk of such impacts occurring is probable given the death rate of 25 per thousand people from road traffic accidents. Mitigation could be used to reduce the likelihood of death or injury as detailed below.

10.12.5. Mitigation to reduce risk of death or injury as a result of road accidents

- Ensure roadworthiness of all vehicles travelling to and from the mine site;
- Train drivers in defensive driving techniques with frequent refresher courses;
- Apply both reward for good driving and punitive measures for bad driving; and
- Implement fatigue management measurements that are consistent with good practice

10.12.6. Land Subsidence

Subsidence has already been presented in Section 9.5.1 but principally in terms of worker safety. For communities in close proximity to the mine, subsidence may result in damage to houses and properties, social infrastructure such as roads, water supply systems, sewage treatment and so forth. In extreme cases subsidence can also result in potential injury or even death. In the case of Shalkiya the underground mining does not extend under the settlements and in fact gets progressively deeper as it moves in the direction of the settlements of Shalkiya North and Shalkiya. As such the risk of damage to community dwellings or social infrastructure is considered to be ***highly unlikely***. While receptor sensitively is considered to be ***very high***, impact magnitude is considered to be ***no change*** resulting in an impact significance of neutral.

10.13. Post closure impacts

10.13.1. Public health and safety

Perhaps the key environmental risk post closure relates to public health and safety. Safety risks can arise from potential failures of the tailings storage facility or the mine water dam and also through people accessing parts of the mine where there are safety risks. As was argued previously receptor sensitivity would be very high given that people are at risk here but the scale of the impact would be no more than moderate given the very limited exposure that people are likely to these risks even were they to occur. The area is very scarcely populated and largely flat with very limited, if any downstream receptors who might be affected by a tailings dam failure. In addition, the probability of a dam failing given the application of modern design protocols is considered highly unlikely even after mine closure. This would see an impact significance of no more than slight. It must be recognised, however, that the impact significance rating is based on the assumption that the following mitigation will be implemented:

10.13.2. Mitigation

- All structures must be designed so that they remain stable after mine closure and so do not pose public safety risks as a result of deterioration or physical failure.
- The tailings and mine water dams must be decommissioned in such a way that rainwater is diverted away from the dams after they have been decommissioned.

- These diversions must be designed to cater for the peak rainfall and a maximum flood event and there must be maintenance of these diversions for at least five years following mine closure.
- Physical hazards such as shafts, and other openings should be effectively and permanently blocked from all access by the public.

10.13.3. Biodiversity impacts

It has already been presented that opportunities for reclamation are likely to be very limited given the harsh conditions that prevail at the mine. The soils are thin and vegetation sparse and this means that opportunities for reclamation will be very limited and there should not be undue expectation as to what is likely to be achieved. That notwithstanding the same assessment as previously presented for biodiversity is likely to apply in that because of the size of the area of similar habitat that extends well beyond the mine and indeed for many hundreds of square kilometres that the biodiversity impact magnitude will minor. Because of the area of which that habitat extends as largely homogenous the receptor sensitivity is considered low and that would result in an impact significance of no more than slight. No specific mitigation is proposed for post closure biodiversity impacts.

10.14. <u>Project's Zones of Impact</u>

Summarizing information and analysis presented in Sections 9 and 10, the following zones of impact can be identified for the Project for better visualization (Figure 80):

- Zone of large environmental impact identified using the adverse impact on ambient air quality as a key criterion with the magnitude of impact considered to be large if the pollutant concentration in the ambient air exceeds the MAC limit set for this pollutant. This zone does not include human settlements and is limited to the Mine site and sanitary protection zone established for the Mine[212];

[212] The size of this zone may differ in the bankable ESIA and national OVOS. The difference stems from different methodologies employed to produce air pollution dispersion estimates and ambient air quality standards applied. Without going into too much detail, it can be only noted that the OVOS and ESIA conclusions are similar at the qualitative level, indicating that human settlements located closest to the Mine site are still outside its zone of air quality impact.

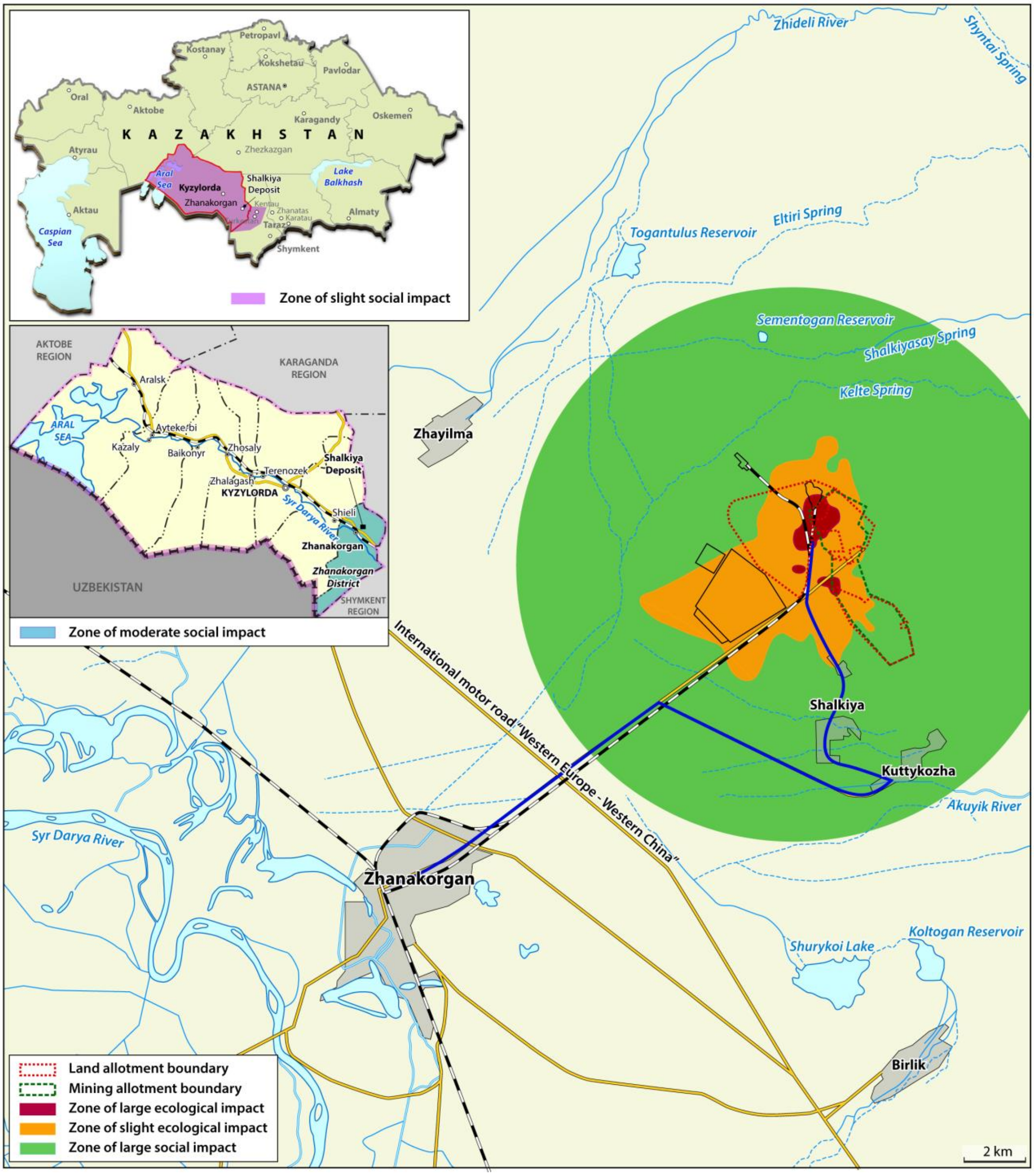

Figure 80. Project's Zones of Environmental and Social Impact

- Zone of slight environmental impact has also been identified based on the air quality impact criterion; the slight impact would be expected if the ambient air pollution levels are in the range from 10% to 100% of the MAC limit values set for polluting substances. This zone also does not extend into the nearest human settlements.
- Zone of large social impact includes Shalkiya and Kuttykozha villages where the Project's social impacts would be expected to be both beneficial and adverse. Relevant recommendations are provided in Section 10.
- Zone of moderate social impact encompasses the whole Zhanakorgan District where mainly positive social impacts would be expected. Relevant assessments and recommendations are also provided in Section 10.

- Zone of slight (positive) social impact includes the whole Kyzylorda Oblast.

The proposed zoning is underpinned by qualitative considerations and not meant to be complete and detailed. It rather helps visualize a general picture of impacts that would be expected during the Project.

11. STAKEHOLDER ENGAGEMENT

The Project stakeholders can be grouped into the following two categories:

- Internal stakeholders including the companies undertaking the Project (ShalkiyaZinc and Tau-Ken Samruk), their management and staff, their contractors and subcontractors involved in the Project, and other stakeholders directly involved in the Project and benefitting from it;
- External stakeholders including authorities involved in the Project approval process, affected communities and interested public.

This Section describes the ShalkiyaZinc relationships with the external stakeholders, especially with the affected communities and interested public.

The internal stakeholders are considered in other Sections.

11.1. Company Experience in Stakeholder Engagement

JSC ShalkiyaZinc Ltd is building its stakeholder relationships in line with the legislation of the Republic of Kazakhstan. It regularly holds public hearings in matters specified in the relevant laws and regulations.

The following public hearing events were conducted in the recent years:

- On 19.06.2012, the public hearing was held to discuss the Shalkiya Mine Expansion Project to produce 4 million tonnes of ore per annum, ongoing activities and 2013-2014 Environmental Protection Plan. The public hearing was attended by 53 participants; information about the Project was distributed; questions raised by the participants were answered.
- On 18.11.2014, the public hearing was held to discuss ongoing activities and progress of the Environmental Protection Plan.
- On 12.02.2016, the public hearing was held to discuss the 2016-2017 Environmental Protection Plan for the Shalkiya Mine.

The public hearings were reportedly held in the past but no records were provided presumably due to long breaks in the Mine operation.

The above mentioned public hearings were conducted in Zhanakorgan settlement. These events were announced in the local newspaper (the Zhanakorgan Tynysy newspaper) and the minutes of public hearings are available. These events were attended by 20-25 people including representatives of relevant authorities (Kyzylorda Region Department of Natural Resource Use and Management, Kyzylorda Region Department of Environment, District Environmental Inspectorate, and District and Rural Akimats), residents of Zhanakorgan, Shalkiya and Kuttykozha settlements, and media.

The agenda of these public hearings included key presentations made by the Company representatives, questions from the public and answers of the Company representatives. The questions raised by the public concerned the efficiency of environmental protection actions, staff recruitment and qualifications, mine water discharges and process emissions. Drinking water quality and scarcity was an issue of particular interest for the members of local communities. The proposal to use the Syr Darya river water for technical purposes was discussed. The minutes of the public hearings contain a summary of presentations made, questions and answers, and a concluding statement of support for the Project and Company activities.

In addition, the Zhanakorgan Forestry Company Republican State Enterprise organized the public hearing on 20 January 2016 in Kyzylorda to discuss the proposed land use change whereby forestry land is converted to industry, transport, communications, space industry, defence, national security and other non-agricultural uses. The ShalkiyaZinc Company was closely involved in the process because the proposed land use change was intended to provide land required for the mine expansion. This hearing was also attended by 4 residents of Zhanakorgan settlement who supported the proposed land use change.

The review of information provided leads to the conclusion that the public hearing events described above are consistent with the RK legislation and current practice.

In addition to public hearings, the Company maintains continuous consultations with the communities on employment and recruitment to provide information on hiring policies, training opportunities etc. Local residents are also able to convey their questions via the Shalkiya Aul District Akimat where the public requests are filed in the incoming correspondence logbook, and appoint a meeting with the Mine management.

Generally, the Company's stakeholder engagement experience is relatively vast and very positive. The success of the dialogue is greatly enhanced by the fact the Company management is closely and directly involved in the public consultations.

That said, the following gaps emerge from the review of this experience in the context of compliance with IFI's requirements:

- The Company has not maintained the systemic identification and analysis of stakeholders: vulnerable groups are not identified; stakeholder expectations and concerns are not examined with analysis being limited to providing answers to questions raised by stakeholders. This approach is fully in line with the national legislation while falls short of meeting the EBRD/IFC requirements and best practice;
- The public meetings were only conducted in Zhanakorgan, not in the Shalkiya Akimat whose residents could find it difficult to attend these events; a closer location to affected communities (Shalkiya and Kuttykozha) should be found for the ESIA consultations;
- The stakeholder conflict avoidance and resolution arrangements are limited to options set out in the RK legislation. There is no special grievance mechanism to handle complaints and questions from the public regarding the proposed Project;
- Information about environmental aspects of the Mine operations is only distributed in the form of announcements published in the media and presentations made at public hearings and only as stipulated by the national legislation. No proactive distribution of environmental and social

information through the Internet, leaflets and topical publications is maintained.

These comments concern the development of stakeholder engagement using the national procedures and have to be considered as opportunities that are being missed but need to be utilized in the ESIA process to underpin the improvement of stakeholder dialogue in the future.

11.2. Stakeholder Parties, Their Expectations, Concerns and Engagement Opportunities

A broader analysis of stakeholder parties is presented in the Stakeholder Engagement Plan developed as part of the present ESIA. This Section focuses on the expectations and concerns of the following affected groups:

- The Shalkiya and Kuttykozha residents (affected communities, please see Section 8) and vulnerable groups;
- Neighbouring land users occupying land adjacent to the Mine site;
- Livestock owners using adjacent areas for livestock grazing.

Shalkiya and Kuttykozha Settlements

Local residents are extremely interested in the Project. They hope that new jobs would be created and community infrastructure improved. These hopes were reiterated by all participants of the ESIA consultation meetings, as well as the members of the public attending the public hearing events organized by the Company in 2012-2016.

Among the environmental issues, the drinking water quality appears to be a top concern for local community members. A significant part of local households use private wells with water that does not meet the drinking water quality standards and is only suitable for technical purposes. It appears that this aspect is not related to the Mine operations and depends on natural factors. In 2017, a water supply line to Shalkiya will be repaired as part of the state programme and local residents will use water from the Talap groundwater basin.

Other issues that cause concern of local people include emissions and discharges associated with the Mine expansion; these issues should be discussed and addressed as part of the ESIA process.

It is important to ensure that access to information on the Project's environmental and social aspects is as easy as possible for the Shalkiya and Kuttykozha residents. This could be achieved by setting up the Public Information Centre in Shalkiya where all ESIA and OVOS materials will be available along with other specially prepared information. The public consultation meetings and hearing are also recommended to be organized in Shalkiya. These steps would help improve the local public awareness about the environmental and social aspects of the Project.

A range of issues for discussion as part of the ESIA process should be made broader, to include both the legacy of past mining activities and future fate of the communities and how it is likely to be affected by the Mine construction, operation and closure.

Neighbouring Land Users

Land users occupying neighbouring parcels of land represent a separate stakeholder group whose members are listed in Section 6.1. It is recommended to deal with this group individually.

Households Grazing Livestock near the Mine Site

The adjacent areas and even the Mine site itself are used for livestock grazing by the members of local communities including Shalkiya, Kuttykozha (cattle, sheep, goats, and horses) and even Zhalyima (camels). Apart from providing a fence around the Mine site, it is required to communicate with the local public to explain them that livestock grazing is not allowed at the Mine site. This communication should be initiated as part of the public consultation process and could take various forms, from information leaflets and public meetings to individual communications.

Local Authorities

The local authorities (the Zhanakorgan District and Shalkiya Aul District Akimats) are very enthusiastic about the Project. That said, the Shalkiya Aul District Akim, while expressing his strong support to the Project, also voiced concern about the future fate of the settlement after the Mine closure. This issue is directly related to a broader topic of the future mine closure phase. The Mine should assist the Akimat in formulating the desirable vision and optimal development strategy for the local communities, to encompass all the stages of the Mine lifecycle including its closure. It is recommended to start working on this issue as soon as possible, for example as part of consultations on the ESIA findings.

Non-Governmental Organisations

The level of interest and potential concerns of this stakeholder group have not been assessed yet. It is recommended to address this issue as part of the ESIA consultations.

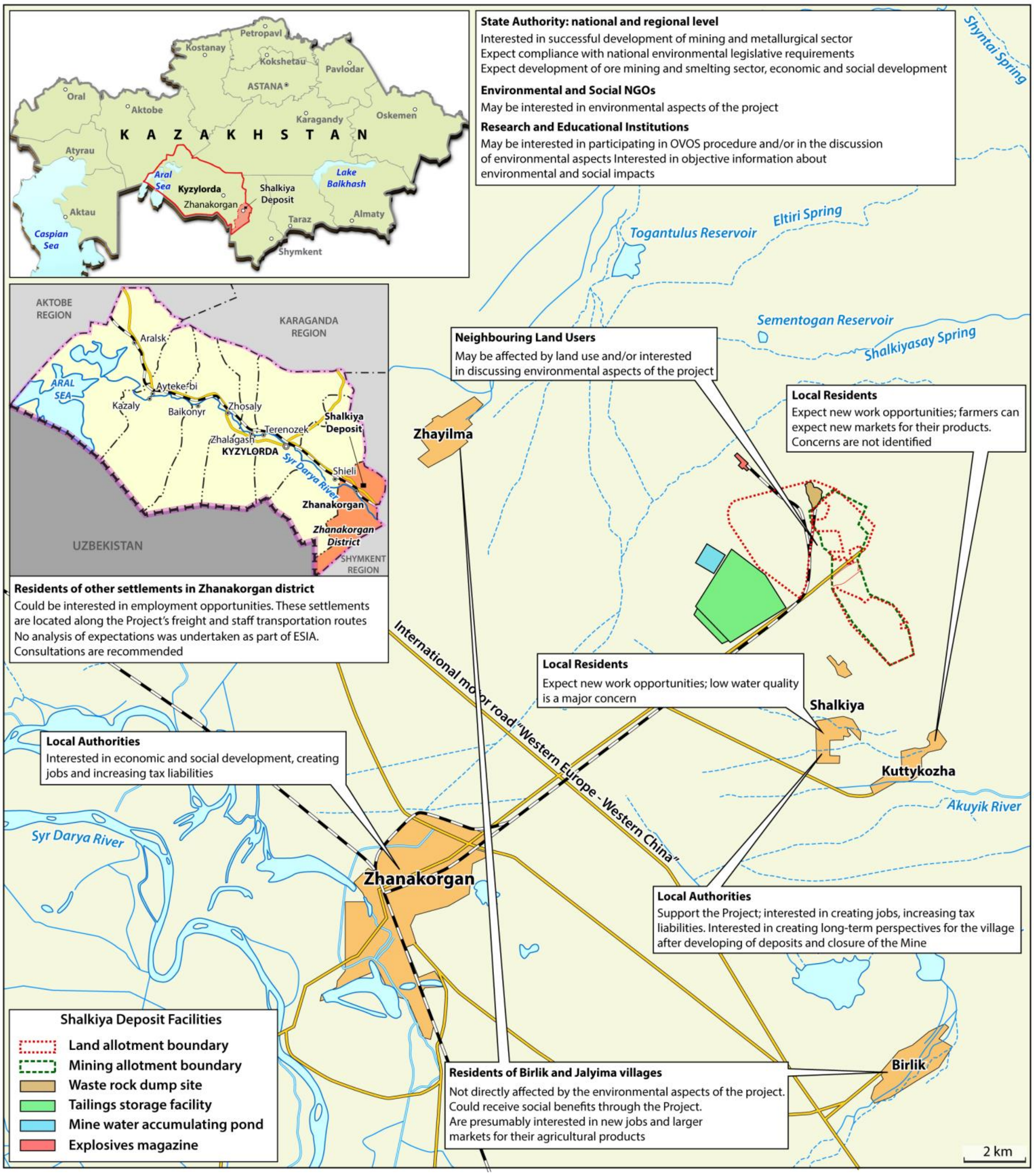

Figure 81. Map of stakeholders

Principles, approaches and mechanisms of stakeholder engagement are discussed in terms of interaction with stakeholders (SEP). There's also the initial proposed programme of cooperation. The implementation of the SEP create a solid base for dialogue and cooperation. The company should analyze the results of the implementation of the Sep, update, and supplement it by the results of the analysis.

12. ENVIRONMENTAL MONITORING PROGRAMME

12.1. Project Monitoring

According to the IFC requirements (2012), the client is required to introduce and maintain procedures for monitoring and evaluating the efficiency of a management system and assessing compliance with relevant legal and/or contractual provisions and regulatory requirements.

GN83. Monitoring is the client's primary means for tracking and evaluating progress towards the implementation of the management system and programs, including all action items specified in the Action Plans. Clients should establish a system for measuring and monitoring consisting of (i) the key risks and impacts of the project on employees, communities and the natural environment as identified; (ii) compliance with laws and regulations; and (iii) progress in implementation of the management programs. The type, extent and frequency of monitoring should be commensurate with the potential impacts and risks of the project as identified by the risks and impacts identification process, and as specified in the management system. In addition, depending on the nature of the project, it may be appropriate for the client to establish, track and measure key indicators and other performance measures over time to illustrate the improvement in a project's performance or highlight areas where more effort is required.

GN84. As part of the monitoring programs established in the management system, it would be appropriate for the client to establish key social development measurements and indicators, quantitative and qualitative measures of success, and include stakeholder engagement practices in the action plans in order to improve performance on the social issues identified or highlight areas where more effort is required.

In line with the recommendations of the Integrated Pollution Prevention and Control Reference Document on Best Available Techniques for Management of Tailings and Waste-Rock in Mining Activities (European Commission, January 2009) and provisions of the Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries, the industrial process monitoring programme should include the following parameters:

- For the tailings storage pond/dam:
    - Water level;
    - Dam seepage quality and quantity;
    - Groundwater level, pore pressure, dam crest and tailings movements;
    - Seismicity to control stability of the dam and underlying geological strata;
    - Pore pressure and liquefaction;
    - Soil mechanics;
- For waste rock heaps:
    - Bench/slope geometry;
    - Drainage;

- Pore pressure;
- Visual inspection and geotechnical review;
- Independent geotechnical (mining and environmental) audit;
- Recommendations for tailings ponds/dams:
- Visual inspection;
- Annual review;
- Independent audit to assess and predict the safety of existing dams.

12.2. Environmental Monitoring Programme

The environmental monitoring programme is an important component of overall project monitoring system and it should be consistent with the following IFC requirements:

GN85. The factors to be considered in establishing an environmental monitoring program typically include (but are not limited to) engineering estimates, environmental modelling, pollutant source (e.g., emissions to atmosphere, wastewater effluents, solid and hazardous waste), noise, ambient water quality and quantity (both surface and groundwater), air quality, and workplace contaminant measurements. For certain projects, biodiversity monitoring can be an important element of the overall monitoring program (refer to Performance Standard 6 and the accompanying Guidance Note for further guidance). The focus and extent of the monitoring should be commensurate with the risk of the pollutant releases as related to the sensitivity of the surrounding areas, taking into account the Affected Community's perception of risks to their health and environment resulting from the project. Appropriate processes should also be in place to ensure the reliability of data, such as calibration of instruments, testing of equipment, and software and hardware sampling. Specific environmental monitoring measures comprise the parameters to be measured, sampling and analytical methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate), and the definition of thresholds that signal the need for corrective actions. Where external laboratories or other analytical services are required to analyse samples, these should be certified at least under nationally recognized schemes to ensure measurements and data provided are accurate, defensible and reliable.

The environmental monitoring programme should be developed in line with the requirements of the national legislation but it also has to take into account key IFC provisions and best international practices (Reference Document on the General Principles of Monitoring, July 2003).

In 2014, the Mine developed and brought through the approval process its Industrial and Environmental Monitoring Programme (IEMP) for 2015-2017 , i.e. for the period involving the construction and commissioning of key mine processes and facilities. The project involving the construction and commissioning of the processing plant, which is currently being launched, is beyond the scope of this Programme.

The monitoring programme proposed in the ESIA will encompass all Project stages starting from the design and construction to mine closure, restoration and/or putting into care and maintenance.

The following essential differences between IFC requirements and those set out in the relevant RK laws and regulations should be borne in mind.

12.2.1. Microclimatic characteristics

The RK environmental legislation does not require determining the local climate characteristics, describing conditions that affect the dispersion of pollutant emissions in the ambient air (wind direction and velocity, humidity, temperature, precipitation quantity and duration etc.) directly at the enterprise site or within the SPZ. Dispersion estimates are produced using measurement data from the nearest meteorological station thus causing an indefinable error in these estimates from the very outset.

An automatic weather station with a required suite of sensors enables the collection of input data for producing accurate pollution dispersion estimates and recording of inclement weather conditions that may require management intervention, for example, for reducing emissions during lengthy winter calms. However, the installation of an automatic weather station that would meet the requirements of the existing monitoring network maintained by KazHydroMet and be capable of providing required data inputs for the emission dispersion modelling as part of the national OVOS process is a quite expensive step that could be made in the future as the Project moves forward. To enable the collection of online data on local climatic characteristics (wind direction and speed, temperature, humidity, and precipitation), a less expensive professional automatic weather station could be considered. It is first of all required for providing data on winds blowing in the direction of the nearest human settlements.

12.2.2. Ambient Air

The RK system of sanitary guidelines regulating the ambient air quality is mainly based on the use of guideline concentrations of pollutants measured over a short time interval and set as maximum acceptable single-time concentrations of regulated pollutants (MAC max s-t.). The maximum acceptable mean daily concentrations of pollutants (MAC md) are used much less frequently.

An industrial and environmental monitoring programme in the RK normally involves the instrumented measurement of pollutant concentrations that are time-averaged across a 20-30 minute period and comparison of measured concentrations with a guideline value set as the MACmax s-t. limit for a relevant pollutant. The results produced using this technique are not sufficiently representative, they often involve a significant amount of uncertainty, and are contingent upon rapidly changing weather conditions , as well as the Mine life cycle activities releasing emissions to the ambient air. The time-averaged 20-minute measurement results are not able to provide an accurate picture of ambient air quality at the SPZ boundary and in the adjacent residential areas; the impact on receptors (employees, adjacent residential areas, local fauna) is therefore difficult to assess properly.

It should be noted that the use of data on mean daily concentrations of pollutants for the emission dispersion modelling is only required in the situations when an industrial site is located close to other polluting industries operating in a cyclic or intermittent manner. In the context of the Project, this concerns the stone crushing plants that generate dust emissions intermittently and temporarily[213]..

To address these differences in air quality assessment techniques, the Industrial Environmental Monitoring Programme adopted at the Mine should be amended to incorporate the IFC requirements regarding the measurement of mean daily concentrations.

Ore mining, processing, haulage and transfer operations generate particulate matter that adversely affects human health including the Mine employees and residents of adjacent human settlements. . The proposed Monitoring Programme should therefore include additional parameters such as fine particulate matter concentrations (PM_{10} and $PM_{2.5}$). Since 2012, these parameters have been in the list of monitored ambient air quality parameters (please see the Ambient Air Section).

12.3. Surface waters

Natural surface watercourses flowing through the mine site or surrounding areas have obvious seasonal nature (please see the baseline) and dry up in summer. However, water levels in these watercourses may rise very rapidly during winter thaws or spring floods, thus creating risk to the safety of mine facilities including waste rock and ore stockpiles, tailings storage facility, mine water and domestic sewage ponds etc. Consequently, the monitoring programme should include a provision on the seasonal water level monitoring in the Kelta stream and other smaller streams.

It is also required to measure water levels in the mine water pond because it is located in the natural depression isolated by the dam and acting as an accumulating basin for rain and snowmelt water in spring. The Mine employees reported that water levels in this pond may rise by up to 2 m relative to levels recorded in summer. This means that water level monitoring in the mine water pond should be included in the Industrial and Environmental Monitoring Programme in order to enable the timely prediction of accidents and early warning/prevention of potential emergencies.

The composition of bottom sediments in the mine pond should be also monitored, both in the deeper section of the pond (accumulation of toxic substances) and in the beach area (airborne transport of fine ore particles).

The mine considers using water from the Syr Darya River as a backup source of water for technical purposes at the processing plant. Once a decision on the design and construction of water line to convey river water to the Mine site is made, a provision on the y monitoring of seasonal variations in water levels in the Syr Darya River at the water intake location should be included in the monitoring programme.

12.4. Waste

During the mine operation, process waste streams generated at the site will mainly consist of overburden, waste rock and tailings that will be disposed of at the tailings storage facility. Waste rock dump drainage and groundwater at the

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[213] Contaminated land, raw materials and accumulated process waste at the stone crushing plant sites continuously generate dust, especially during strong wind periods

waste rock dump sites should be also monitored because it may migrate downslope during heavy rainfall events, winter thaws and spring floods, causing soil, groundwater and surface water contamination.

12.5. Physical factors: noise, vibration and electromagnetic radiation

No measurement and assessment of impacts caused by physical factors to potential recipients at the SPZ boundary and in the nearest residential areas are currently conducted at the Mine site. These parameters should be included in the Environmental Monitoring Programme.

12.6. Industrial and Environmental Monitoring Locations

The choice of proposed industrial and environmental monitoring locations identified in the approved IEMP relies on recommendations developed in 2007 (**Figure 21**) and has not changed since then.

This section focuses on those parameters that are missing in the IEMP.

12.6.1. Local climate monitoring using automatic weather station

By promptly installing an automatic weather station, the Mine will be able to collect and accumulate data on wind directions and speeds that are required to estimate emissions from various sources associated with the processing plant and other mine facilities. The availability of meteorological characteristics adequately describing weather conditions at the mine site will enable the adjustment of emission estimates taking into account prevailing wind directions and plan actions to be taken in the event of inclement weather in a manner that takes account the seasonal variability of weather parameters.

12.6.2. Mine water pond

The Mine employees reported that the design documentation for the mine water pond including a bottom lining system has been lost and there is no information on whether there is a lining system. The technical condition of this water management facility is currently not monitored. Information about the mine water pond capacity is similarly lacking, thus impeding the assessment of risks and consequences that may occur as a result of the dam failure and release of contaminated bottom sediments downgradient.

In the fall of 2015, the pond’s walls and dam were raised and illegal livestock watering was banned. The actual current capacity of the mine water pond, condition of the pond bottom and volume of bottom sediments can be assessed by conducting an underwater sonar survey using a sonar or echo sounder. A ground survey should be also conducted to assess the accumulation of sediments in the beach section of the pond.

The following parameters should be monitored on a regular basis in the mine water pond as part of the Environmental Monitoring Programme:

- Visual inspection of the pond dam to assess its technical condition;
- Establish a hydrological station to monitor water levels near the pond dam;
- Mine water volume in the pond;
- Mine water discharges;
- Bottom sediment sampling at the deeper section of the pond based on the sonar survey results;

- Mine water sampling at the mine water discharge outfall and in the emergency spillway in the dam;
- Concentrations of metals in both dissolved and suspended form in mine water;
- Water table and water quality in the baseline and monitoring wells near the mine water pond.

12.6.3. Domestic sewage pond

Domestic sewage pond is currently not operational due to a poor technical condition of sewage pipeline. Because the configuration of a sewage treatment and recycling system that would help meet the water demand of the processing plant is currently being considered, the monitoring programme for the domestic sewage pond will be developed at a later stage on a routine basis. It is expected the scope and composition of monitoring activities will be similar to those planned for the mine water pond, to include the control of technical condition of the pond itself and its retaining dam, volume and quality of wastewater discharges, and water quality in the baseline and monitoring wells.

12.6.4. The Shalkiya-sai Stream and its tributary Kelte

The seasonal hydrological monitoring stations are recommended be maintained in the Shalkiya-sai and Kelte streams during winter thaws and spring floods. The monitoring frequency will depend upon the quantity of snow in the catchment area and ambient air temperature. It is also required to monitor water quality in the streams during the flooding events and quiet periods in order to provide a picture of baseline water quality.

12.6.5. The Syr Darya River in the water intake location

The hydrological monitoring station should be installed as quickly as feasible at the proposed water intake location in the Syr Darya River in order to collect information on water level variations and enable the design of water intake facility as a backup water supply source.

12.6.6. Construction of New Mine Facilities

Because the design documentation for new mine facilities (waste rock dump, tailings storage facility, ore storage, processing plant, etc.) has not been approved yet, the routine industrial and environmental monitoring programme for these facilities will be developed at a later stage in the course of operation. It should be borne in mind that this programme should be consistent with the RK, EU and IFC requirements (see Section 4) and include monitoring provisions for emissions, discharges, construction waste arisings and other mining waste streams, waste management practices employed (reuse, landfilling, backfilling etc.). For the construction period, the Programme include the monitoring of noise, vibration, lighting regime of construction sites and access roads during the day and night time. In order to minimize adverse impact of construction activities on the local communities, it is required to monitor and restrict work hours for construction machinery and haul trucks delivering goods and materials to the construction site.

The monitoring programme should also include the monitoring provisions for the ambient air, surface water, groundwater, and soil quality, noise and vibration levels in the Project’s area of influence and in the nearest settlements (Shalkiya and Kuttekozha).

Mine and Processing Plant Operation

The development of the Shalkiya mining design is currently underway. The proposed Industrial and Environmental Monitoring Programme is tentative and will be further elaborated as part of the design development process.

Key process monitoring indicators are listed in **Table 70**.

Mine and Processing Plant Closure

The post-closure monitoring of mine workings, emissions, discharges and potential related impacts is one of the key requirements of the IFC Guidelines for Mining. Special attention is paid to ensuring the monitoring of completed restoration works and mine facility closure/sealing, especially underground structures and water management facilities. After the mine closure the technical condition of these structures should be safe and not to pose potential hazards for local communities, as well as ensure that the risks of accidents and injuries that may result from visiting closed/sealed facilities are carefully evaluated and managed.

The duration of the post-closure monitoring depends upon the nature of risks identified but normally is not less than five years after closure. A Preliminary Mine Closure and Reclamation Plan has been developed as part of the FS process. Therefore, the post-closure monitoring programme should be developed after the draft mine closure plan is prepared.

12.7. Monitoring Programme

The monitoring programme for each of the Project phases is presented in **Table 70**. It will be adjusted and updated in the course of the mine operation.

Table 70: Industrial Environmental Monitoring Parameters

Monitoring Component	Activity	Monitoring Locations	Parameters	Frequency
		1. Design and Mining Resumption Phase		
1.1. Climate	1.1.1. Monitor local climate characteristics using an automatic weather station	Mine site	1. Wind direction and speed 2. Temperature 3. Humidity 4. Precipitation 5. Solar exposure	Automatic discrete measurements
1.2. Pollutant emissions	1.2.1. Measure one-time (20-min averaged) and mean daily concentrations of priority pollutants	1. Boiler house, 2. Underground mine ventilation shaft 3. Wet dust collectors PVMSA at: a) Bin loading areas, b) Ore unloading areas, c) Belt conveyor, d) Feeder compartment	1. Particulate matter (PM10, PM2.5 and total), 2. Nitrogen, sulphur and carbon oxides	Quarterly according to IEMP
1.3. Ambient air	1.3.1. Measure mean daily concentrations of priority pollutants	According to the sampling map including two additional sampling points at the downwind side of neighbouring stone crushing plants	1. Particulate matter (PM10, PM2.5 and total), 2. Nitrogen, sulphur and carbon oxides	Quarterly according to IEMP
1.4. Mine water discharges to the mine water pond	1.4.1. Monitor the technical condition of mine water pond: 1.4.1.1. Visual inspection to check the dam condition 1.4.1.2. Sonar	Mine water pond	• Pond capacity • Volume of loose sediments • Volume of sediments in the beach area • Water level near the	Quarterly

Monitoring Component	Activity	Monitoring Locations	Parameters	Frequency
	survey of the pond bottom 1.4.1.3. Exploratory hole drilling in the beach area 1.4.2. Hydrological station to measure water levels in the pond		dam • Water table in the baseline and monitoring wells	
	1.4.3. Bottom sediment sampling in the beach section	Samples collected in the deeper section and exposed beach section of the pond	Parameters required to characterize the composition of bottom sediments: • Oil products • Copper • Zinc • Lead • Cadmium • Arsenic	Once per annum
	1.4.4. Water sampling	Samples collected from the mine water discharge outfall and emergency spillway in the dam	Parameters determined in water samples: • pH, • temperature, • odour, • transparency, • hardness, • suspended substances, • dry residue • BOD total • oil products • surfactants, • bacteriology: total coliforms (LFB), thermotolerant coliforms	Twice a year (high-flow and low-flow periods)
	1.4.5. Water sampling	Samples collected from the baseline and monitoring wells near the		

Monitoring Component	Activity	Monitoring Locations	Parameters	Frequency
		pond	• sulphates, • chlorides, • hydrocarbonates, • nitrites, • nitrates, • ammonium nitrogen, • calcium, magnesium, copper, cadmium, zinc, lead, arsenic in both dissolved and suspended form	
1.5. Wastewater discharges to the sewage water pond	Currently, the pond does not receive discharges due to poor technical condition of pipelines. After the repair/upgrade of sewage collection system and construction of biological treatment plant, technical condition of the sewage management system and treated effluent quality should be monitored	Wastewater samples collected upstream and downstream of a wastewater treatment plant	Parameters determined in water samples: • pH, • temperature, • odour, • transparency, • hardness, • suspended substances, • dry residue • BOD total • oil products • surfactants, • bacteriology: total coliforms (LFB), thermotolerant coliforms • sulphates, • chlorides, • hydrocarbonates, • nitrites, • nitrates, • ammonium	Once per annum according to the IEMP

Monitoring Component	Activity	Monitoring Locations	Parameters	Frequency
			nitrogen, • calcium, magnesium, copper, cadmium, zinc, lead, arsenic in both dissolved and suspended form	
1.6. Surface watercourses – Shalkiya-sai and Kelte streams and Syr Darya River	1.6.1. Seasonal hydrological stations to measure water levels in the watercourses 1.6.2. Water quality monitoring in the Shalkiyasai and Kelte springs 1.6.3. Bottom sediment sampling (if there are any in the streams)	Locations of seasonal hydrological stations will be identified in spring during the high-flow period	List of parameters determined in water samples is provided in 1.4.3	During winter thaws and spring floods
1.7. Soil and vegetation cover	1.7.1. Monitor soil contamination at the industrial site and in the mine's area of influence	Soil and vegetation sampling locations are specified in the IEMP: • Mine (Ventilation Shaft). • Mine water pond, • Domestic sewage water pond, • Waste rock dump, • Baseline locations and those within the mine's area of influence	List of monitored parameters is specified in the IEMP: • Humus content, • pH, • Nitrogen, phosphorus pentoxide, potassium oxide, • Heavy metals (lead, zinc, copper, cadmium, arsenic	Once per annum
1.8. Radiation monitoring	1.8.1. Surface water, groundwater and soil contamination by radionuclides	Monitoring locations are specified in the IEMP	• As part of the industrial monitoring, indicators for external gamma background will be measured, as well as	Once per annum

Monitoring Component	Activity	Monitoring Locations	Parameters	Frequency
			the content of natural and man-made radionuclides (radium-226, radium-228, thorium-228 and uranium-238, potassium-40, cesium coating 137) in samples of ores and rocks; • include in the industrial monitoring programme an action to determine the level of accumulation of alpha-active gas (radon and thoron) and radionuclide content of dust in the air.in underground working areas	
1.9. Physical factors	1.9.1. Measure noise, vibration and EM radiation levels	Industrial site and mine's area of influence including nearest residential areas		Once per annum
1.10. Workplace air	1.10.1. Measure the shift-average dust concentrations and free silica levels	The workplace air in the underground and surface working areas		Once per quarter
2. Mine and Processing Plant Operation **Monitoring arrangements recommended for the design phase also apply to the operation phase including the commissioning of new facilities to be covered by the monitoring programme (processing plant and tailings storage facility)**				
2.1. Processing plant				
2.2. Tailing Storage Facility				

Monitoring Component	Activity	Monitoring Locations	Parameters	Frequency
3. Mine and Processing Plant Closure and Aftercare Period **This section of the monitoring programme will elaborated as the Project moves forward. As was already mentioned, the post-closure monitoring should continue for at least five years after the mine closure.**				

12.8. Hydrogeological Monitoring Programme

The design calls for drilling 27 observation wells placed around the current mine workings and workings included in the design for construction of the first phase to observe the expansion of the existing cone in order to assess the effectiveness of the groundwater protection measures employed at the mine. The wells were placed with consideration of the assumed impermeable barriers, the groundwater flow direction, the direction of mining operations and the location of the Kuttykozha utility and drinking water intake. Observations of the expansion of the depression cone consists of measurements of the occurrence depth of the groundwater level in the observation wells drilled from the surface to the exogenic weathering zone of the roof of the rock mass composed of Famennian-Tournaisian carbonate rocks. The results of the measurements will be used to create groundwater contour maps; and the expansion of the depression cone in different directions will be predicted as information is accumulated. As the development area of the carbonate rock mass increases and the existing hydrodynamic depression cone expands, the requirement for placement of additional observation wells will be justified from an analysis of the observation data. If observations during mining identify a verifiable trend of propagation of the hydrodynamic depression toward the Kuttykozha water intake, the design recommends drilling additional observation wells to monitor this process.

Observation wells shall be designed for the first hydrogeological unit from the surface to monitor possible hydrochemical effects on groundwater in the ore-hosting rock dump and the outdoor ore storage.

The depth, design and location of the observation wells shall be revised on the basis of additional hydrogeological studies that will be used to obtain specific geological cross sections and hydrogeological conditions.

Measurements of the occurrence depth of the groundwater level and seasonal water sampling shall be carried out in the observation wells, first of all to determine the indicators of the chemical composition of groundwater that will be used to monitor elements exceeding the maximum permissible concentrations in water of mine water containment ponds. It is also advisable to check the concentrations of chemical elements classified as harmful substances that may enter groundwater from typical ores of the Shalkiya deposit. We recommend validating the frequency of observations in wells by analogy with other similar deposits where environmental monitoring of groundwater is carried out. All measurements of groundwater quality should be carried out in laboratories accredited to perform analyses of groundwater in accordance with established procedure.

If pollution of groundwater is detected during monitoring of the hydrochemical effect on groundwater, the need to drill additional observation wells located on the profile along the probable propagation direction of the groundwater pollution halo shall be considered.

ANNEXES

ANNEX 1 BASIC PHYSICAL DATA ON AND SAFE HANDLING PROCEDURES OF REAGENTS

Lime (milk of lime)

Lime (as a lime powder including lumps) is transported to mine site in closed containers and transferred into bin. Lime will be fed from the bin into wet ball mill to reduce the particle size suitable for delivery into process. Water will be added to dilute lime to desired strength.

Lime powder needs to be handled in a manner that it does not have any contact with eyes, mouth as it is highly alkaline and will cause severe “burns” and irritation. Safety glasses and a breathing mask are necessary personal safety gear when working in an area, where dry lime powder is present.

First aid procedure if lime or milk of lime has contacted e.g. eyes is to use plenty pure water to wash eyes and immediately seek a doctor for help and checking.

Xanthate

Xanthate is the most important reagent in the processing of Shalkiya Pb-Zn ore. It will be delivered in bags or in barrels. It needs to stored in a dry, cool and ventilated area. Xanthate is a crystalline powder (pH 9-10, density 1,6 t/m3), which has unpleasant odour.

Xanthate in bags will unloaded into the preparation tank, where water will be added to end up in a desired solution strength. In the area, where xanthate is stored and prepared into solution, no fires are permitted or over 150 C temperature. Flammable gases may be generated from xanthate.

Personnel need to prevent xanthate to contact skin, eyes or clothes and not to breath its dust or vapour. It will irritate eyes, skin and linings. If swallowed it can cause irritation, diarrhoea and vomiting. Personal safety gear (when dealing with xanthate) needs to be used: gloves, eye protection and if required also breathing protection.

Xanthate is not allowed to be disposed into local environment (ground or waters).

Aerofloat (or Aerophine)

Aerofloat (aerophine) will be delivered in barrels. Barrels will be dumped into a preparation tank, where it is diluted to suitable solution strength prior to dosing into flotation process. Storing of these reagents to be in ventilated and dry place.

Personal safety gear (when dealing with aerofloat or aerophine) needs to be used: gloves, eye protection and if required also breathing protection.

Aerofloat or aerophine is not allowed to be disposed into local environment (ground or waters).

Na2S

Na2S (sodium sulphide) is delivered in bags in crystals or flakes and it has odour of hydrogen sulphide (H2S). Bags (sealed) need to be stored in a cool area and away from exploding and oxidizing materials. Na2S is regarded as a toxic reagent. Contact with acids will create SO2 and H2S, which are harmful, toxic gases. Na2S-solutions are strongly alkaline (pH is high), corroding and dangerous to environment. It will generate toxic gases in fires.

Na2S will be transferred into preparation tank, where water will be added to get the suitable solution strength.

Personnel need to wear personal safety gear (according to local safety instructions) when exposed to Na2S reagent or its solutions.

Na2S cannot be disposed in local environment (ground, waters).

Liquid glass

Liquid glass (sodium silicate 40%) in liquid form will be delivered in containers, from where it is transferred into local storage tank. It can be diluted with water is needed before feeding it into process. The role of liquid glass is to prevent silicate minerals (quartz) floating into concentrates.

Liquid glass (Ph 12,4) is a corroding reagent and it irritates aspiration (lungs) organs. If swallowed, it is harmful.

When working with liquid glass personal safety gear needs to be worn according to local safely instructions.

Liquid glass can’t be disposed into local environment (ground, waters).

ZnSO4

ZnSO4 (zinc sulphate) is delivered in big bags in crystalline form. Relative density is 3,2 t/m3 and pH 4-6. It needs to be stored in sealed bags in a cool and dry place. It is generally harmful and dangerous to environment. ZnSO4 will irritate eyes and skin and therefore contact without protection to be avoided. In fires ZnSO4 generates toxic gases (Zn and sulphur oxides).

It is used in the process to depress Zn minerals and not to float into Pb concentrate. ZnSO4 will be dissolved in preparation tank into desired water solution strength before dosing into flotation.

When working with ZnSO4 power or liquid all personnel need to follow local safety rules and safety gear used as instructed.

ZnSO4 cannot be disposed into local environment (ground, waters).

CuSO4

CuSO4 (copper sulphate) is delivered in big bags in blue crystalline form. Relative density is 2,3 t/m3 and pH 3,5 (10% solution). It needs to be stored in sealed bags in a cool and dry place. CuSO4 is a corroding reagent (will dissolve metals). It is generally harmful and dangerous to environment. In fires CuSO4 generates toxic gases (carbon and sulphur oxides).

It is used in the process to activate zinc minerals to float. CuSO4 will be dissolved in preparation tank into desired water solution strength before dosing into flotation.

When working with CuSO4 power or liquid all personnel need to follow local safety rules and safety gear used as instructed. Especially prevent contact with eyes and skin.

CuSO4 cannot be disposed into local environment (ground, waters).

NaCN

NaCN is used to prevent pyrite minerals to float into Pb concentrate. NaCN is extremely toxic and dangerous to environment.

It will react with acids creating highly toxic gases. It needs to be stored in tightly closed containers in a locked, dry and ventilated area and to be kept separated from acids. In fires NaCN can generate toxic HCN gases.

NaCN is a white, crystalline powder (Ph 11-12 and density 1,6 t/m3). Cyanide powder or pebbles will be transferred into preparation tanks, where water will be added to end up in suitable solution strength for the process.

When handling cyanide everybody needs to follow local safety regulations and use personal safety gear to prevent any contact with cyanide and to prevent formation of highly toxic gases (cyanide reaction with oxidation agents, chlorates, nitrates).

NaCN cannot be disposed into environment (ground, waters). It needs to be

disposed according to law for dangerous waste handling.

Frother

Frother (T-92) will be used to reduce surface tension in slurry and enable for formation in flotation cells. Frother can be used without water dilution or if it is water soluble can diluted to suitable strength for dosing purposes.

Frother is flammable product and therefore no fires or high temperatures are permitted in frother storing area. Personal safety gear according local safety instruction needs to wear when working in an area, where frother is present.

Frother can't be disposed into local environment (ground, waters).

Flocculent

Flocculent will be delivered on bags in a powder form. It needs to be stored in a dry storage area. It will be used as water solution in thickeners to improve material settling properties. Flocculants water solution is corrosive (pH<7).

ANNEX 2 SURFACE INFRASTRUCTURE FACILITIES AND THEIR STATUS

Name	Status
On-site Buildings and Structures of the Surface Structure:	
Roads	Restructuring; existing; new
Access road	Restructuring; New
Roads to inter-site facilities	Existing; New
On-site reads	Existing; New
Parking	Existing; New
Cargo handling sites	Existing; New
Railroads	Existing
Wagon balance	Existing
Repair and Storage Facilities:	
Shop Unit	Restructuring
Garage for 50 vehicles with a boiler house and a gym	Restructuring
Central storage	Restructuring
Light petroleum products storage of 375 м^3 with tank of 100 m^3	Existing
Open storage	Existing
Storage of packed oils, paints and chemicals	Existing
Modular compressor station	New
Gas Storage	New
Modular oxygen/nitrogen station	New
Administration and Amenities Buildings:	
AAB with a canteen for 300 seats. (near PCS 6/0.4 kV)	Restructuring
Process plant AAB	New
Residential and Public Buildings:	
Dormitory, 240 Beds	Restructuring
Dormitory for engineers and technicians for 28 beds	Restructuring
Dormitory, 160 beds, with a canteen	Restructuring
Dormitory No. 1 for workers for 170 beds.	New
Dormitory No. 2 for workers for 170 beds.	New
Dormitory No. 3 for workers for 170 beds.	New
Hostel for engineers and technicians for 90 beds	New
Canteen	New
Gym	Restructuring
Mine Rescue Brigade and Fire-engine House:	
Fire station for two vehicles	Existing
Mine rescue brigade	Restructuring
Explosives Storage:	
Powder magazine for 480 tons with two tanks of 100 m^3 each	Existing
Security Objects:	
Gatehouse No.1	Existing
Gatehouse No.2	Existing
Site fencing	New
Utility Engineering	
Power Supply	
PS 220/35/6kV (for mining needs)	Restructuring
PS 220/6/6kV (for the process plant)	New
Intra-site power supply networks	New
Substations and distribution networks (excluding the process plant)	New

Name	Status
Water Supply System	
Water supply and water disposal department piping	New
Heat Supply System	
Heat networks piping	New
Communication Networks and Instrumentation and Automation	
Control System	New
Communication Networks	New
Off-site Buildings and Structures of the Surface Structure:	
Residential and Public Buildings:	
Hotel No. 1 with a Canteen	Existing
Hotel No. 2	Existing
Residential Houses (5)	Existing
Residential Houses (6)	New
Residential Houses (130)	New
Mine Rescue Brigade Facilities:	
The mine rescue brigade in Shalkiya	Restructured
Existing Buildings:	
Dismantled Facilities:	
The automated cement warehouse facility (ready-mix station, gallery, cement storage, inert aggregate receiver hoppers, compressor station, outdoor completed transformer substation)	Dismantled
Woodworking shop with a Substation	Dismantled
Unified Boiler House	Dismantled
Pressure Tanks	Dismantled
Cooling Tower	Dismantled

ANNEX 3 IFC ENVIRONMENT, HEALTH AND SAFETY REQUIREMENTS

Summary of the IFC General Environment, Health and Safety Guidelines

The General EHS Guidelines contain the specific requirements for the natural environment quality and the permissible environmental impacts which are applicable to all sectors of the economy. A brief overview of the standards applicable to this project is specified below. The description is not exhaustive, but provides guidance on the level of detailed requirements necessary to achieve compliance with the IFC policies and standards.

Air Emissions and Ambient Air Quality

The ambient air quality requirements are specified in the table below.

Table 71 IFC Ambient Air Quality Requirements (based on the World Health Organization (WHO) Guidelines)

Index	Averaging period	Guideline value, in mg/m^3
Inorganic dust, PM_{10}	year	0 (Interim target – 1)
		0 (Interim target – 2)
		0 (Interim target – 3)
		0 (guideline)
	4 hour	50 (Interim target – 1)
		00 (Interim target – 2)
		5 (Interim target – 3)
		0 (guideline)
organic dust, PM_{25}	year	5 (Interim target – 1)
		5 (Interim target – 2)
		5 (Interim target – 3)
		0 (guideline)
	4 hour	5 (Interim target – 1)
		0 (Interim target – 2)
		7,5 (Interim target – 3)
		5 (guideline)

Discharge

In determining the wastewater quality guidelines the following should be taken into account:

- the requirements for the wastewater treatment process set forth in the applicable industry sector guidelines;
- the requirements of the national legislation;
- the wastewater discharge should not result in an increase in the water environment temperature greater than 3°C at the edge of a scientifically established discharge dispersion zone.

Typically stormwater are contaminated by suspended sediments, metals, oil products, Polycyclic Aromatic Hydrocarbons (PAHs), coliforms, etc. Rapid runoff relates to eroding stream beds and banks of a water body. In order to reduce the need for stormwater treatment the following measures should be taken:

- Stormwater runoffs should be separated from process and sanitary wastewater streams;
- prevent or minimize the stormwater runoffs from the contaminated areas and ensure the reduction of the peak discharge rates;
- focus on treatment of the first flush of stormwater runoff where the majority of contaminants tend to be present;

- Install the oil water separators and grease traps to treat stormwater as appropriate.

Table 72. Indicative Values for Treated Sanitary Sewage Discharges

Pollutants	Meas. units	Guideline value
pH	g/l	– 9
DD	g/l	)
OD	g/l	25
trogen	g/l	)
hosphorus	g/l	
l and grease	g/l	)
uspended solids	g/l	)
otal coliform bacteria	PN[b] /100 ml	)0

Table 73. Noise Level Guidelines

Receptor	Allowable level, dBA	
	y-time (07:00 – 22:00)	ght-time (22:00 – 07:00)
Residential, institutional, educational		
dustrial		

Hazardous Materials Management

Avoid leaks and spills of hazardous material through:

- establishing hazardous materials management priorities; avoiding or minimizing the use of hazardous materials,
- preventing uncontrolled leaks and spills;
- implementing engineering and management controls to reduce residual risks.

Where there is risk of the spills of hazardous materials, a hazardous material spill and leak prevention plan as a component of the General Emergency Preparedness and Response Plan should be prepared. The standard operating procedures regulating the process of filling the underground and above-ground storage tanks, and other equipment operations, as well as the procedures for the transfer of hazardous materials should be developed. The hazardous materials management plan should address all essential elements of occupational health and safety management.

Hazards Management

To effectively manage the hazards the following measures can be taken:

- auditing for each process to assess compliance with the requirements of prevention programs;
- accident investigation;
- personnel involvement;
- development and implementing of a mechanism of control over the contractors which includes a requirement for them to develop the hazardous materials management procedures.

Summary of the Environment, Occupational Health and Safety Guidelines for Mining

These Guidelines are applicable in respect of the first stages of mining projects implementation (exploration, overburden operations). The most essential requirements come down to the following:

Sewage

The discharge requirements established by the IFC are applicable to this project (see the table below).

Table 74. Discharge Pollution Guidelines

Pollutants	Meas. units	Recommendable guideline value
Total Suspended Solids	g/l	
		9
OD	g/l	0
OD	g/l	
and grease	g/l	
senic	g/l	
n (total)	g/l	
mperature		degree differential
etals concentrations represent total metals		

At the construction stage the recommendations are as follows:

- Establishment of water protection zones;
- Timely implementation of a set of measures on contouring techniques, terracing, slope reduction / minimization, runoff velocity limitation and appropriate drainage installations to reduce erosion in both active and inactive areas;
- Access and haul roads should have gradients or surface treatment to limit erosion, and road drainage systems should be provided;
- The facilities should be designed and operated for a final Total Suspended Solids discharge of 50 mg/l.

Acid Rock Drainage and Metal Leaking

Where the geologic structure determines the possibility of formation of acid runoff exposed to oxygen and water and metal leaking it is necessary to take all measures to prevent environmental pollution by acid runoff.

Waste Management

At this stage the relevant issue is the location of overburden rock dumps. In this regard the following requirements are proposed:

- Set appropriate terrace and lift height specifications based on the nature of the material and local geotechnical considerations;
- Consider potential changes of geotechnical properties in dumps due to weathering. These changes in geotechnical properties apply especially to facilities without covers. Design of new facilities has to provide for such potential deterioration of geotechnical properties with higher factors.
- Hazardous and Non-Hazardous Waste Management should be established according to the recommendations of the General Environment, Occupational Health and Safety Guidelines.

Air quality

The requirements for the dust emissions from the fugitive sources are primarily applicable to this project. It is recommended to use:

- Dust suppression techniques for roads and work areas, optimisation of traffic patterns, and reduction of travel speeds;
- Exposed soils and other erodible materials should be re-vegetated or covered promptly;
- New areas should be cleared and opened-up only when absolutely necessary;

- Surfaces should be re-vegetated or otherwise rendered non-dust forming when inactive;
- Storage for dusty materials should be enclosed or operated with efficient dust suppressing measures;
- Loading, transfer, and discharge of materials should take place with a minimum height of fall, and be shielded against the wind, and consider use of dust suppression spray systems.

In addition it is recommended to use the vehicles and fuels and lubricants which ensure the minimum emission of the pollutants into the ambient air.

Visual impacts

This adverse impact can be related to such objects and phenomena as high walls, erosion, discoloured water, haul / access roads, waste dumps, abandoned mining equipment and structures, garbage and refuse dumps, open pits, and, loss of vegetation. Mining operations should prevent and minimize negative visual impacts through consultation with local communities about potential post-closure land-use, and, incorporating visual impact assessment into the mine reclamation process. Reclaimed lands should, to the extent feasible, conform to the visual aspects of the surrounding landscape.

Mitigation measures may include strategic placement of screening materials including trees and use of appropriate plant species in the reclamation phase as well as modification in the placement of ancillary facilities and access roads.

Occupational Health and Safety

The occupational safety and health requirements are mainly consistent with the requirements of the national legislation, except for the matters of relationships with the contractors. It should be noted that the IFC' clients should provide the same safety level for the contractors and subcontractors working in the project, as for the key personnel.

When planning the occupational health and safety measures a systematic and structured approach to prevention and protection from physical, chemical, biological, and radiological hazardous and harmful factors, as described in the General Guidelines, should be followed.

The IFC requires the emission and discharge monitoring, as well as the environment quality monitoring and the monitoring of the occupational health and safety regulations.

ANNEX 4 STATEMENT OF KAZGIDROMET FOR THE AKKUM METEOROLOGICAL STATION

ЭНЕРГЕТИКА МИНИСТРЛІГІ
"ҚАЗГИДРОМЕТ"
ШАРУАШЫЛЫҚ ЖҮРГІЗУ ҚҰҚЫҒЫНДАҒЫ
РЕСПУБЛИКАЛЫҚ МЕМЛЕКЕТТІК
КӘСІПОРНЫНЫҢ ҚЫЗЫЛОРДА ОБЛЫСЫ
БОЙЫНША ФИЛИАЛЫ

ГОСУДАРСТВЕННОГО ПРЕДПРИЯТИЯ
НА ПРАВЕ ХОЗЯЙСТВЕННОГО ВЕДЕНИЯ
"КАЗГИДРОМЕТ"
МИНИСТЕРСТВА ЭНЕРГЕТИКИ
РЕСПУБЛИКИ КАЗАХСТАН ПО
КЫЗЫЛОРДИНСКОЙ ОБЛАСТИ

120016, Қызылорда қаласы, Бөкейхан көшесі, н/з
тел.: 8 (7242) 23-56-44, факс: 8 (7242) 23-85-73
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120016, город Кызылорда, улица Бокейхана, б/н
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№ 29-01-1-24/115
26.02.2015 ж.

Председателю правления
АО «ШалкияЦинк ЛТД»
Б.М. Рамазанову

Филиал РГП «Казгидромет» по Кызылординской области, на Ваш запрос №91 от 11.02.2015 года, предоставляет метеорологические данные по метеостанции «Аккум» за 2012-2014 годы.

Приложение: 1л

Директор **Калымбетова Ж.А.**

Инженер-метеоролог: Ахметова Н.	Маркетолог: Машрапова К.

Т-фон/факс 8 (7242)23-85-73

0000036

приложение

№ п/п	метеорологические данные	2012	2013	2014
1	максимальная температура воздуха (средняя), T^0C	август +36,7	июль +36,2	июнь +36,0
2	минимальная температура воздуха (средняя), T^0C	февраль -14,8	январь -7,0	февраль -15,7
3	количество осадков за год, мм	148	217	188
4	влажность воздуха за год, %	44	45	45
5	скорость ветра за год, м/сек	1	1	1
6	роза ветров за год, %			
	С	20	20	21
	СВ	12	12	14
	В	16	10	17
	ЮВ	8	8	7
	Ю	23	25	22
	ЮЗ	6	8	6
	З	5	7	5
	СЗ	10	10	8
	штиль	39	40	37
7	скорость ветра (И*) по средним многолетним данным, повторяемость превышения, которой составляет 5%, м/сек за 2012-2014гг	6		

Подпись исполнителя

Печать исполнителя

ANNEX 5 RESULTS OF AGROCHEMICAL SOIL ANALYSIS

№№ pit, depth of sampling, cm	Humus, %	pH	Content, mg/kg			Soil
			N	P_2O_5	K_2O	
Shalkiya main production site						
Ш1, 0 – 26	0,95	8,85	28,00	29,50	280,00	Light sierozem
Ш1, 26 - 45	0,40	8,08	11,20	1,50	40,00	
Ш2, 0 - 10	0,90	9,00	28,00	32,50	320,00	Grey-brown
Ш2, 10 - 40	0,41	9,00	11,20	4,00	160,00	
Ш12, 0 – 6	0,71	8,90	25,20	32,50	290,00	
Ш12, 6 - 25	0,81	9,05	11,20	6,00	280,00	
Ш13, 0 - 8	1,13	9,00	44,80	49,00	360,00	Common sierozem
Ш13, 22 - 40	0,66	9,00	11,20	4,00	160,00	
Ш14, 0 - 11	0,82	9,00	15,40	34,50	440,00	Light sierozem
Ш14, 32 - 60	0,41	7,92	8,40	3,00	70,00	
Ш15, 0 - 8	0,49	9,00	25,20	27,50	360,00	Grey-brown
Ш15, 31 - 55	0,42	8,92	11,20	4,00	100,00	
Polluted sites						
Ш3, 0 – 20	0,62	8,75	25,20	30,50	390,00	Grey-brown
Ш3, 30 – 55	0,28	8,00	8,40	3,00	40,00	
Background sites						
Ш6, 0 – 8	0,62	9,10	22,40	26,0	300,00	Grey-brown
Ш6, 30 – 60	0,28	9,47	8,4	8,5	70,00	
Ш9, 0 – 15	0,99	9,05	25,20	24,50	440,00	
Ш9, 15 – 35	0,61	9,05	14,00	8,50	210,00	

ANNEX 6 THE AVERAGE CONTENT OF HEAVY METALS IN SOILS OF THE SHALKIYA MINE AREA, MG/KG

Depth, cm	Mn	Ge	Cu	Pb	Ga	Ti	V	Cr	Ni	Co	Ba	Mo	Sn	Zr	Zn
Shalkiya Main Production Site															
0 - 8	733,33	***2,00***	11,67 0,05	26,67 11,21	5,00	716,67	63,33	75,00	**60,00** 1,51	***30,00*** 1,25	216,67	***3,00***	5,00	50,00	**283,00** 1,75
8 - 26	633,33	***2,00***	10,00	18,33	5,00	600,00	66,67	75,00	**60,00**	***30,00***	216,67	***3,00***	5,00	50,00	**150,00**
26 - 45	633,33	***2,00***	10,00	18,33	5,00	683,33	66,67	75,00	**60,00**	***30,00***	200,00	***3,00***	5,00	50,00	**150,00**
Average	666,67	***2,00***	10,56	21,11	5,00	666,67	65,56	75,00	**60,00**	***30,00***	211,11	***3,00***	5,00	50,00	**194,44**
Polluted sites															
0 - 7	600,00	***2,00***	10,00 0,05	20,00 10,80	5,00	700,00	60,00	70,00	**50,00** 1,60	***30,00*** 0,95	200,00	***3,00***	5,00	50,00	**250,00** 1,55
7 - 28	600,00	***2,00***	15,00	15,00	5,00	600,00	70,00	70,00	**50,00**	***30,00***	200,00	***3,00***	5,00	50,00	100,00
28 - 50	**1750,00**	0,00	10,00	15,00	5,00	1350,00	70,00	70,00	**40,00**	***30,00***	300,00	***3,00***	5,00	50,00	50,00
Average	983,33	1,33	11,67	16,67	5,00	883,33	66,67	70,00	**46,67**	***30,00***	233,33	***3,00***	5,00	50,00	**133,33**
Background sites															
0 – 6	500,00	0,00	10,00 0,05	10,00 11,07	5,00	500,00	50,00	50,00	**50,00** 1,10	***30,00*** 0,83	200,00	***3,00***	5,00	50,00	**150,00** 1,37
6 – 28	1000,00	0,00	10,00	10,00	5,00	500,00	60,00	60,00	**50,00**	***30,00***	200,00	***3,00***	5,00	50,00	**200,00**
28 – 50	600,00	0,00	6,50	6,50	5,00	500,00	40,00	30,00	**40,00**	***30,00***	200,00	1,50	2,50	50,00	**50,00**
Average	700,00	0,00	8,83	8,83	5,00	500,00	50,00	46,67	**46,67**	***30,00***	200,00	***2,50***	4,17	50,00	**133,33**

MPCn (national standards)															
	1500,00	-	23,00	32,00	-	-	150,00	-	35,00	-	-	-	-	-	110,00
Average content for soils in the world															
	850,00	2,00	20,00	10,00	30,0	4600,00	100,00	90,00	40,00	10,00	500,00	2,00	10,0	300,00	50,00
Clark in the crust (as per A.P. Vinogradov)															
	1000,00	1,40	47,00	16,00	19,0	4500,00	90,00	83,00	58,00	18,00	65,00	1,10	2,50	170,00	83,00
Hazard class															
	3	-	2	1	-	-	3	-	-	-	-	-	-	-	1
Notes: 1. Values exceeding MPCn are marked in bold 2. Bold and italics readings shows the values that exceed the average content in the soils of the world															

ANNEX 7 SUMMARY TABLES OF THE SOIL OPERATIONAL MONITORING FOR 2012-2015

Indicator name		**Date of sampling**			
		06.09.2013			15.09.2014
		Storage pond Point 15	Background Point 9	Mine shaft Cage-type shaft Point 2	Storage pond Point 15
1. pH of water extract		6,86	6,64	6,75	7,49
2. Organic carbon	%				
3. Total nitrogen	mg/kg	108,5	133,5	106,5	87,8
4. Phosphoric oxide	mg/kg	316	158	64,7	1533
5. Potassium oxide	mg/kg	1904	2873	2199	1967
6. Humus	%	0,083	0,285	0,1	2,11
7. Lead	mg/kg	94,838	18,636	17,932	1160
8. Zinc	mg/kg	65,592	49,27	40,142	307
9. Copper	mg/kg	8,198	10,824	9,148	21,6
10. Cadmium	mg/kg	1,294	1,076	1,076	0,54

Indicator name, unit of measure	Date of sampling 05.09.2015								
	Mine shaft Dispensing p. 13	Storage pond p. 15	Storage pond p. 16	Storage pond p. 19	Storage pond for utility fluids	Background point 6	Background point 9	Background point 18	Impact zone, p.3
Humus, mg/kg	11755,0	18406,4	15935,8	8561,4	9915,2	11381,5	7494,3	11509,9	8270,0
Phosphoric oxide, mg/kg	10,06	29,93	3,10	9,03	11,74	16,13	8,39	12,52	3,87
Nitrogen, mg/kg	1340,54	1707,2	1001,04	1233,84	205,64	1117,44	582,0	2172,5	3450,0
Potassium oxide, mg/kg	114,0	417,39	143,42	54,74	417,39	323,08	100,0	217,39	176,59
pH	6,8	7,5	7,0	6,77	6,62	7,33	7,85	7,48	6,9
Lead, mg/kg	78,7	23,0	28,6	46,03	40,4	13,63	12,03	14,43	28,13
Zinc, mg/kg	365,47	54,17	32,4	25,44	81,67	36,94	28,27	51,67	51,97
Copper, mg/kg	12,9	10,14	12,81	5,77	12,81	13,61	11,87	12,44	16,51
Cadmium, mg/kg	1,27	0,56	0,53	0,70	0,93	0,66	0,43	0,70	1,03

ANNEX 8 LIST OF ANIMALS IN THE PROJECT AREA AND ADJACENT AREAS. SPECIES OF BIRDS INCLUDED IN THE RED BOOK OF KAZAKHSTAN

Mammals			
No.	***Name***	***Distribution***	***Specific Features***
10.	Earded hedgehog (Erinaceus auritus)	Throughout the Project area	
11.	Lesser white-toothed shrew (Crocidura suaveolens)	Near the shrub thickets	
12.	Chiroptera, Vespertilionidae, great bat (Nyctalus noctula),	Industrial and residential structures	
13.	Chiroptera, Vespertilionidae, particoloured bat (Vespertiliomurinus),		
14.	Carnivora, Canidae, dog fox (Vulpes corsac)	Project area periphery	Known to spread rabies, plague and anthrax
15.	Carnivora, Canidae, fox (Vulpes vulpes)	Semi-desert areas, shrub thickets	
16.	Carnivora, Canidae, jackal (Canis aureus).	Migrate from the Syr Darya floodplain	
17.	Mustelidae, least weasel (Mustela nivalis) and steppe polecat (Mustela eversmanni).	Occur near the rodent colonies, on the shores of water bodies and river channels	
18.	Mustelidae, steppe polecat (Mustela eversmanni).		
19.	Rodentia, little ground squirrel (Spermophilus pygmaeus)	Occur in the wet depressions covered with cereal vegetation	
20.	Rodentia, yellow ground squirrel (Spermophilus fulvus)	Sandy areas	
21.	Little jerboa (Allactaga elater)	Semi-desert areas	
22.	Great jerboa (Allactaga major)		
23.	Lesser five-toed jerboa (Pygerethmuspumilio)		
24.	Siberian jerboa (Allactaga sibirica)		
25.	Dipodidae, feather-tailed four-toed jerboa (Stylodipus telum)	Hummocky areas	
26.	Dipodidae, feather-footed jerboa (Dipus sagitta)	Sodded areas	
27.	Cricetinae, gray hamster (Cricetulus migratorius),	Hummocky areas	
28.	Cricetinae, mole vole (Ellobius talpinus).	Hummocky areas	
29.	Ammodytidae, great gerbil (Rhombomys opimus)	Key species	Key plague transmitting species
30.	Ammodytidae, tamarisk gerbil (Meriones tamariscinus)	Sandy areas and shrub thickets	Form colonies
31.	Ammodytidae, red-tailed gerbil (Meriones libycus)	Ephemeral hilly deserts with dense soil and consolidated sand	Form colonies with great gerbil
32.	Muridae, house mouse (Musmusculus).	Residential houses	Known to spread rabbit fever,

			plague etc.
33.	Lagomorpha, tolai hare (Lepus tolai).	Areas with shrub vegetation, foothills, riparian areas	Known to transmit plague, rabbit fever, pasteurellosis, etc.
Birds			
34.	Accipitridae, kite (Milvus migrans)	Throughout the Project area	
35.	Accipitridae, buzzard (Buteo buteo)	Shrub thickets	
36.	Accipitridae, long-legged buzzard (Buteo rufinus).		
37.	Falconidae, common kestrel (Falco tinnunculus).		
38.	Rufous lark (Calandrella rufescens)	Common species Nest in shrub thickets	
39.	Small skylark (Calandrella cinerea)		
40.	Steppe lark (Melanocorypha calandra		
41.	Finsch's wheateater (Oenanthe finschi)		
42.	Isabelline wheateater (Oenanthe isabellina)		
43.	Great gray shrike (Lanius excubitor),		
44.	Turkestan shrike (Lanius phoenicuroides)		
45.	Rufous warbler (Cercotrichas galactotes),		
46.	Desert warbler (Sylvia nana)		
47.	Red-headed bunting (Emberizia bruniceps),		
48.	Rose-coloured starling (Pastor roseus),	Foothills	
49.	Myna (Acridotherestristis).	Plain areas	
50.	Common nightingale (Luscinia megarhynchos)		
51.	Saxaul sparrow (Passer ammodendri)		
52.	Common bee-eater (Merops apiaster),		
53.	Sand martin (Riparia riparia),		
54.	White wagtail (Motacilla alba)		
55.	Great-crested grebe (Podiceps cristatus)	Waterfowl and riparian species occur during seasonal migrations in the water bodies, near springs and in the Syr Darya floodplain	
56.	Horned grebe (Podiceps auritus)		
57.	Gray heron (Ardea cinerea),		
58.	Great white egret (Egretta alba)		
59.	Purple heron (Ardea purpurea).		
60.	Sheld duck (Tadorna ferruginea),		Migrating species
61.	Gadwall (Anas strepera)		
62.	Sheldrake (Tadorna tadorna),		
63.	Pintail (Anas acuta)		

64.	Mallard (Anas platyrhynchos),		
65.	Common pochard (Aythya ferina),		
66.	Red-crested pochard (Netta rufina)		
67.	Common shoveler (Anas clypeata).		
68.	Coot (Fulica atra)	Occur rarely	
69.	Shorebirds (Charadriidae)		
70.	Avocet (Recurvirostridae)		
71.	Rock pigeon (Columba livia)	Anthropogenic landscapes, residential housing and auxiliary structures	
72.	Eastern turtle dove (Streptopelia orientalis)		
73.	Little owl (Athene noctua),		
74.	Hoopoe (Upupa epops),		
75.	Tree sparrow (Passer montanus)		
76.	House sparrow (Passer domesticus)		
77.	Barn swallow (Hirundo rustica).		
Reptiles			
78.	Testudinidae, Central Asian tortoise (Agrionemys horsfieldi)	Densely distributed in the west in the Syr Darya floodplain	
79.	Agamidae, steppe agama (Agamas angunolenta)	Common species	
80.	Agamidae, sunwatcher (Phrinocephales helioscopus)	Clay pans, semi-arid areas with clayey soil	Sub-endemic species in the Central Asia
81.	Agamidae, toad-headed agama (Phrinocephales mystaceus)	Scarcely occurring in the study area	
82.	Lacertilia, rapid fringe-toed lizard (Eremias velox)	Widely distributed; low density	
83.	Lacertilia, steppe runner (Eremias arguta)	Occur throughout the area	Sub-endemic species in the Central Asia
84.	Natrix, Dione snake (Elaphe dione).	Semi-arid areas with dense sands	
85.	Natrix, steppe ribbon snake (Psammphis lineolatum)	Areas with consolidated sand, clay and loess sediments	
86.	Natrix, Tatary sand boa (Eryx tataricus).	Semi-arid areas with dense sands	
87.	Viperidae, Orsini’s viper (Vipera ursuni)	Riparian areas and rodent colonies	Scarce population
88.	Trimeresurus, Central Asian viper (Agkistrodon halys).	Biotopes with clayey and loess soil	
89.	Amphibia, Bufonidae, green toad (Bufo viridis)	Near shallow water bodies	
Invertebrates			
90.	Broad-winged damselfly (Coenogrionidae	Common species, widely distributed	

91.	Large dragonfly (Aeschnidae)		
92.	Mantid (Manteidae)		
93.	Darkling beetle (Tenebrinoidae)		
94.	Ground beetle (Carabidae)		
95.	Scarab beetle (Scarabaeidae)		
96.	Noctuid (Noctuidae)		
97.	Ant (Formicidae)		
98.	Social wasp (Vespidae)		
99.	Digger wasp (Sphecidae)		
100.	Spider wasp (Pompilidae)		
101.	Cicada (Cicadidae)		
102.	Housefly (Muscidae)		
103.	Gray blowfly (Sarcophagidae)		
104.	Gadfly (Tabanidae)		
105.	Cricket (Grillidae)		
106.	Grasshopper (Acrididae)		
107.	Tarantula (Lycosas ingoriensis)	Widely distributed. Scarce	Dangerous for humans
108.	Galeode (Galeodes araneoides)		
109.	Black widow (Lathrodectus tredecimguttatus)		
110.	Scorpion (Buthus)		
Rare and Endangered Bird Species Listed in the Kazakhstani Red Data Book[214]			
111.	Steppe eagle (Aquilarapax)	Relatively large population that was decreasing abruptly not too long ago	Protection Category 5
112.	Imperial eagle (Aquilaheliaca),	Occur during migrations	Protection Category 2
113.	Demoiselle crane (Anthropoides virgo)	The species is restoring its population and occurs in the steppe and semi-desert areas, penetrates deep into the desert	Protection category 5
114.	Black-bellied sand grouse (Pterocles orientalis),	Nest in the remote areas	Protection category 3
115.	Pallas sand grouse (Syrrhaptes paradoxus)	The species population is shrinking. Occur in the semi-desert and desert areas	Protection Category 4

[214] Based on the degree of rarity, each Red Data Book species is assigned one of the following protection categories: 1 – vanishing; 2 – rare; 3 – shrinking; 4 – unclear status (understudied species); 5 – restored species. i.e. those that are no longer threatened as a result of conservation measures taken.

ANNEX 9 LETTER FROM THE KYZYLORDA REGIONAL CENTER FOR AIDS PREVENTION AND CONTROL

«ҚЫЗЫЛОРДА ОБЛЫСЫНЫҢ
ГОСУДАРСТВЕННОЕ

ДЕНСАУЛЫҚ С БАСҚАРМАСЫНЫҢ
КОММУНАЛЬНОЕ ПРЕДПРИЯТИ

«ЖИТС-ТІҢ АЛДЫ АЛУ ЖӘНЕ ОҒАН
ПРАВЕ ХОЗЯЙСТВЕННОГО ВЕДЕНИЯ

ҚАРСЫ ІНДЕГІ ҚЫЗЫЛОРДА
«КЫЗЫЛОРДИНСКИЙ ОБЛАСТНОЙ

ОБЛЫСТЫҚ ОРТАЛЫҒЫ»
ЦЕНТР ПО ПРОФИЛАКТИКЕ И БОРЬБЕ СО ШАРУАШЫЛЫҚ ЖҮРГІЗУ
ҚҰҚЫҒЫНДАҒЫ СПИДОМ» УПРАВЛЕНИЯ
ЗДРАВООХРАНЕНИЯ

МЕМЛЕКЕТТІК КОММУНАЛДЫҚ КӘСІПОРНЫ
КЫЗЫЛОРДИНСКОЙ ОБЛАСТИ»

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« 12 » 10 2015 жыл./г.
№ 3-1168

Заместителю Председателя Правления
АО «ШалкияЦинк ЛТД» **Шабантаеву А.**

Согласно **Вашего запроса №689 от 09.10.2015 г.** ГКП на ПХВ «Кызылординский областной центр по профилактке и борьбе со СПИДом» управления здравоохранения Кызылординской области представляет информацию о заболеваемости ВИЧ/СПИД по Кызылординской области и Жанакорганскому району.

Приложение: 1 таблица в формате Word.

Главный врач Б.Карибаева

Исп Сарсенбаева С.А. врач-эпидемиолог
тел 87242239454

Приложение. Данные в абсолютных цифрах

	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
По области	**6**	**6**	**12**	**5**	**5**	**4**	**6**	**4**	**9**	**4**	**8**
По Жанакорганскому району							**1**				**1**

ANNEX 10 LETTER FROM THE KYZYLORDA REGIONAL CENTER FOR CULTURE, ARCHIVES AND DOCUMENTS

№ исх: 05-10/945 от: 16.07.2015

ҚЫЗЫЛОРДА-10/945

ӘКІМДІГІ

«ҚЫЗЫЛОРДА ОБЛЫСЫНЫҢ МӘДЕНИЕТ, МҰРАҒАТТАР ЖӘНЕ ҚҰЖАТТАМА БАСҚАРМАСЫ» мемлекеттік мекемесі

АКИМАТ КЫЗЫЛОРДИНСКОЙ ОБЛАСТИ

Государственное учреждение

«УПРАВЛЕНИЕ КУЛЬТУРЫ, АРХИВОВ И ДОКУМЕНТАЦИИ КЫЗЫЛОРДИНСКОЙ ОБЛАСТИ»

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Председателю Правления
АО «ШалкияЦинк ЛТД»
Б.М. Рамазанову

В ответ на письмо №397 от 14 июля 2015 года

Управление культуры, архивов и документации Кызылординской области, согласно Вашему запросу в связи с производственными работами по добыче полиметаллических руд месторождения Шалкия подземным способом расположенного в районах Жанакорган, Шиели в хребте Каратау, сообщает следующее.

Комплекс наскальных рисунок ущелья Сауыскандык в районе Шиели, коллекция наскальных рисунок ущелья Майдамтал, Бесарык в районе Жанакорган расположенные вблизи району где будут проводиться производственные работы входят в состав историко-культурных мест хребта Каратау, где обитали древние люди. А, производственные работы могут негативно влиять на защиту и сохранение историко-культурных ценностей хребта Каратау.

В связи с этим, на данной территории перед началом производственных работ в соответствии Законом Республики Казахстан "Об охране и использовании объектов историко-культурного наследия" (статьи 39,40) должны осуществляться исследовательские работы для определения историко-культурного наследия объектов.

Наряду с этим, обращаем внимание на то, что исследовательские работы могут осуществлять физические и юридические лица, имеющие лицензию Министерства культуры и спорта Республики Казахстан в этой области и расходы по исследованию должны быть компенсированы от предприятия, которое будет осуществлять работы в этом регионе, значит с Вашей стороны.

Руководитель управления **Е. Абдрахманов**

Исп.: С.Көзейбаев
Тел.8-724-2-26-41-93

27-86-84

Результаты согласования
16.7.2015: Қойшығұлова А. Қ. (Қойшығұлова А. Қ.) - - согласовано без замечаний

ANNEX 11 HISTORICAL AND CULTURAL REVIEW CONCLUSION №4

Archeo-Service

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ЗАКЛЮЧЕНИЕ ИСТОРИКО-КУЛЬТУРНОЙ ЭКСПЕРТИЗЫ №4

Организация	Товарищество с ограниченной ответственностью «Archeo-service». Лицензия №15011787 от 23.06.2015 г.
Отрасль науки	Археология
Предмет и цели	Выявление наличия или отсутствия объекта историко-культурного наследия
Наименование объекта	Территории земельного отвода проектируемых стволов «Южный» и «Вентиляционный» рудника Шалкия, общей площадью 11,2 га

Границы участка

Угловые точки	Комплекс ствола «Вентиляционный»		Угловые точки	Комплекс ствола «Южный»	
	Координаты (система координат 1963 г.)			Координаты (система координат 1963 г.)	
	x	y		x	y
1	62548,01	76256,21	9	59795,55	78609,70
2	62548,46	76438,78	10	59795,55	78767,60
3	62498,29	76440,22	11	59633,06	78767,60
4	62473,43	76427,78	12	59633,06	78713,50
5	62463,89	76402,74	13	59599,70	78713,50
6	62465,43	76351,62	14	59599,70	78681,50
7	62448,88	76325,92	15	59633,06	78681,50
8	62448,04	76252,75	16	59633,06	78609,70

Настоящее заключение археологической экспертизы составлено ТОО «ARCHEO-SERVICE» по заказу АО «ШалкияЦинк ЛТД» согласно условиям договора № SHZ-116/15 от 04. 11. 2015 г.

Экспертиза проведена 12-13 ноября 2015 г. путем непосредственного обследования территории, согласно предоставленной Заказчиком информации (план-схеме).

В процессе подготовки к Экспертизе были изучены исторические материалы и археологические карты.

<u>Заключение:</u>

1. В ходе проведения Экспертизы на территории проектируемого ствола «Южный» обнаружен и исследован могильник, признанный памятником истории и культуры, состоящий из 2 курганов (См. «Таблица обнаруженных памятников»).
2. На территории проектируемого ствола «Вентиляционный» зафиксированы действующие технические дороги рудника и ЛЭП, нарушившие целостность ландшафта. Объекты истории и культуры не обнаружены.
3. Обследованный памятник находится в пределах буферной зоны осваиваемой территории.

<u>Рекомендации:</u>

1. в период строительства соблюдать охранную зону памятника 50 м, либо произвести комплексные научно-исследовательские работы.
2. в случае обнаружения других памятников археологии (а также древней керамики, артефактов, костей и т.п.) при строительстве, не выявленных в ходе Экспертизы в виду отсутствия видимых признаков, остановить все работы и сообщить о находках в ТОО «Archeo-service», либо в уполномоченный государственный орган.

<u>Приложения:</u>

1. *Таблица обнаруженных памятников*

ANNEX 12. HISTORICAL AND CULTURAL REVIEW CONCLUSION NO. 5

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ЗАКЛЮЧЕНИЕ ИСТОРИКО-КУЛЬТУРНОЙ ЭКСПЕРТИЗЫ №5

Организация	Товарищество с ограниченной ответственностью «Archeo-service». Лицензия №15011787 от 23.06.2015 г.
Отрасль науки	Археология
Предмет и цели	Выявление наличия или отсутствия объекта историко-культурного наследия
Наименование объекта	Территории земельного отвода проектируемого объекта «Хвостохранилище» рудника Шалкия, площадью 180 га и земельного отвода под будущие объекты вспомогательного производства

Границы участка

Угловые точки	Объект «Хвостохранилище»		Угловые точки	Будущие объекты вспомогательного производства	
	Координаты (система координат 1963 г.)			Координаты (система координат 1963 г.)	
	x			x	y
1	63173.262	72948.675	1	63593.9574	73212.0779
2	61917.916	74095.392	2	62805.5376	74239.3422
3	61275.079	72932.792	3	61769.9994	74898.8214
4	61990.235	72200.235	4	60705.5395	73150.1557
			5	60764.206	73092.2919
			6	60664.9913	72889.5967
			7	61576.2055	72025.8596
			8	61767.3561	72133.6411
			9	61222.2815	72667.3301
			10	61275.079	72932.792
			11	61917.916	74095.392
			12	63173.262	72948.675

Настоящее заключение археологической экспертизы составлено ТОО «ARCHEO-SERVICE» по заказу АО «ШалкияЦинк ЛТД» согласно условиям договора № SHZ-8-59/16 от 15. 04. 2016 г.

Экспертиза проведена 15 апреля – 03 мая 2016 г. путем непосредственного обследования территории и закладки рекогносцировочных шурфов, согласно предоставленной Заказчиком информации (план-схеме).

В процессе подготовки к Экспертизе были изучены исторические материалы и археологические карты.

Заключение:

1. В ходе проведения Экспертизы на территории проектируемого объекта «Хвостохранилище» и земельного отвода под будущие объекты вспомогательного производства памятников истории и культуры не обнаружены.

Рекомендации:

1. в случае обнаружения памятников археологии (а также древней керамики, артефактов, костей и т.п.) при строительстве, не выявленных в ходе Экспертизы в виду отсутствия видимых признаков, остановить все работы и сообщить о находках в ТОО «Archeo-service», либо в уполномоченный государственный орган.

"Archeo-service" ЖШС БСН: 140440034521, ИИК KZ8496516F0007799636 «ForteBank» АҚ, БИК: IRTYKZKA, КБе 17

ANNEX 13. HISTORICAL AND CULTURAL REVIEW CONCLUSION NO. 6

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ЗАКЛЮЧЕНИЕ ИСТОРИКО-КУЛЬТУРНОЙ ЭКСПЕРТИЗЫ №6

Организация	Товарищество с ограниченной ответственностью «Archeo-service». Лицензия №15011787 от 23.06.2015 г.
Отрасль науки	Археология
Предмет и цели	Выявление наличия или отсутствия объекта историко-культурного наследия
Наименование объекта	Территории земельного отвода проектируемых объектов «Обогатительный фабрики», «Конвейерной ленты», «ПГУ-ТЭС» рудника Шалкия, общей площадью 9,7 га

Границы участка

Угловые точки	Объект «Обогатительная фабрика»		Угловые точки	Объект «ПГУ-ТЭС»	
	Координаты (система координат 1963 г.)			Координаты (система координат 1963 г.)	
	x	y		x	y
1	75365.2646	62978.1872	1	75290.3555	62557.0562
2	75583.7218	62678.1872	2	75140.3849	62560.0282
3	75583.7218	62783.5439	3	75138.0074	62440.0517
4	75365.2646	62783.5439	4	75287.9779	62437.0798

Угловые точки	Объект «Конвейерной ленты»	
	Координаты (система координат 1963 г.)	
	x	y
1	75504.2549	64138.8519
2	75554.1265	63807.3676
3	75553.3073	62993.3365

Настоящее заключение археологической экспертизы составлено ТОО «ARCHEO-SERVICE» по заказу АО «ШалкияЦинк ЛТД» согласно условиям договора № SHZ 8-59/16 от 15. 04. 2016 г.

Экспертиза проведена 04-30 мая 2016 г. путем непосредственного обследования территории, согласно предоставленной Заказчиком информации (план-схеме).

В процессе подготовки к Экспертизе были изучены исторические материалы и археологические карты.

Заключение:

1. В ходе проведения Экспертизы на территории проектируемых объектов «Обогатительный фабрики», «Конвейерной ленты», «ПГУ-ТЭС» памятников истории и культуры не обнаружены.

Рекомендации:

1. в случае обнаружения других памятников археологии (а также древней керамики, артефактов, костей и т.п.) при строительстве, не выявленных в ходе Экспертизы в виду отсутствия видимых признаков, остановить все работы и сообщить о находках в ТОО «Archeo-service», либо в уполномоченный государственный орган.

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ANNEX 14 LIST OF USED SOURCES

Regulatory documents

A. Code of the Republic of Kazakhstan № 212-III of January 09, 2007 (as amended and supplemented on 15.06.2015) - http://online.zakon.kz/Document/?doc_id=30085593

B. Order of the Minister of the Environment of the Republic of Kazakhstan dated June 28, 2007 № 204-p On Approval of Instruction on Environmental Impact Assessment of the Planned Economic and Other Activity within the Development of Preplanning, Planning, Predesign and Design Documentation (as amended and supplemented on 24.09.2013) - http://online.zakon.kz/Document/?doc_id=30115016

C. Water Code of the Republic of Kazakhstan № 481 of July 09, 2003, as amended and supplemented on 15.06.2015 - http://adilet.zan.kz/rus/docs/K030000481_/info

D. RK Law “On Energy Conservation and Efficiency” № 541-IV of January 13, 2012 (as amended and supplemented on 15.06.2015.) – http://online.zakon.kz/Document/?doc_id=31112351

E. Code of the Republic of Kazakhstan "On people's health and the health care system", dated September 18, 2009 № 193-IV (with amendments and additions as of 2011)

F. Law of the Republic of Kazakhstan dated 11 April 2014 № 188-V “On Civil Protection”.

G. Labor Code of the Republic of Kazakhstan dated May 15, 2007 № 251-III (with amendments and additions as of 07.21.2015)

H. Order of the Minister of the Environment of the Republic of Kazakhstan dated July 25, 2007 № 238-p On Approval of the Rules on Access to the Environmental Information Related to the OVOS Procedure and Decision Making Process on the Planned Economic and Other Activities – http://online.zakon.kz/Document/?doc_id=30120736#sub_id=100

I. Order of the Minister of the Environment of the Republic of Kazakhstan dated May 07, 2007 № 135-p On Approval of Rules on Public Hearings, registered with the Ministry of Justice of the Republic of Kazakhstan on May 30, 2007 under № 4687 – http://adilet.zan.kz/rus/docs/V070004687_

J. Land Code of the Republic of Kazakhstan from 20.06.2003 № 442-II.

K. Law the Republic of Kazakhstan from 24 June 2010 № 291-IV “On Subsoil and Subsoil Use”.

Additional references used in the Section on Greenhouse Gases*

** This list supplements those sources that are mentioned in the Section’s footnotes.*

1. Research Assignment Report “Quantify Greenhouse Gas Emissions, Develop Greenhouse Gas Emission Scenarios, Develop the National Kazakhstani Greenhouse Gas Emission Strategy, Facilitate the Establishment of the

National Greenhouse Gas Emission Licensing System. Enhance the Greenhouse Gas Emission/Sink Monitoring and Reporting System", KazNIIEK RK MEP, Almaty, 2008

2. IPCC Methodology "National Greenhouse Gas Inventory Guidelines", 2003
3. RK Fuel and Energy Balance, RK Agency of Statistics, Almaty, 2006-2007
4. United Nations Convention on Climate Change, Published for the Climate Change Secretariat by UNEP's Information for Conventions, http://www,unfcc,inthttp://forum,zakon,kz/lofiversion/index,php?t11593,html/
5. 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume Energy, http://www,ipcc,ch
6. Greenhouse Gas Emission Estimation Technique, MEP, Astana, 2009
7. RK Environmental Code (Article 16, Clause 7);
8. The National Accounting Rules for Greenhouse Gas Emissions and Ozone Depleting Substance Consumption, RK Government Resolution of 8 February 2008 No. 124;
9. RK Government Resolution "Greenhouse Gas Emission Restriction, Termination and Reduction Rules" of 11 February 2008 No. 128;
10. Greenhouse Gas Monitoring and Inventory Rules. Order by the RK Minister of Energy of 19 March 2015 No. 221;
11. Toxic emissions from vehicles are estimated in accordance with the Emission Estimation Technique Manual for Fugitive Emissions. United Nations Convention on Climate Change, Published for the Climate Change Secretariat by UNEP's Information for Conventions, http://www.unfcc.int
12. Emission estimates for diesel fuel tanks have been produced in accordance with the Methodological Guidance Document RND 211.2.02.09- 2004 "Emission Estimation Guidance for Emissions from Reservoirs". http://online.zakon.kz/Document/?doc_id=30379214
13. Emission estimates for vehicle maintenance shops have been produced in accordance with the Emission Estimation Technique Manual for Aggregated Emissions from Motor Transport. 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, http://www.ipcc.ch
14. Emission estimates for welding operations have been produced in accordance with the Emission Estimation Technique for Air Emissions from Welding Operations (based on the specific emission values), RND 211.2.02.02-2004.http://online.zakon.kz/Document/?doc_id=30203227
15. Emission estimates for metal processing operations have been produced in accordance with the Emission Estimation Technique for Air Emissions from Metal Processing Operations (based on the specific emission values), RND 211.2.02.06-2004.http://online.zakon.kz/Document/?doc_id=30203227

List of the reviewed documents (As at the issuing date of the "A" version of this report – 21 July 2015)

НАЗВАНИЕ ИСХОДНОГО ФАЙЛА НА РУССКОМ ЯЗЫКЕ	НАЗВАНИЕ ФАЙЛА НА АНГЛИЙСКОМ ЯЗЫКЕ
page-0001	Permit for Mine Drainage (2008)
page-0002	Permit for Mine Drainage (2008)
page-0003	Permit for Mine Drainage (2008)
page-0004	Permit for Mine Drainage (2008)
page-0005	Permit for Mine Drainage (2008)
page-0001 (2)	Permit for Special Water Use (2002)
page-0002 (2)	Permit for Special Water Use (2002)
page-0003 (2)	Permit for Special Water Use (2002)
KZ10VCZ00025140_ru (1)	Permit for Emissions into the Environment (2015)
Пояснение к разрешению на эмиссии	Comments to Emissions Permit
Пояснение к разрешениям на водопользование	Comments to Water Use Permits
Горный отвод 2014г ПВ	Land Claim (Kazakh Geology + Land Use Ministry, 2014)
Контракт 3483	Contract for Underground Water Extraction (Contract 3483, 2009)
Доп 2 и РП К3483 2012г	Addendum 2 to the Contract 3483 for Underground Water Extraction (2009)
page-0001	Mining Lease with Geographic Coordinates
page-0002	Map of Mining Tracts Stirrer Locations
гос лиценз и стат карта	State Licenses and Statistical Card (2001)
Тизбеси	List - The Types of Work in Architecture and Town-Planning, in the Technical Audit and Examination (1996)
перечень	List - The Types of Work in Architecture and Town-Planning, in the Technical Audit and Examination (1996)
Проект горного отвода	The Project Mining Lease (2001)
рнн	Taxpayer Certificate (2001)
Закон ЗРК №о271_V_ЗРК от 29-12-2014 (об изменениях_недроплольз)	National Legislation regarding subsoil (2014)
ЗАКОН РК от 24.06.10 N291-IV О недрах с изм.на 29.12.14г	The Law On Soil and Subsoil Use (2014)
Экологический кодекс от 291214	The Ecological Code from (2014)
ЗЕМЕЛЬНЫЙ КОДЕКС РК ОТ 20.06.2003 № 442-II от 291214	The Land Code (2003)

НАЗВАНИЕ ИСХОДНОГО ФАЙЛА НА РУССКОМ ЯЗЫКЕ	НАЗВАНИЕ ФАЙЛА НА АНГЛИЙСКОМ ЯЗЫКЕ
Водный кодекс от 291214	The Water Code (2014)
Новые правила проведения общественных слушаний 26-03-2013	New Regulations for Carrying out Public Hearings (2007)
Требования_ атмосферный воздух	National Requirements for Air
Требования_вода	National Requirements for Water
Требования_почва	National Requirements for Soil
Расчет водопотребления	Water Consumption at Shalkiya Mine
Основные нормативные акты_экология	Main Environmental Regulations (a list)
KZ10VCZ00025140 (1)	Waste Management Program (2014 - 2020)
KZ10VCZ00025140 (1)	Waste Management Program Approval (2014 - 2020)
KZ10VCZ00025140	Environmental Protection Action Plan (2015 - 2017)
ПЭК 2	Production Environmental Control Program (2014)
ПЭК 1	Production Environmental Control Program (2015 - 2017)
000000M6076R0 final Ru	Outotec - Summary of Basic Design of Processing Plant at 4 million tonnes per year (June 2008)
000000F1009R2	Outotec - Shalkiya Concentrator - Basic Engineering Report: Process and Plant Description
000000F1014R3	Outotec - Process Flow Diagram for Concentrator Plant
2001 г. (есть геогр. положение и климат)	Geography and Climate (2001)
ОЦЕНКА МИНЕРАЛЬНЫХ РЕСУРСОВ И ЗАПАСОВ РУДЫ, 2007 г.	Assessment of Mineral Resources and Reserves (2007)
предложения нам от эколога	Offers to us from the ecologist (2014)
План Горных работ П Р О Е К Т 21.07.08	Plan of Mining Operations - Increased Productivity in Shalkiya up to 4 million tonnes of ore per year (2008)
Отчет 8ГР 2012г	Statistical Reporting Balance of Mineral Reserves, Lead-Zinc (2012)
Задание на проект Шалкия	Task for Shalkiya's Project (2014)
текст ТЭО Шалкия книги 1	Feasibility Study for Book 1 (2004)
Проект пром. разработки полимет-х месторождения Геология	Industrial Development Project, Volume 1, Book 1 (2012)
Проект пром. разработки полимет-х месторождения	Industrial Development Project, Volume 1, Book 1 (2012)
Проект пром. разработки полимет-х руд местор. «Шалкия» подземным способом, 2012 г.(есть крепости руд)	Industrial Development Project, Volume 1, Book 2 (2012)

НАЗВАНИЕ ИСХОДНОГО ФАЙЛА НА РУССКОМ ЯЗЫКЕ	НАЗВАНИЕ ФАЙЛА НА АНГЛИЙСКОМ ЯЗЫКЕ
радиация_территория	Certificate of Accreditation - Measurements of Gamma Radiation Dose on 09.11.2014
ООС	Volume 3, Book 1 - Environmental Protection Report
ООС	Volume 3, Book 1 - Environmental Protection Report
протокол	Protocol of Technical Meeting
стр 9-10	Brief Description of the Environmental Protection section
стр 15-16	Short Description of: - The Physiographic/Climate Conditions of the Region - The Characteristic of the Level of Pollution of Atmospheric Air in the Area - The Characteristic of a Designed Project as a Pollution Source
Список лит-ры	List of Used Literature
с021-36 Таблицы 3.1-3.8	Table 3.1 - 3.8 - The list of the harmful substances released into the atmosphere
с040 Таблица 3.9 Мероприятия по снижению выбросов	Table 3.9 - Action plan to reduce emissions into the atmosphere
с042-43 Таблица 3.11 Приземные концентрации	Table 3.11 - A list of the sources that provide the greatest contribution to atmospheric pollution project
с044-49 Таблица 3.12 Нормативы	Table 3.12 - Emissions of pollutants into the atmosphere of the project
с050-51 Таблица 3.13 Контроль ПДВ	Table 3.13 - Calculation of emission types by sources from the project
с053 Таблица 3.14 Контроль на границе СЗЗ	Table 3.14 - Control values of ground concentration of harmful substances for control of standards of PDV
с056 Таблица 3.15 Платежи	Table 3.15 - Calculation of a payment for emissions in the atmosphere from stationary sources
с058-59 Таблица 3.16 Расчет шума	Table 3.16 - Characteristic of levels of sound pressure of sources of noise
с064 Таблица 4.1 Баланс водопотребления и водоотведения	Table 4.1 - Balance of water consumption and water disposal on consumers
с067 Таблица 4.2 Состав сточных вод	Table 4.2 - Qualitative and quantitative composition and properties of wastewater
с068 Таблица 4.3 Состав шахтных вод	Table 4.3 - Qualitative and quantitative composition and properties of mine water
с071 Таблица 4.4 Расчет ПДС выпуск 1	Table 4.4 - Calculation of PDS standards for the production of number 1 - untreated household sewage
с072-73 Таблица 4.5 Расчет ПДС выпуск 2	Table 4.5 -Calculation of PDS standards for the production of number 2 - mine waters of the mine "Shalkiya"
с075 Таблица 4.6 Очистка сточных вод	Table 4.6 - Qualitative and quantitative indicators of sewage treatment

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с079 Таблица 4.7 Расчет ущерба по воде	Table 4.7 - The calculation of the mass of pollutants discharged
с086-91 Таблица 6.1 Отходы	Table 6.1 - The list, a brief description of waste and measures to eliminate the harmful effects of the environment
184, 291, 301, 330, 337, 2908, 5002, 6009, 6034, 6039, 6041, 6043	Maps of Dispersion calculations
не надо	Maps of Dispersion calculations
Точки расчетные	Substances Calculation
с148-149 Приложение С	Appendix C - Protocol - technical meeting regarding "Environmental Protection" and "EIA"
с104-105 Приложение Д Расчет выбросов дробильного комплекса сущ	Appendix D - Calculation of emissions of harmful substances from the existing crushing complex
с106-118 Приложение Е Расчет выбросов от АЗС	Appendix E - The calculation of emissions from a petrol station
с102-103 Приложение Г Взрывные работы	Appendix G - Calculation of emissions of harmful substances when carrying out explosive works
с124-126 Приложение И Выбросы от склада уравнивания руды	Appendix I - The calculation of emissions from the storage equalization ore
с127-129 Приложение К Выбросы от породного отвала	Appendix K - The calculation of emissions from the waste dump
с130-131 Приложение Л Выбросы от сжигания угля в горне	Appendix L - The calculation of emissions from the combustion of coal in the forge blacksmith
Приложение	Appendix N - The hydrogeological parameters taken into consideration of norms of PDS (max permissible discharge) - Includes table with indicators, unit of measure, and indicator size.
с136-147 Приложение Р Карты рассеивания	Appendix P - Maps of ground concentration of harmful substances in the atmosphere
с119-123 Приложение Ж Расчет выбросов бетонорастворного участка	Appendix Zh - The calculation of emissions from land mix concrete (ist. 0003)
MYSCAN_20060725_0002	Map of Shalkiya NFB
Карта Шалкия ООС	Map of Shalkiya NFB DWG File
Текст	Text
Приложение Д Буровые работы	Appendix D - Calculation of Emissions During Drilling Operations
Приложение Е Погрузочно-разгрузочные работы	Appendix E - Calculation of emissions during loading and unloading
Приложение К Расчет выбросов дробильного комплекса проект	Appendix K - The calculation of emissions from the projected crushing plant
Приложение М Экспериментальный участок	Appendix M - Calculation of emissions from the experimental site
Приложение П Зарядная аккумуляторов	Appendix P - The calculation of emissions of harmful substances from the battery plant
Приложение Т Выбросы от золошлакоотвала	Appendix T - Calculation of the emission of pollutants, emissions from the storage of ash and slag in the future

НАЗВАНИЕ ИСХОДНОГО ФАЙЛА НА РУССКОМ ЯЗЫКЕ	НАЗВАНИЕ ФАЙЛА НА АНГЛИЙСКОМ ЯЗЫКЕ
Приложение У Выбросы от склада угля	Appendix U - Emissions from a Coal Warehouse
Приложение Ж Сварочные работы	Appendix Zh - The calculation of emissions during welding
1.tif	Approval of data in the ecological sections (2007)
2.tif	Technical Meeting on the Sections, "Environmental Protection" and "EIA" of the Project (2007)
2-1.tif	Official stamp for Technical Meeting on the Sections, "Environmental Protection" and "EIA" of the Project (2007)
ОВОС	Volume 3 - Book 2 - Environmental Impact Assessment (EIA)
ОВОС	Volume 3 - Book 2 - Environmental Impact Assessment (EIA)
ОВОС-2007	Statement on the Research Work on the Topic: Environmental Impact Assessment
с39-42 Таблицы 7.2-7.3	Table 3.3 - Parameters of Emissions of the Polluting Substances in the Atmosphere for 1 Year of Operation
с17 Таблица 3.2 Химсостав пов. и подз.вод	Table 3.2 - A chemical composition of surface and underground water of Shalkiya mine (2002 - 2007)
MYSCAN_20060725_0002	Figure 4 - Schematic Map
Рисунок 4 Карта-схема	Figure 4 - Schematic Map DWG file
Карта 2	Drawing 1 Survey card
Рисунок 1 Обзорная карта	Drawing 1 Survey card DWG File
Усл.обозн	Legend
с20 Рисунок 3 ЭГГкарта	DWG File
с25 Булейко	Notes
с70-71	Appendix D - Protocol, Technical Meeting on the Sections "Environmental Protection" and "EIA"
ЗЭП	Volume 3, Book 3 - Statement of Ecological Consequences
Folder: 230215 ОВОСЫ от Заказчик: - 0.Титульн. шаблоны_doc - 1.Введение_doc - 2. Перечень_doc - 3.Проведение расчетов_doc - 4. Необх. расчета_doc - 5. Параметры_doc - 6. Нормативы_doc - 7. Санитарно-защитная_doc.pdf - 8. План-график_doc - 9. Воздействия_doc - 10. Инвентаризация_doc - 11. Расчеты_DOC	Environmental Impact Assessment (Phase II, 2012)

НАЗВАНИЕ ИСХОДНОГО ФАЙЛА НА РУССКОМ ЯЗЫКЕ	НАЗВАНИЕ ФАЙЛА НА АНГЛИЙСКОМ ЯЗЫКЕ
- Заключение ГЭЭ на проект ОВОС 4 млн 2012год - Заявление об ЭП_doc	
Ответы на запрос гл инженера проекта	Responses to the Request of the Project Engineer (2014)
отчет по результатам анализа воды за 1 кв 2013года	Report for Q1 Water Analysis (2013)
отчет по результатам анализа воды и растений за 2 кв 2013г	Report for Q2 on Water and Plant Analysis (2013)
Отчет 3 кв 2013год	Report for Q3 Water and Soil Analysis (2013)
отчет по результатам анализа воды и почвы за 3 кв	Report for Q3 on Water and Soil Analysis (2013)
Отчет 4 кв 2013год	Report for Q4 Water Analysis (2013)
отчет по результатам анализа воды за 4 квартал 2013 года	Report for Q4 on Water Analysis (2013)
отчет по результатам анализа 1 кв 2014 год	Report for Q1 Water Analysis (2014)
Отчет 2 кв за 2014год	Report for Q2 Water Analysis (2014)
отчет 3 кв 2014 год	Report for Q3 Water Analysis (2014)
ПДС Рудник Шалкия от 01.11.11	Project - Updating the Standards for Maximum Permissible Discharge for Pollutants Discharged with the Wastewaters of ShalkiyaZinc LTD (2011)
ПЭК 2013-2014гг	PEC (Performance Validation Check) 2013 - 2014
результаты анализа воды скв 6 Г БИС 1	Testing of Drinking Water Samples of Centralized and Decentralized Water Supply (2014)
результаты анализа воды скв 6 Г БИС	Testing of Drinking Water Samples of Centralized and Decentralized Water Supply (2014)
Результаты радиоактивности воды	The Results of the Radioactivity of Water (2014)
page-0006 - page-0007	Scheme of Mining and Geological Binding Facilities and Coordinates
Scan_20150227	Meteorological Data (2012-2014)
Scan_20150227_2	Meteorological Data (2012-2014)
Справка Казгидромет	Meteorological Data (2012-2014)
koncepciya_mk_rus_isp	Report - The Creation and Development of the Metallurgical Complex in the Kyzylordinsky Area (2014)
kyz	Development Program of the Kyzylordinsky Area between 2011 and 2015
Presentation to KGTSM	Presentation
Ответ Казгидромета	Letter from Director about Weather Station
Сотрудничество с ABB	Text file - information is not legible/incoherent

НАЗВАНИЕ ИСХОДНОГО ФАЙЛА НА РУССКОМ ЯЗЫКЕ	НАЗВАНИЕ ФАЙЛА НА АНГЛИЙСКОМ ЯЗЫКЕ
FW_ для Сидорова	Text file - information is not legible/incoherent
FW_ для Сидорова-1	Text file - information is not legible/incoherent
FW_ для Сидорова-2	Text file - information is not legible/incoherent
Image	Code of the Organization for Russian National Classification of Businesses and Organizations
Image0001	Code of the Organization for Russian National Classification of Businesses and Organizations
титуль корректировки пдв	Project Permit - Updatings of Standards of Maximum-Permissible Emissions for the Polluting Substances in the Atmosphere (2007)
ПДВ_рудник	Project Document - Updatings of Standards of Maximum-Permissible Emissions for the Polluting Substances in the Atmosphere (2007)
0001	Closing State Ecological Examination on Adjustment of the Project MPE Mine (Shalkiya, 2007) I
0002	Closing State Ecological Examination on Adjustment of the Project MPE Mine (Shalkiya, 2007) II
0003	Closing State Ecological Examination on Adjustment of the Project MPE Mine (Shalkiya, 2007) III
Заключение ГЭЭ_корректировка ПДВ	Closing State Ecological Examination on Adjustment of the Project MPE Mine (Shalkiya, 2007) I - III
Заключение ГЭЭ_НОО	Project Document - For the Treatment of Waste (2007)
титульный проект норм. обр. с отход.	Approval of Waste Management Standards for 2007 to 2008
Проект НОО Шалкия Цинк	Standards for Waste Management Draft (2007 - 2008)
климатич.условия - Физико-географ. и климатич.условия	Notes: Physical Geography
Растительный и животный мир	Notes: Flora and Fauna
Социально-экономическая хар-ка	Notes: Socio-Economic Characteristics
Программа по упр отходами 1	Waste Management Program for the Shalkiya Mine (2014-2020)
Программа по упр отходами 2	Waste Management Program for the Shalkiya Mine (2014-2020)
Жанакорган тынысы (3)	Zhanakorgan Newspaper Clipping for Public Hearing (2014)
Протокол об слуш	Minutes of the Public Hearing (11.18.2014)
3394 (ИГ) (Шалкия Цинк ЛТД)	Geological Survey (2008)
Копия 3394 (ИГ) (Шалкия Цинк ЛТД)[1]	A Copy of Geological Survey (2008)
plot.log	plot.log - information not legible/incoherent

НАЗВАНИЕ ИСХОДНОГО ФАЙЛА НА РУССКОМ ЯЗЫКЕ	НАЗВАНИЕ ФАЙЛА НА АНГЛИЙСКОМ ЯЗЫКЕ
Каталог координат Шалкия цинк[1]	Catalog of coordinates and heights of developments
Определение гипса	Plaster/gypsum Measurements
Определение гипса[1]	Copy of Plaster/gypsum Measurements
Таблица лабораторных определений коррозийной активности грунтов[1]	Table of Lab Results of Soil Corrosivity
Таблица расчетных значений деформационных характеристик и плотности грунтов1[1]	Table of Calculated Values of Deformation Characteristics and Density of Soils
Таблица результатов лабораторных определений водной вытяжки грунтов[1]	Table of laboratory results of aqueous extract of soil
Таблица результатов химического анализа грунтов на коррозийную активность по отношению к свинцу и	Table chemical analysis results of soils for corrosion activity in relation to the lead and aluminum
Инженерно-геологические колонки дудок	Engineering-geological columns of pipes
План , разрезы	Site Plan, cuts
План разрезы Таблицы и условные обозначения	Site Plan cuts Tables and symbols
Роза ветров(Кызылорда)	Wind rose (Kyzylorda)
Отчет_Эколимит_ 2007	Statement on the Research Work on the Waste Production Environmental Monitoring (2007)
Приложения_произв. монит. накоп. отходов	Appendix: Research Work on the Waste Production Environmental Monitoring (2007)
Отчет_обзор_ОФ и хвостохранилище_2007	Statement on the Research Work on the Environmental Performance Review (2008)
Степень загрязнения шахтных вод	Table: Measurements of the Degree of Contamination of Mine Water (2007 - 2014)
doc00960620150708141341	Approval: Department of Sanitary Inspection Committee on Kyzylorda oblast (2012) I
doc00960720150708141404	Approval: Department of Sanitary Inspection Committee on Kyzylorda oblast (2012) II
doc00960820150708141423	Approval: Department of Sanitary Inspection Committee on Kyzylorda oblast (2012) III
doc00960920150708141443	Approval: Department of Sanitary Inspection Committee on Kyzylorda oblast (2012) IV
doc00961020150708141514	Newspaper Clipping: "Industrialization and Modernization of the Region" (2012?)
doc00961120150708141534	Newspaper Clipping: "Environmental Assessment"(2012?)
doc00961320150708141706	Newspaper Clipping: "Dedicated to the Achievements and Shortcomings" (2012)
doc00961420150708141727	Newspaper Clipping: "Тындау еткізіледі"
doc00961520150708141751	Minutes of Public Hearing (06.19.2012) I
doc00961620150708141809	Minutes of Public Hearing (06.19.2012) II
doc00961720150708141829	Minutes of Public Hearing (06.19.2012) III

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doc00961820150708141849	Minutes of Public Hearing (06.19.2012) IV
doc00961920150708141910	Minutes of Public Hearing (06.19.2012) V
doc00962020150708141930	Minutes of Public Hearing (06.19.2012) VI
doc00962120150708141951	Minutes of Public Hearing (06.19.2012) VII
doc00962220150708142011	Minutes of Public Hearing (06.19.2012) VIII
doc00962320150708142032	Minutes of Public Hearing (06.19.2012) IX
doc00962420150708142052	Photos from the Public Hearing (06.19.2012)
№104 18 01 2012_ПДК_вода	Sanitary Requirements No. 104 (01.18.12): On the approval of the Sanitary Rules "Sanitary requirements for water sources, places of water intake for drinking purposes, drinking water supply and places of cultural and community water use and water security facilities"
Письмо вхд208 от 17 марта 2015г_Казгидромет	Approval: for meteorological data request No. 133 on 03.03.2015 from the weather station. - Table presents temperature of the coldest 5 days in 2012.
Программа _ЭК рудник_2015-2017	Production Environmental Control Program (2015 - 2017)
ПЭК 1	Production Environmental Control Program (2015 - 2017)
ПЭК 2	Production Environmental Control Program (2014)
Казгидромет_1.jpg	Meteorological Data (2012-2014)
Казгидромет_2.jpg	Meteorological Data (2012-2014)
Basic Eng Review 1	Outotec Basic Engineering Review
Basic Eng Review 2	Outotec Basic Engineering Review
Расчёт удельного количества воздуха	ConBelt Proposal: Calculation of the necessary number of air emissions requirements for self-propelled diesel equipment used in underground mining operations
ТКП Система Pocketlift 28.04.2015г	ConBelt Proposal: Technical and commercial proposal for a vertical conveyor system Continental «ContiTech POCKETLIFT»
Drawings - Existing Mine Facilities	Drawings - Existing Mine Facilities
Outotec HIGmills Leaflet	Outotec Information Leaflet on HIGmills (Grinder)
Xstrata Information - IsaMill Testing	IsaMill Testing
Outotec Material Balance	Outotec Basic Engineering Review: Material Balance (12.19.14)
Outotec - HIGmill Reference List - May 2015	Outotec - HIGmill Reference List (2015)

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Shalkiya Facilities List	List - Infrastructure for the Shalkiya Mine
Outokumpu Technology Minerals - Report - Russian	Outokumpu Technology Minerals - Report - Russian (2006)
Outotec - GSF Test Work Report	Outotec/Geological Survey of Finland - Preparation and a Grindability Test of the Shalkiya Zinc Ore Samples
Outotec - HUT Test Work Report	Outotec - HUT Test Work Report
Outotec Report - Sampling and Sample Preparation in Shalkiya and Kentau	Outokumpu Shalkiya Process Development Project - Sampling and Sample Preparation in Shalkiya and Kentau (2006)
Outotec Report - Laboratory Grinding Tests and Preliminary Sizing of the Mills	Outokumpu Shalkiya Process Development Project - Grinding: Laboratory Grinding Tests and Preliminary Sizing of the Mills (2006)
Capital Development Schedule	Tables - Schedules of Capital Mining Operations
Chinese Fans Specification - Russian	Report on the Multi-Axial Mine Fan of Local Ventilation Model DK 45-6-18, Production Company "Chengdu Yuchen Ventilator"
Preliminary Summary of the Classification and Flortation Tests at the Kentau Concentrator, and Dewatering and Grinding Tests Memo - M6063R1	Outotec - Preliminary Summary of the Classification and Flortation Tests at the Kentau Concentrator, and Dewatering and Grinding Tests Memo - M6063R1 (2014)
Classification Tests at the Kentau Concentrator	Outotec - Classification Tests at the Kentau Concentrator (2014)
Outotec Testwork Report - Mineralogy - t06094	Outokumpu - Shalkiya Process Development Project - Mineralogy: Mineralogical Characterization of the Ore Samples and Grinding Products (2006)
Outotec Testwork Report - Flotation - t06099	Outokumpu - Shalkiya Process Development Project - Flotation: Laboratory Flotation Study on the Shalkiya Pb-Zn Ore Sample (2006)
Outotec Testwork Report - Flotation - t06102	Outokumpu - Shalkiya Process Development Project - Flotation: Modeling of the Pb-Zn Flotation Circuit Based on Laboratory Tests (2006)
Outotec Testwork Report - Modeling the Upgrading of Shalkiya Zinc Concentrate - t08055	Outotec - Modeling the Upgrading of Shalkiya Zinc Concentrate (2008)
Shalkiya Continuous Pilot Tests and Preliminary Process Concept Report - t07113	Outotec - Shalkiya Continuous Pilot Tests and Preliminary Process Concept (2007)
X-Ray Assay of Twin Holes	X-Ray Assay of Twin Holes (X-Ray Logging Results of the South-East Area)
Shalkiya - 2015 Cashflow	Table: Design Works for the Construction of the Shalkiya Mine (2015) and Production program of reconstruction and overhaul, repair and refurbishment of existing buildings (2015)
3D Mine Design	3D Mine Design
Shalkiya - Existing Openings Level Plans	Shalkiya - Existing Openings Level Plans - AutoCAD files
Basic Testwork with the Outotec Pilot HIGmill	Thesis Report - Basic Testwork with Outotec HIGmill (2013)

НАЗВАНИЕ ИСХОДНОГО ФАЙЛА НА РУССКОМ ЯЗЫКЕ	НАЗВАНИЕ ФАЙЛА НА АНГЛИЙСКОМ ЯЗЫКЕ
Risk Management Policy of "Samruk-Kazyna" JSC	Risk Management Policy of "Samruk-Kazyna" JSC (2013)
Методика оценки КСУР	Methods of assessing the effectiveness of corporate risk management system in subsidiaries and affiliated organizations of "Samruk-Kazyna" (2012)
Политика управления рисками	The risk management policy of "Samruk-Kazyna" (2013)
Shalkiya Overview - Russian	Savonia Overview of Shalkiya (2013)
(MERGED)Вариант 200.14 - Схема вскрытия-Model	Drawing: Access Option from the Design Institute
(MERGED) 1-этап Шалкия (1)-Model	Drawing: Technical inspection of the structures of buildings and structures in the fields "Shalkiya" Zhanakorgan region, Kyzylorda oblast (2014)
(MERGED)Гараж лаборатория-Model	Drawing: Technical inspection of the structures of buildings and structures in the fields "Shalkiya" Zhanakorgan region, Kyzylorda oblast (2014)
(MERGED)Гостиница 1_recover-Model	Drawing: Technical inspection of the structures of buildings and structures in the fields "Shalkiya" Zhanakorgan region, Kyzylorda oblast (2014)
(MERGED)Градирня-Model	Drawing: Technical inspection of the structures of buildings and structures in the fields "Shalkiya" Zhanakorgan region, Kyzylorda oblast (2014)
(MERGED) Цент. Склад-Model.pdf	Drawing: Technical inspection of the structures of buildings and structures in the fields "Shalkiya" Zhanakorgan region, Kyzylorda oblast (2014)
(MERGED) Шалкия(Кызылорда)-Model.pdf	Drawing: Technical inspection of the structures of buildings and structures in the fields "Shalkiya" Zhanakorgan region, Kyzylorda oblast (2014)
(MERGED) PDF	Drawing: Technical inspection of the structures of buildings and structures in the fields "Shalkiya" Zhanakorgan region, Kyzylorda oblast (2014)
(MERGED) PR List-Plan Horizon	Drawing of Full Project Site (2014)
(MERGED)Лист П-002-23-02-2012-ПР Схема вскрытия-Model	Drawing: Projects of industrial exploitation of polymetallic ores deposits at "Shalkiya" (2012)
(MERGED)643 DRIVING-Model	Drawing: Topographic Drawing of Deposit Area
(MERGED)_PLANSHEET_планшет-Model	Drawings from Kazgiprotsvetmet: Topographic, Factory Plan Sheet (2007)
(MERGED)планшет-Model	Drawings: Tailings Plan Sheet (2007)
(MERGED)Лист 2 П-002-23-02-2012-ГГ Геологический план горизонта -200 м-Лист1	Drawing: Ore Deposit (2012)
(MERGED)Toposemka Shalkiya upon	Drawing: Reconstruction of asphalt-concrete coatings: details Access road km. 1.6 platform on the planned area in front of the battery, the area in front of mine "dispensing" (2014)
(MERGED) PDF	Drawings: Combined AutoCAD Drawings of Mine
(MERGED) ANNEX	Drawings: Locatino of Engineering Works

НАЗВАНИЕ ИСХОДНОГО ФАЙЛА НА РУССКОМ ЯЗЫКЕ	НАЗВАНИЕ ФАЙЛА НА АНГЛИЙСКОМ ЯЗЫКЕ
(MERGED) SHEET 1-6	Drawings: Ore Deposit
(MERGED)Инженерно-геологические колонки дудок-Model	Table: Model of Geotechnical Column Horns
(MERGED)-Model (2007)	Drawings: Model of Geotechnical Column Horns (2007)
(MERGED)M_1_1000_планшет	Drawing: Solid horizontally held at 0.5 meters (2007)
(MERGED)M_1_500_Планшеты	Drawing: Solid horizontally held at 0.5 meters (2007)
Additional Shalkiya Drawings for Reference - PDFs	Drawing: A one piece chamber-development system for testing of ore with an angle of incidence 0-8 (2012)
Documents, presented in march – june 2016	
Генплан_уточненныи.pdf – Схема расположения обогатительной фабрики	Drawing: Location scheme of processing plant
Для составления плана мероприятий по ЭСО_вариант Ахметовои.docx - Перечень документов, которые необходимо разработать в рамках внедрения международного стандарта ИСО-14001	Table: List of documents, which are required to develop for ISO-14001 standard
Информация для экологов	Text file - Information for egologists
координаты ШОФ	Text file - coordinates of Shalkiya processing plant
Копия Схема Граф автобусов_1	Table: scheme of buses timetable
Ответ Акимата_Ай-Тах.pdf	Response of Ai-Takh akimat
перечень документов с подписями.pdf	List of signed documents
план огажд.pdf	Action plan for prevention of unauthorized access
Праис-лист_утилизация мусора_2016.pdf	Price-list for waste utilization
Предложения по планам для ESIA	Text file – Suggestions for ESIA plans
Промбезопасность_политика.pdf	Health and safety policy
Регламент по подбору персонала.pdf	Recruitment specifications
Схема перевозки людей_Жанакорган	Drawing: Peolple transportation scheme_Zhanakorgan
Схема транспортировки грузов со станции Жанакорган	Drawing: Scheme of cargo transportation from Zhanakorgan station
Техспецификация_фоновые_ТЛ	Text file - Technical specifiacation of baseline studies
ТОО ГИИЗ_Заключение по гидрогеологии.pdf	Report on hydrogeolgy
Экологическая политика.pdf	Environmental policy

НАЗВАНИЕ ИСХОДНОГО ФАЙЛА НА РУССКОМ ЯЗЫКЕ	НАЗВАНИЕ ФАЙЛА НА АНГЛИЙСКОМ ЯЗЫКЕ
Noname – Письмо: Перечень документов по EHS	Email: List of EHS documents
Графическая часть ПЛА-2016	Drawing: Graphical part of the emergency containment plan
Запрещена рыбная ловля	Text file - Prohibitory signs
ОПЕРАТИВНАЯ ЧАСТЬ - копия	Copy of the operative part of the emergency containment plan for I – half of the year 2016
ПЛА 2014-1	Text file - Emergency containment plan for basic feed storage BM of Shalkiya mine for I – half of the year 2016
ПЛА баз склада	Operative part of the emergency containment plan for basic feed storage BM for I – half of the year 2016
Пояснения от Искандера для Эколайн	Text file – Information for Ecoline
Перечень+ инструкции по ТБ	Table: OHS instruction list according to specialties and registration numbers
программа 10час рабочим 001	Education and advanced training program for staff, regarding OHS issues (10-hour program)
проба Шалкия	Shalkiya mine atmosphere analysis results (May 2016)
программа ИТР 40 час 001	Education and advanced training program for ИТР regarding OHS issues (40-hour program)
стропальщик 001_план обучения	Curriculum, education and advanced training program for “Sling operator” profession
Untitled_20160527222241500 – Извещение о результатах анализа выхлопных газов	Notice of emission gases analysis results
Маршруты	Drawing: Routes
Шалкия-4	Drawing: Shalkiya-4 Deposit Facilities
Шалкия-isolines-2	Drawing: Shalkiya-isolines
Шалкия-stakeholders	Drawing: Shalkiya-stakeholders
ESIA_Shalkiya_C_Eng_2_May_2016_v4 _green 66 - Объекты АО «ШалкияЦинк» и соседствующие землепользователи	ShalkiyaZink Facilities and Neighbouring Land Users
Construction Environmental Management Plan_H349292-00000-121-050-0001.PDF	Construction Environmental Management Plan
Environmental Design Criteria_H349292-00000-245-210-0001_0_V6.pdf	Environmental Design Criteria
HAZOP Report _H349292-00000-142-066-0001_0_V2.PDF	HAZOP Report
Preliminary HAZOP Report_H349292-20000-142-066-0001_0_V2.PDF	Preliminary HAZOP Report

НАЗВАНИЕ ИСХОДНОГО ФАЙЛА НА РУССКОМ ЯЗЫКЕ	НАЗВАНИЕ ФАЙЛА НА АНГЛИЙСКОМ ЯЗЫКЕ
Аттестат аккредит 2014 рус.	Accreditation Certificate (2014)
Область аккредитации 2014 г	Accreditation area (2014)
ОСТ 4142-89_определение мышьяка	Text file - Drinking water. Method for determination of arsenic mass concentration
СТ РК ГОСТ Р 51212-2003_определение ртути	Text file – RK GOST Drinking water. Method for determination of mercury
СТ РК ИСО 8288-2005_определение кадмия	Text file – RK GOST Drinking water. Method for determination of cadmium
Limits - Нормативы	Table: Limits
Протокол испытания заказа_3 кв 2015.pdf	Test protocol (2015)
Протокол №293-15498 от 10.12.15 водосборник шахтных вод 001.jpg	Protocol №293-15498 (10.12.15) settler pond
Протокол №293-15498 от 10.12.15 водосборник шахтных вод	Protocol №293-15498 (10.12.15) settler pond
Минералогический состав	Mineral composition
Результаты биотестирования	Biotesting results
Результаты рентгеноспектрального анализа	X-ray spectroscopic analysis results
Результаты спектрального анализа	Spectrum analysis results
Результаты химического анализа	Chemical analysis results
12.04.05г. – Наряд на анализ воды	Water analysis work order (12.04.05)
16.06.05г. – Наряд на анализ воды	Water analysis work order (16.06.05)
18.04.2008 – Наряд на анализ воды	Water analysis work order (18.04.08)
28 августа 2008 года – Наряд на химанализ	Chimical analysis work oder (28.08.08)
наряд+ЦХЛ+240408г	Chimical analysis work oder (24.04.08)
Результаты анализа хвостовой 06.05.08	Results of tailings facility analysis (06.05.08)
1. Основные положения – ТЭО отработки месторождения Шалкия	General Terms – FS of Shalkiya Mine
2. Исходные данные	Baseline information –
3. Геология	Geology
4. Горная часть	Mountain Part
5. Геотехника	Geotechnics
6. ОФ	Enrichment and processing

НАЗВАНИЕ ИСХОДНОГО ФАЙЛА НА РУССКОМ ЯЗЫКЕ	НАЗВАНИЕ ФАЙЛА НА АНГЛИЙСКОМ ЯЗЫКЕ
7. Хвостохрагилище	Tailings Facility
8. Водоснабжение и водоотведение	Water Supply and Water Disposal
9. Поверхностная инфраструктура	Surface Infrastructure
10. Производственная деятельность	Production activities
11. План реализации проекта	Project implementation plan
12. Капитальные затраты	Capital costs
13. Операционные затраты	Operating costs
14. Экономика - старая	Economy - old
Глоссарий	Glossary
Критерии проектирования подземного рудника	Design criteria of underground mine
Ответ по вентиляции рудника	Response about mine ventilation
Отчет о характеристике горных пород	Report on the charecteristis of rock formation
Отчет пробелов в геомеханике	Report on gaps in geomechanics
Отчет AMC по мин. ресурсам	AMS report on mineral resources
Оценка методов ведения горных работ	Assessment of mining methods
По горному планированию в софте.ZIP	About rock planning in soft. ZIP
Подземная инфраструктура на английском	Underground infrastructure in English
Подземные АСУТП и коммуникации	Underground ASUTP and communication
Подземные сети - электроэнергия на английском	Underground Utilities – Power in English
Руководство по подземным водам на английском	Undergound Mine Dewatering System in English
Указатель приложений по горному планированию	Rock Planning Annexes Index
Указатель приложений по геотехнике	Geotechnics Annexes Index
Указатель приложений по геологии	Geology Annexes Index
H349292-21000-284-026-0001_-_V1 модель в Ventsym и обоснование по вентиляции.ZIP	Model in Ventsym and Ventilation Proof
Первоначальеон обращение Омарова Р.Е..msg	Initial speech of P.E. Omarov
Первоначальные комментарии от Азелгареевой Р.Т..msg	Initial comments of P.T. Azelgareeva
~$H349292-00000-620-016-0005_-_V1 свод кап. затрат на рудник	Table: Code of Mine Costs

НАЗВАНИЕ ИСХОДНОГО ФАЙЛА НА РУССКОМ ЯЗЫКЕ	НАЗВАНИЕ ФАЙЛА НА АНГЛИЙСКОМ ЯЗЫКЕ
~$H349292-20000-280-014-0002_-_V1 только частота замен ГШО	Table: Only replacement rate of mining equipment
Инструкция по креплению от Жигера по сокращению бетонных работ.msg	Fixing instruction to cement works reduction from Zhiger
Комментарии от рудника	Table: Comments from Mine
Обоснование от Жигера 2.msg	Proof from Zhiger
H349292-00000-620-016-0005_-_V1 свод кап. затрат на рудник	Table: Code of Mine Costs
H349292-20000-280-014-0001_-_V1 штатное расписание	Table: Staff schedule
H349292-20000-280-014-0002_-_V1 только частота замен ГШО	Table: Only replacement rate of mining equipment
H349292-20000-280-284-0001_-_V1 график добычи	Table: Production schedule
H349292-TR-00158-CA01PDFCover	Cover
Вторичные комментарии от рудника	Secondary comments from Mine
Первоначальные комментарии рудника - ответы от РО	Initial comments from Mine – responses from RO
Свод капитальных затрат 1	Table: Code of Mine Costs
Форма заполнения по сталепрокату - для запроса ценовых	Form for rolled steel products – request for costs
H349292-00000-620-016-0001_-_V1 расходы собственника	Expenses of owner
H349292-00000-620-016-0002_-_V1 трудозавтраты расчеты	Labour contribution - accounts
H349292-00000-620-016-0003_-_V1 трудозавтраты предложения собранные HATCH	Labour contribution – proposals, made by HATCH
H349292-00000-620-016-0004_-_V1 непредвиденные	Unexpected
H349292-TR-00157-CA01PDFCover	Cover
Ком. предложения от Султанбекова Т.Е..msg	Fee proposal from T.E. Sultanbekov
Сообщение от Султанбекова Т 2.msg	Message from Sultanbekov T. 2
Сообщение от Султанбекова Т.msg	Message from Sultanbekov T.
Сообщение Рабига - HATCH по трудозатратам.msg	Message Rabiga – HATCH about labour contribution
Fwd расценки.msg	Tariffs
Форма для заполнения по трудозатратам	Form for labour contribution
Предложения от подрядчиков в адрес HATCH по стоимости трудозатрат	Proposals from contractors to HATCH, regarding labour contribution costs

НАЗВАНИЕ ИСХОДНОГО ФАЙЛА НА РУССКОМ ЯЗЫКЕ	НАЗВАНИЕ ФАЙЛА НА АНГЛИЙСКОМ ЯЗЫКЕ
doc01858920160407110400	Request for labour contribution from Energoservice
doc02148420160407094726	Reply from ShalkiyaZink to Energoservice
doc02149420160407112509	Table of labour contribution made by Energoservice
Письмо 1 – ценовое предложение от «Нефтерееммаш»	Letter - Cost proposal from Nefteremmash
Ценовое предложение	Cost proposal
Page1 – запрос о трудозатратах	Request for labour contributions
Орг структура Шалкия 2016	Table: Organisational set-up (2016)
протокол собрания с частными землепользователями	Minutes of the meeting with private land users
Мобилизация персонала	Personnel mobilization
Записка по асбесту	Memorandum about asbestos
Схема транспортировки грузов со станции Жанакорган	Scheme of cargo transportation from the Zhanakorgan station
200 т.3 кн.1 ОВОС	OVOS Report
Воздействие на подземные воды	Impact on Groundwater
Заключение археологов: План участка_2016 фабрика, конвейер и ПГУ Заключения археологов_1 Хвостохранилище и другие производства	Archeologists' report: Site plan Plant, line and CCCP Archeologists' reports_1 Tailings Storage Facility and other productions

ANNEX 15 SOCIAL SURVEY METHODOLOGY

1. Goal and approaches

The goal of the survey is assessing the socio-economic situation in the Project area. Specific survey objectives include characterizing the baseline social situation before the start of the Project; predicting potential changes caused by the Project; defining the extent of impacts; assessing potential risks and confirming that the Project's area of impact does not include any cultural heritage that can be damaged or destroyed as a result of the Project implementation. This section describes the data collection technique used to address the initial objective, i.e. providing a description of the baseline social situation in the region.

This description is required to focus on the following several levels:

- National level (Republic of Kazakhstan)
- Oblast level (Kyzylorda Oblast)
- District level (Zhanakorgan District)
- Local level (Shalkiya village and perhaps other nearest settlements including Kuttykozha, Zhaiylma, and Pioner villages).

The following aspects of the socio-economic situation will be covered in the survey:

- Regional economy
    - General overview
    - Role of mining sector
    - Other key sectors
    - Small and medium business, level of business development
- Infrastructure (transport routes, housing and utilities, water/gas/electricity supply, communications, education, healthcare, culture)
- Land use (land use zoning, land use pattern, major landlords and tenants)
- Demography (natural trends, migration, gender and age pattern)
- Labour market (by sector, by business ownership, workforce sources) and unemployment
- Social welfare system
- Environmental situation and environmental organisations
- Presence/absence of cultural/archaeological heritage and protected areas
- Intangible heritage and indigenous people

At the national level, the survey also focuses on reviewing information about the national strategic planning in mining sector and key sectoral players. At the local level, the survey considers information about the levels of awareness about the Project among local residents inhabiting the nearest settlements and their attitudes, concerns and expectations associated with the Project.

The following data collection steps will be required to provide an adequate and complete description of the baseline socio-economic situation:

- A desktop study including the review of published information
- Interviews with relevant experts at all levels of the survey
- Interviews with the residents of Shalkiya village and, if deemed necessary, Kuttykozha and Zhaiylma villages (focus groups and questionnaires)

2. Desktop Review of Published Information

The following public information sources have been used in the survey:

- Official websites and publications of various RK authorities
- Mass media
- Sectoral publications
- RK Statistics Agency data

Other required pieces of information that are not publicly available and will be received from relevant authorities upon request. These include:

- Statistic data for the district and individual settlements, data samples related to specific indicators
- Maps showing land zoning and property boundaries
- Information about cultural heritage sites and their exact location.

3. Interviews with Experts

Interviews with experts cover the following levels:

Oblast level (Kyzylorda City)

District level (Zhanakorgan village)

Local level (Shalkiya, Zhaiylma and Kuttykozha villages).

The following individuals can be interviewed as experts:

- Officials dealing with information required for this survey as part of their professional duties: staff members of healthcare and education departments, major industry managers, environmental specialists
- Informal leaders (mainly at the local level), i.e. people that are viewed by the members of the public as someone worth listening due to their perceived experience and reputation and those that are able to influence the situation and initiate change in the community life. Often though not necessarily, informal leaders also lead non-governmental organisations.

Interviews are conducted on the basis of questionnaires prepared and distributed in advance of the meetings. List of experts with their contact details and questionnaires are presented below.

4. Interviews with the Local Residents: Questionnaires and Focus Groups

The questionnaire based survey seeks to provide a more complete picture of socio-economic situation in the Project area. This survey complements the top-down view based on the review of statistic data and expert thoughts with the bottom-up overview of pieces of information received from ordinary people living in the circumstances we want to learn more about. The questionnaire based survey is a good way to understand the good aspects of the situation in the region and key problems that raise concern among the local people.

The questionnaire includes a special part designed to clarify whether the local people are aware of the Project. If so, focus groups will be organized to gain a more complete understanding of public perceptions and attitudes regarding the Project. The questionnaire for focus groups will include questions pertaining to the current socio-economic situation that will also complement a picture emerging from the questionnaire-based survey.

4.1. Questionnaire Based Survey

The socio-economic questionnaire will be distributed among the households of Shalkiya village and Kuttykozha aul. Local experts will be involved in the selection of the household sample for the survey. They will be asked to include households with different income levels.

Questionnaires are distributed among all households included in the sample.

From 30 to 50 questionnaires will be filled in each of the two settlements (Shalkiya and Kuttykozha).

The questionnaire survey produces predominantly qualitative information that helps assess and understand the baseline socio-economic situation.

The questionnaire form is presented below.

4.2. Focus Groups

The following three focus groups are planned in Shalkiya village: 1) middle age people; 2) young people; and 3) women. In each case, information derived through the focus group exercise can be divided into the following two categories: 1) information about public attitudes to the Project and what can be done to improve; what are their concerns; what forms of corporate social responsibility do they value more than others; and what communication channels do they prefer to use; 2) information about socio-economic situation in the village and district; key issues and options to address them. The focus group scenario for young people also includes questions like whether young people do plan to stay in Shalkiya or to move elsewhere and why; what do they like most in Shalkiya and what do they feel they lack there.

The optimal size of a focus group is 15 people. The focus groups are selected with the assistance of local experts who inform potential respondents in advance and conduct the pre-screening.

The focus group scenarios are presented below.

5. Written Requests for Information to Relevant Authorities

5.1. Kyzylorda

5.1.1. List of Addressees

	Organisation	Name	Contact Details
	Industrial and Innovation Development Department		120003 Kyzylorda, 1 Sultan Beibarys street Tel.: +7 (7242) 60 54 07 Fax: +7 (7242) 60 54 08 info@upp.orda.gov.kz
	Economy and Budget Planning Department		120003 Kyzylorda, 1 Sultan Beibarys street Tel./Fax: +7 (7242) 60 53 74 info@plan.orda.gov.kz
	Passenger Transport and Motor Road Department		
	Natural Resources and Uses Management Department		120003 Kyzylorda, 1 Sultan Beibarys street Tel./Fax: +7 (7242) 60 53 62 info@prd.orda.gov.kz
	Land Relations Department		120003 Kyzylorda, 1 Sultan Beibarys street Tel./Fax: +7 (7242) 60 53 20 info@uzo.orda.gov.kz
	Energy and Municipal Utility Department		120003 Kyzylorda, 1 Sultan Beibarys street +7 (7242) 60 53 90 Fax: +7 (7242) 60 53 94 info@jkh.orda.gov.kz
	Healthcare Department		120008 Kyzylorda, 27 Abay avenue Tel.: +7 (7242) 40 04 51 info@uzdr.orda.gov.kz
	Education Department		

6. Interviews with Experts

6.1. Oblast Level (Kyzylorda)

6.1.1. Expert - Head of Natural Resources and Uses Department

6.1.2. Questions:

Is the notion of traditional resource use practices applied, what does it mean, are there traditional resource use areas in the Oblast and if so, where, how and by whom are they used?

What natural zones are distinguished in the Oblast; climate, soil and land uses in each zone? What natural resources are known to be present in the Oblast?

Are there any protected natural areas in the Oblast?

How the environmental legislation compliance is monitored?

How the status of the environment in the Oblast is monitored?

What environmental issues do exist in the Oblast? What steps are taken to address them?

6.2. Zhanakorgan District

6.2.1. List of Experts

No.	Position	Name	Contact Details
1.	Head, Entrepreneurship, Industry and Tourism Division	Nurdilda Abdildayevich Zhanabekov	120300 Kyzylorda Oblast, Zhanakorgan Town, 37 M. Kokenova Street Tel.: 8(72435) 2-24-97
2.	Head, Passenger Transport and Motor Road Division		120300 Kyzylorda Oblast, Zhanakorgan Town, 37 M. Kokenova Street
3.	Head, Division of Employment, Social Programmes and Civil Registration		
4.	Head, Economy and Budget Planning Department		120300 Kyzylorda Oblast, Zhanakorgan Town, 37 M. Kokenova Street Tel.: 22312; 22096
5.	Head, Division of Agriculture		120300 Kyzylorda Oblast, Zhanakorgan Town, 37 M. Kokenova Street Tel.: 22372
6.	Head, Division of Culture and Language Development		120300 Kyzylorda Oblast, Zhanakorgan Town, 4 M. Kokenova Street Tel.: 22332
7.	Head, Division of Education	Allabergen Sakhimbekovich Akhmetov	Zhanakorgan Town, 33 Amangeldy Street Tel.: 22-3-36; 21336
8.	Head, Division of Healthcare		468750, Zhanakorgan Town, 65 Amangeldy Street Tel.: 22297

6.2.2. Questionnaires

1. *Head, Entrepreneurship, Industry and Tourism Division*

What industrial enterprises are the major contributors to the District's GDP? What trends have prevailed in this area over the past 10 years? Are the District's enterprises linked with each other by stable economic relations and if so, what kind of relations do they have? Are the District's enterprises linked by stable economic relations with other enterprises in the Oblast and if so, what kind of relations do they have and with what enterprises? Are there enterprises exporting their products and if so, please specify?

Are there enterprises receiving state subsidies? If so, please specify?

What enterprises do receive investments from the government and other sources? What investment perspectives does the District's industrial sector have and how they can be improved?

Please specify the main sales channels for manufacturing output produced in the District.

Please specify key issues faced by the local industries. How they can be addressed?

What is the role the District is expected to play in the development of the Kyzylorda Oblast metallurgical cluster? Why?

Why were the mining operations closed at the Shalkiya mine? Why the decision was made to resume mining? How do you assess the perspectives for the development of processing plant at the Shalkiya mine? What kind of change the Project is expected to bring about to the local industrial sector?

Please assess the level of business development in the District. What population groups do typically represent local entrepreneurs? Are they local or migrants? What kind of support do entrepreneurs receive from the state? Please provide statistics about the number, GDP generated and workforce used by small and medium businesses over the past 10 years. In what sectors small and medium businesses are most developed? Why?

2. Head, Housing, Municipal Utility, Passenger Transport and Motor Road Division

Please describe the District's housing sector (types of housing, condition). What are key issues associated with the housing sector? Do authorities provide alternative housing to households living in old and dilapidated houses; what kind of housing; is there any housing reserve that can be used to resettled or evacuated families?

Are all houses connected to water, electricity and gas supply? What proportion of housing and in what settlements are not connected? How water/electricity/gas supply is organized there? What developments are planned in this area?

Housing rent and utility tariffs for households.

How municipal solid waste collection is organized, what organisations are responsible for this service?

How the public transportation service is organized among human settlements in the Oblast? What is the bus service frequency; are there settlements that are not covered by the bus service; if so, please specify? How these settlements can be accessed? Are there private companies operating the public transport service and what market share do they have? What is the cost of service?

Please provide a map showing all roads in the District. Are there human settlements which do not have a paved access road? If so, please specify. Are there plans to build new roads? Please describe the condition of local roads. Please provide statistics on the road construction and repair expenditures over the past 10 years.

3. Head, Division of Employment, Social Programmes and Civil Registration

What enterprises and institutions are key employers in the District? What sectors and what forms of ownership do they represent?

In what sectors self-employment is most developed? How people who consider individual farming as their main occupation and do not seek other employment are accounted for?

In what sectors and for what jobs available offers on the local labour market exceed the demand? Are there any skill conversion programmes and employment alternatives in other regions for these specialists? If so, please specify?

What employment opportunities do exist in agricultural sector?

What population groups are most vulnerable to unemployment? Why? What steps are taken to protect them?

Is there any labour immigration from other districts and regions? If so, please describe the nature of this migration (who comes, where from, what jobs/enterprises, is it seasonal/temporary/permanent)? What attitude do local residents show toward this issue? Is there any labour migration to other districts in the Oblast, to other regions and countries? If so, please describe the nature of this migration?

What social programmes are maintained in the District? How are they funded?

Please provide the statistics on the demography, employment, unemployment, and social situation over the past 10 years in the district.

How the Project is expected to affect the social situation, employment/unemployment and migration trends in the district?

4. Head, Economy and Budget Planning Department

Please provide the statistics on the District budget performance over the past 10 years.

What authorities and officials are involved in the drafting, endorsement and approval of the district budget?

What are the main revenue sources for the district budget? How tax and non-tax revenues are distributed among various budget levels?

What are the main expenditure items? What district organisations, programmes etc. are financed from the Oblast or national budget?

Please describe the dynamics of economic growth in the District over the past 10 years. What are the economic development plans in the District for the next few years?

What changes can be expected to be brought about by the Project?

5. Head, Division of Agriculture

What is the role the agriculture plays in the District's economy? Is it subsidized from the budget? If so, please specify the purpose and amount of these subsidies? Are investments made in the agriculture and if so, please specify which enterprises receive them and from what sources?

Which branches and enterprises does the District's agricultural sector include?

Please provide information about agricultural enterprises (number of employees, area of land, specialization, form of ownership). What dynamics has been demonstrated by agricultural sector over the past 10 years?

How the agricultural product sales are organised?

Do local people consider employment in agricultural sector as an attractive option? Why?

Are there opportunities for receiving higher education and improving skills in agricultural sector in the District or in the Oblast? If so, please specify? If not, is there any deficit of qualified specialists in the agricultural sector? If so, please specify what branches and what enterprises are most affected by this deficit?

Is the Project expected to have any effect on the situation in the agricultural sector? If so, please specify.

6. *Head, Division of Culture and Language Development*

Are there any language problems in the district; if so, please specify? How are they dealt with?

What cultural facilities do exist in the district? What sources they are financed from? Is their number sufficient to meet the demand of the local public? What things are lacking?

What cultural heritage assets are present in the District (historical/cultural/archaeological monuments etc.)? Do they play any social and cultural role in the community life?

What cultural events and activities have gathered the broadest audience in the recent years? What events are popular among young people?

7. *Head, Division of Education*

Please provide the statistics on educational facilities, number of students and staff over the past 10 years, and number of children not attending educational facilities.

Do all human settlements in the district have kindergartens and schools? If not, how the residents of these settlements deal with this problem? Are there any arrangements to support them? Are there children not attending school? If so, please specify why and what steps are taken to address this issue?

Are there any private pre-school educational facilities and if so, what percentage of the total number is accounted for by them, do they have the state accreditation, what is the approximate cost of education?

Is there any difference in training curricula used by schools and if so, please specify?

Where do school specialists mainly come from? Where are most of them trained?

What percentage of school graduates does enter higher educational institutions? What percentage of them does enter secondary vocational institutions? What higher and secondary educational institutions are most popular among the school graduates in the district? Why? What employment opportunities do the graduates of these institutions have? What employment opportunities do exist for those school graduates who decide not to continue their education?

8. *Head, Division of Healthcare*

Please provide the statistics on the District’s healthcare facilities and number of staff over the past 10 years.

Please provide the statistics on the disease incidence rates, occupational and social diseases, death rates (and causes) over the past 10 years.

Are healthcare facilities available in all human settlements? If not, how many settlements do not have their own healthcare facility? Where the residents of these settlements do receive healthcare services? How do they reach that place?

How are free healthcare services provided to local residents funded? Are there any medical insurance programmes in place (please specify)? From what budget sources are they financed?

How is the staff of rural medical stations constituting the basic piece of the healthcare system formed? How many healthcare facilities in the district do provide medical help to women in labour and what is the percentage of births that take place outside a hospital?

Are there any private healthcare facilities and how many, do they overlap or complement the state-owned healthcare facilities on services (i.e. whether do they provide services which the state-owned facilities don't or operate in the areas not covered by the state-owned medical services), are they owned by local residents or migrants?

What are the most widely distributed diseases and public health threats in the district and why? What occupational diseases are recorded in the district and what are their causes; is there an occupational disease prevention system? What social diseases do occur in the district and what steps are taken to prevent them?

How much time it takes for an ambulance car to respond to a call (average travel time/travel time required to reach the most remote community)? How many ambulance cars does the District's ambulance station have and what types of cars?

What are the key healthcare problems faced by the District?

6.3. Local Level – Shalkiya Rural District (Shalkiya and Kuttykozha Villages)

6.3.1. Experts

No.	Position	Name	Contact Details	Note
1.	Akim of Shalkiya Rural District	Serikbek Emseuly Umirbekov	42-2-37 87756905110	Ask each interviewee about informal experts
2.	Shalkiya Rural Medical Station	Akmaral Zhulamanovna Arysbayeva, Doctor		
3.	Shalkiya Secondary School	Bekmaganbet Abilarisovich Akhmetzhanov, Director		
4.	Informal Experts			

6.3.2. Questions

1. *Akim of Shalkiya Rural District*

What are the largest industrial and agricultural companies by revenue in the rural district? What is the approximate annual turnover of each of them? Where and how do they find customers for their products?

What companies are the largest employers in the district? Which professions are in demand? Is there any labour migration (wherefrom and whereto; what professions)?

What is the unemployment rate and how has it changed in the recent years? What kind of job and wage level a school graduate may expect to get?

Housing sector: what kind of housing prevails; level of wear and tear; affordability of housing; housing development perspectives. Electricity, water and gas supply: from what sources; service coverage; key issues.

What are the key social issues faced by the district? How are they dealt with? What social programmes are in place? What population groups are least protected and why? How many families are in these groups?

Do the existing education and healthcare facilities have sufficient capacity and are they adequately staffed? What are key issues in this area? What educational and healthcare programmes are in place?

Are there any environmental issues and how are they dealt with; what organization/official is responsible for dealing with these issues.

How Shalkiya and Kuttykozha villages differ from each other in terms of all these issues? What authorities are represented in Kuttykozha?

How many households do Shalkiya and Kuttykozha villages have? Please provide the statistics on the household incomes.

A group of structures known as Pioner and located near the Shalkiya Mine; what is it, who is the owner, and how is it used now? Who owns and uses land extending along the Project site boundaries?

How do you assess the Project and associated impact on the socio-economic situation in the area? Where the workforce for the mine and processing plant will come from? How this will affect the local community life?

Is the Project expected to have any impact on other human settlements including Zhaiylma? Which human settlements are likely to be affected and how?

How does the Shalkiya rural district rank among other rural communities in terms of socio-economic situation and how does it differ from the others in terms of employment rates, environmental situation etc. Why? With which human settlements in other districts do Shalkiya and Kuttykozha villages have close links and what kind of links?

Does the rural district have any informal leaders, i.e. people who are viewed as someone worth listening due to their perceived experience and reputation and who have influence on other community members? Please provide their contact details.

2. <u>Doctor of Shalkiya Rural Medical Station</u>

What specific health complaints are more prevalent among the local residents; do you have required equipment and medicines to provide medical aid? Of not, where do you send your patients to? Do any occupational diseases occur among the local residents and what kind of diseases?

How many medical staff do you have at the medical station? Are there any other state-owned and private medical facilities in the rural district? How many patients do you receive? Who is eligible for free medical service? Do you provide medical services on a commercial basis and on what criteria?

How much time does an ambulance car need to respond to a call from your area?

What are key issues related to healthcare in the district? What can be done in this area?

How the situation may change due to the Project?

Does the rural district have any informal leaders, i.e. people who are viewed as someone worth listening due to their perceived experience and reputation and who have influence on other community members? Please provide their contact details.

3. *Director of Shalkiya School No. 68*

What percentage of your school graduates decide to continue education? What educational institutions do they choose? What are the main occupations of those school graduates who do not continue their education; what kinds of job do they normally find?

What language is used to teach children at school and what are other languages they study? Are there bilingual children and if so, what languages do they speak and why? Are there children that do not speak the language used at school and if so, how the teaching process is organized for them?

What free time activity options are available for young people? Are they adequate and sufficient? What can be done to improve situation in this area?

Where did children from Kuttykozha village study before a new school opened there? Has the launch of new school caused any change for you?

What are key issues related to education in the district? Does the Shalkiya rural community differ in this respect from other communities in the district?

How the situation may change for young people and education system in the district due to the Project?

Does the rural district have any informal leaders, i.e. people who are viewed as someone worth listening due to their perceived experience and reputation and who have influence on other community members? Please provide their contact details.

4. *Informal Experts*

Do people live better in the Shalkiya rural district as compared to other districts or other regions of the country? Why?

What factors play a decisive role in influencing the level of affluence in Shalkiya (for example, choice of profession, level of education, land ownership, belonging within any social group etc. – what is really important?)? Why?

What should be improved in the district? What has to be done as a matter of priority?

What kind of future do you imagine for Shalkiya?

Do you know about the resumption of mining operations and plans to construct a processing plant? What do you think about these plans and are they expected to affect the local community life? If so, please specify what consequences can be expected, both positive and negative?

Would you like the mine management to listen to the views of the local residents? What do you consider as the most efficient way of communicating information to the public? How views and opinions of local residents can be communicated to the mine management?

7. Focus Group Scenarios

7.1. Working Age Men (25-50 Years)

1. Introductions and information about who works where.
2. What kind of job is considered good here in Shalkiya? What is not?
3. What level of income is considered good? What is an approximate wealth line above which are the high-income households? What is the poverty line below which are the low-income households?
4. Is it easy to find a job? What are key issues a person seeking for a job may encounter?
5. Are there any employment support programmes? Have you used them and are they efficient?
6. Are many people engaged in subsistence farming? What products do they produce? Do they consume these products themselves or sell; where do they sell them?
7. What do you like most in your district? What do you dislike most and what does cause difficulties? What would you like to change here?
8. How do you spend your free time?
9. Are you aware about the Project? What do you think about the role it may play for the local residents? Would you like to work for the Project and why? Would you like to learn more about the Project and be able to see how it develops? What do you think is the most convenient way of receiving information about the Project? What kind of information are you interested most in?

7.2. Young People (14 – 25 Years)

1. Introductions and information about who works/studies where.
2. What are your plans for the nearest few years (continue studying, work, look for a new job, leave Shalkiya, get married)?
3. Is it better to live here all your life or move elsewhere? If move, whereto? Why?
4. What kind of job is considered good here in Shalkiya? What is not?
5. What level of income is considered sufficient for a single young man/woman? For a young family?
6. Is it easy to find a job? What are key issues a person seeking for a job may encounter?
7. What do you like most in your district? What do you dislike most and what does cause difficulties? What would you like to change here?
8. How do you spend your free time?
9. Are you aware about the Project? What do you think about the role it may play for the local residents? Would you like to work for the Project and why? Would you like to learn more about the Project and be able to see how it develops? What do you think is the most convenient way of receiving information about the Project? What kind of information are you interested most in?

7.3. Working Age Women (25 – 50 Years)

1. Introductions and information about who works where.
2. What kind of job is considered good here in Shalkiya? Why? Are these job options good for both women and men? If they are not good for men, why?
3. What is better for a woman in Shalkiya, working or being a housewife? Why?
4. What level of income is considered good for a woman? For a man?
5. Questions about housekeeping
6. Food. Does your family have enough food; what products are in shortage; are there any seasonal variations; please specify prices for key products. What products are considered expensive but necessary?
7. Medical service. Are you satisfied with it? What would you like to change? Are there any issues related to children's healthcare? What costs are involved? What are the issues related to providing medical service to women in labour?
8. Education. Do you like the quality of children's education? Are there any issues; what would you like to change?
9. Paying municipal bills. Cost of municipal services, housing issues.
10. What do you like most in your district? What do you dislike most and what does cause difficulties? What would you like to change here?
11. How do you spend your free time?

Are you aware about the Project? What do you think about the role it may play for the local residents? Would you like to work for the Project and why? Would you like to learn more about the Project and be able to see how it develops? What do you think is the most convenient way of receiving information about the Project? What kind of information are you interested most in?

ANNEX 16 SUMMARY OF MEETINGS AT THE AKIMATES

1. Meeting with the Deputy Akim of Zhanakorgan District, 19 August

Meeting Participants:

- Bakhytjan Ermanovich Aitbembet, Deputy Akim
- Askar Shatanbayev, ShalkiyaZinc, Deputy Director
- Mira Kabdualiyevna Akhmetova, ShalkiyaZinc, Chief Environmental Specialist
- Mohammed Ali, Hatch, Project Manager
- Marina Vladilenovna Khotuleva, Ecoline EA Centre, Director
- Tatiana Georgievna Laperdina, Ecoline EA Centre, Chief Specialist

Summary:

Introduction and background information: A. Shatanbayev, M. Khotuleva

B.E. Aitbembet:

- The District authorities welcome the revival of the Shalkiya Mine;
- The situation of the education sector:

The secondary education quality has improved significantly (according to the Unified National Testing results, from 68.5 in 2014 to 86.1 in 2015) due to more stringent qualification requirements to teachers, better and free-of-charge access to Internet at schools etc. In 2015, 200 people entered the North Kazakhstani higher educational institutions under a special governmental programme; about 80 people received grants to study at the higher educational institutions. The secondary vocational institutions train cooks, agricultural and industrial specialists. The District has the Agro-Industrial College.

There are 15 colleges and one university in Kyzylorda.

Mining industry specialists are trained in colleges in Kentau and Karaganda; higher educational institutions providing training to the mining industry specialists include the Kazakh National Technical University and Karaganda State Technical University.

2. Meeting with the Chief of Staff of the Zhanakorgan District Hospital, 19 August

Meeting Participants:

- Saulebek Eskhozhauly Yskakov, Chief of Staff, Central District Hospital
- Askar Shatanbayev, ShalkiyaZinc, Deputy Director
- Mira Kabdualiyevna Akhmetova, ShalkiyaZinc, Chief Environmental Specialist
- Mohammed Ali, Hatch, Project Manager
- Marina Vladilenovna Khotuleva, Ecoline EA Centre, Director
- Tatiana Georgievna Laperdina, Ecoline EA Centre, Chief Specialist

Summary:

S.E. Yskakov provided information about the public health situation and disease rates in the district.

All local medical facilities are managed by the Chief of Staff of the Central District Hospital. The District has 6 hospitals, 17 medical laboratories, 14 rural medical stations, and 7 first aid stations. A medical laboratory comprising 1 doctor, 2 paramedics and an ambulance car with a driver works in Shalkiya village.

- Social diseases:

The social disease incidence rates remain stable and show no indication of growth. The tuberculosis incidence rates are low and the number of beds at the TB department of the district hospital has been cut. Reduced TB incidence rates are attributed to a decrease in the number of cattle transmitting tuberculosis.

There are 2 registered HIV-infected individuals in the district (an ex-prisoner and his wife). The drug addiction rate is lower than in other districts. The sexually transmitted disease rates have dropped after a small increase attributed to the inflow of visitors from Astana and other cities, as well as to higher disease incidence rates among labour migrants including uranium miners working in rotating crews.

An urgent issue is poor quality of drinking water in Shalkiya where only 30% of residents have access to good quality water. Poor water quality in local wells is caused, among other factors, by the development of depression cones causing the outflow of good quality water which is replaced by contaminated water.

3. Meeting at the Shalkiya Akimat, 19 August

Meeting Participants:

- Serikbek Omirbek, Akim, Shalkiya Aul District
- Erkinbek Bolganbaev, Chief Specialist, Deputy Akim
- Raikhanbak Mamanovna Shaikhattarova, Chief Specialist in the Akimate
- Maksat Madenist Nakipov, Specialist, Culture Department of the Akimate
- Kennesbek Zeinetker Kurmanbekov, pensioner
- Saulebek Aksakaldar Kalybaev, Chairman of the Elders
- Abdulkhan Abdurakhmanovich Kambarbekov – former Shalkiya Mine Director in 1989-2006 (tel.: 8-701 7709498)
- Moralbek Koshanov – local resident
- E. Ukibaev, local resident
- Askar Shatanbayev, ShalkiyaZinc, Deputy Director
- Mira Kabdualiyevna Akhmetova, ShalkiyaZinc, Chief Environmental Specialist
- Mohammed Ali, Hatch, Project Manager
- Marina Vladilenovna Khotuleva, Ecoline EA Centre, Director
- Tatiana Georgievna Laperdina, Ecoline EA Centre, Chief Specialist

Summary:

Serikbek Omirbek provided general information and outlined key issues:

The Shalkiya Aul District has a population of 3056 people including 2031 people in Shalkiya village and 1025 people in Kuttykozha village.

Employment: About 80% of the working-age population used to work at the Shalkiya Mine. The Project implementation will result in increased employment rates among the local population in 5-10 years. Proper education should be provided to local children to enable them to occupy skilled job positions at the mine.

The drinking water quality in the wells is poor. Tap water quality is similarly poor because water supply network is old, worn out and has a limited coverage.

Askar Shatanbayev told about the Company's employment policy; priority will be given to local residents; a trilateral agreement has been signed regarding the provision of specialized training for mine workers.

At the initial stage, 80% of mine employees will be invited specialists; the longer term strategy focuses on improving and developing local skills base and providing training to local children.

A.A. Kambarbekov asked how the training of local specialists will be organized; how the tailings storage facility will be developed and whether the wind rose will be taken into account. He suggested conducting the advanced exploration of the mine to increase confirmed ore reserves and mine life.

M.V. Khotuleva described the objectives of the bankable social assessment; she told that major projects normally boost the development of small and medium businesses, infrastructural projects and agricultural developments.

A.A. Kambarbekov emphasized the need for supporting the development of local building material (sand, cement, bentonite) producers to minimize import of these materials from other areas. He said that he plans to work on this issue. It is also important to train local workforce at the mine to ensure that worker positions (drivers, miners etc.) are occupied by local residents.

Poor water supply service and lack of sewerage system pose a serious problem for local community.

The site for the stone crushing plant was allocated illegally within the boundaries of the mining allotment; the plant processes do not meet technology requirements; it generates dust in large quantities due to the lack of wetting system. The stone crushing operations at this plant should be stopped!

S. Kalybaev, Chairman of the Elders, stressed the need for increasing the production of meat and providing supplies to the mine. Key issues faced by the village: 1) poor quality of drinking water, dilapidated condition and insufficient coverage of water supply network; 2) lack of meat marketing and processing chain in the village where the residents keep a large number of cattle.

E. Bolganbaev, Deputy Akim, suggested that visiting households and talking to local residents would be useful; he asked for help in terminating the stone crushing operations because dust emissions reach local homesteads and cause nuisance.

M.V. Khotuleva presented the Social Survey and Focus Group Programme.

Mohammed Ali briefed the participants about the HATCH Company and its activities.

4. Meeting at the Zhanakorgan Akimat, 20 August

Participants:

- Karzhybek Tazhybaevich Burtzhibaev, Head, Division of Agriculture
- Orman Aitmogonbekovich Akhmetov, Head, Division of Entrepreneurship, Industry and Tourism
- Esdaulet Mirzadauletovich Seilov, Head, Division of Housing, Municipal Service Infrastructure, Transport and Motor Roads
- Semser Musabekovich Asenov, Head, Division of Economy and Budget Planning
- Moldakhmet Kozhakhmetdin Auanov, Head, Centre of Employment, Social Programmes and Civil Registration
- Algoz Nurzhanovna Aidosova, Head, Division of Culture and Language Development
- Askar Shatanbayev, ShalkiyaZinc, Deputy Director
- Mira Kabdualiyevna Akhmetova, ShalkiyaZinc, Chief Environmental Specialist
- Mohammed Ali, Hatch, Project Manager
- Marina Vladilenovna Khotuleva, Ecoline EA Centre, Director
- Tatiana Georgievna Laperdina, Ecoline EA Centre, Chief Specialist

Summary

M.V. Khotuleva introduced the meeting participants to the objectives of the ESIA process for the Shalkiya Mine Project in line with the IFI requirements.

K. Burtzhibaev informed the participants about investment projects in agricultural sector. The poultry plant project will be developed near Shalkiya to produce 6000 t of poultry meat per annum. The project will be funded by a private investor who plans to attract the governmental support. The Tatu-Agro agricultural farm is developing its operations that include growing tomatoes and cucumbers and producing tomato juice.

The District has developed a business plan for constructing a meat processing plant with the involvement of the Eurasia-Agro Holding and Coca-Cola Russia.

An apple garden occupying 126 ha will be developed near the poultry plant in Shalkiya; 35 hectares of trees have already been planted; grapes and other vegetables will be also planted. The drop irrigation system will be used.

Long-term vegetable supply contracts are used in the District. For example, a 25 million Tenge contract for supplying potatoes and onions to the Baikonur Cosmodrome has been signed.

E. Seilov told that the District's road network will be repaired and expanded within the framework of the state programme. All existing roads are paved except the road connecting the district centre with one aul. The road connecting the district centre with Shalkiya village will be repaired in 2016.

Water supply in the district partly relies on groundwater sources (for example, a water intake in Kuttykozha) and private wells. Currently, about 30% of water is reported to be of poor quality. The District will receive 4.5 billion Tenge for the modernization of its water supply system including the construction of two water supply lines from the Talap and Syr Darya groundwater intakes. The water supply system in Shalkiya is planned to be modernized in 2016.

There is no centralized sewer network in the district, only private septic tanks are in place. The development of sewerage system requires governmental funding which is currently not available even for financing the design works.

The centralized gas supply network covers only the district centre; there is no funding to finance the development of the gas supply network in the entire district.

Electricity is supplied from 4 sources.

The improvement of housing involved the construction of 10-15 high rise buildings and low rise buildings under the Affordable Housing Programme.

The housing waiting list has 300 families including 170 socially vulnerable families.

As compared to the rest of the Oblast, the condition of housing and municipal utilities, road network and population incomes is around average.

Auanov provided information about the repatriation of families under the Kazakh Repatriation Programme. All repatriates received the Kazakh citizenship 5-6 years ago (44 families moved from Iran and 46 families from Turkey).

5. Focus Group Results

Shalkiya Village

No.	Question	Men (25-50 Years)	Women (25-50 Years)	Young People (14-21 Years)
1	What kind of job is considered as good and attractive here in Shalkiya? What kind of job is least attractive?	Mine		Mine
2	What is a good level of income? (Tenge)		50 thousand	50-100 thousand
3	Is it easy to get a job? What key issues are encountered by those who are looking for a job?	It is difficult. Mine is not in operation	It is difficult. Self-employment is the main option	
4	Do many people have homestead farms? What products do they produce? Do they produce these products for their own consumption or for sale, and what sales channels do they use?	There are few homestead farms in Shalkiya. They mainly produce crops for their own consumption. There are farmers in Kuttykozha		
5	Are there any employment assistance programmes? Did you use them and	Did not use	Did not use	

	were they efficient?			
6	What do you like most here?			This is our home
7	What do you like least here? What would you like to change?	Water quality	Water quality Tuberculosis dispensary	
8	Where do you spend your free time?	At home	At home	At a cafe

ANNEX 17 INFORMATION ON LAND REQUIREMENTS FOR NEW FACILITIES

1. Total estimated land requirement for new facilities is 1085.224 ha including:

- 1010 ha for new facilities,
- 20 ha for the Southern shaft,
- 28 ha for the Ventilation shaft,
- 2.1 ha for a 9.9 km gas supply line,
- 10 ha for a water supply line (Syr Darya water intake),
- 0,125 ha for 11 residential houses,
- 15 ha for a rotating crew camp.

The land allotment formalities have been completed for land required for new facilities (1010 ha).

The land allotment certificates have been issued for land plots required for the Southern shaft and gas supply line.

The land allotment certificates have been also issued for land required for residential houses.

The land allotment formalization process is underway for the Ventilation shaft, water supply line (Syr Darya water intake), and rotating crew camp.

The following land allotment certificates have been issued for land plots required for new mine facilities (1010 ha):

- Certificate No. 1175 of 25.05.2012 (204,2 ha),
- Certificate No. 1176 of 25.05.2012 (292 ha),
- Certificate No. 1177 of 25.05.2012 (31,8 ha),

Certificate No. 544 of 16.06.2005 (650,8 ha).

ANNEX 18 LIST OF LEGAL ENTITIES AND INDIVIDUALS WHOSE LAND PLOTS BORDER WITH THE SHALKIYA MINE SITE WITHIN A 2-5 KM RADIUS

No.	Name of Legal Entity / Individual	Land Use Designation
1	N. Toleuov	Agricultural use
2	Meliorator LLC	Industrial use
3	ShalkSchebZav LLC	Industrial use
4	Alliance LLC	Industrial use
5	Ai Takh LLC	Agricultural use
6	KDSM Kyran LLC	Industrial use
7	UAD LLC	Industrial use
8	Bagzhai LLC	Industrial use
9	ZhKNM LLC	Industrial use
10	KazProm LLC	Industrial use
11	Zh. Bazarbayev	Industrial use
12	Korgan-Tas LLC	Industrial use
13	Alliance Dolomite LLC	Industrial use
14	ZhanaDolKorgan LLC	Industrial use
15	Victoria Ten	Agricultural use
16	B. Maulenbekov	Agricultural use
17	B. Zhanazarov	Agricultural use
18	O. Oksikbayev	Agricultural use
19	A. Auyesbekov	Agricultural use

ANNEX 19 HOUSEHOLD SURVEY RESULTS

18.1. Households in Shalkiya Village

No.	Question	Sh1	Sh2	Sh3	Sh5	Sh6	Sh7	Sh8	Sh9	Sh10
1	How many persons live with you? How is each family member related to you?	**3**: Head of household with his wife and son	**3**: Head of household with his wife and son	**5**: Head of household, son with his wife and child, son is an extramural student	**6**: Head of household, his wife and 4 children	**6**: Head of household and his wife, son and his wife and child, and son	**6**: Head of household, his wife and 4 children	**6**: Head of household, his wife, son and his wife and child, and a son who is a student	**4**: Head of household with her husband, 2 sons	**4**: Head of household, his wife and 2 sons
2	Of them:									
	Children below 18 years of age	-	1	1	4	1	4	1	-	-
	Working-age persons	1	-	4	2	3	2	3	3	4
	Persons not able to work (with disabilities)	-	1	-	-	-	-	-	-	-
	Retired pensioners	2	1	-	-	2	-	-	-	-
	Working pensioners	-	-	-	-	-	-	1	1 (PE)	-
	Students (living in a town)	-	-	-	-	-	-	1	-	-
3	How many persons in your family have:						All (PE - private entrepreneurship)		-	-
	- Permanent work	1	-	1	2	-	-	3	2 (public sector)	2
	- Seasonal or temporary work	-	-	1	-	2	-	-	-	-
4	How many persons in your family work:									
	- In agriculture	-	-	-	-	-	-	-	-	-
	- In industry	1	-	1	1	1 (mine)		2 (ShalkiyaZinc and AtomProm)		2 (ShalkiyaZinc)
	- In education / healthcare sector	-	-	1	1	-	-	-	-	-
	- In other public	-	-	-	-	-	-	1 (Akimat)	2	-

No.	Question	Sh1	Sh2	Sh3	Sh5	Sh6	Sh7	Sh8	Sh9	Sh10
	institutions									
	- In trade and service sector	-	-	-	-	-	-	-	-	-
	- In other sectors (please specify)	-	-	-	-	1 (electrician)	-	-	1 (PE) shop, bakery, agriculture	-
5	Incomes:									
	- Wages in public sector	-	-	60000	50000	-	-	40000	220000	-
	- Wages in private sector	50000		65000	-	100000	?	155000		250000
	- Private business, sale of their own products	-	-	-	-	-	-	-	?	-
	- Pensions, allowances	100000	63000	-	-	80000		37000	38000	
	- Interests on deposits, dividends etc.	-	-	-	-	-	-	-	-	-
	- Property for lease	-	-	-	-	-	-	-	-	-
	- Other (please, specify)	-	-	-	-	-	-	-	-	-
	Total	150000	63000	125000	50000	180000		232000		250000
6	Non-cash incomes (subsistence gardening, hunting etc.)	No		No	Subsistence garden	Subsistence garden	PE (subsistence garden, pasture, lake for lease)	Огород		
7	Monthly expenses									
	- Food (Tg/%)	40000	28000	45000	35000	60000	50000	70000	200000 (100 – personal expenses)	65000
	- Utility bills (Tg/%)	13000	10000	9000	10000	14000	30000	17000	40000	17000
	- Public transport (Tg/%)	-	-			-	-		-	
	- Fuel and private transport maintenance (Tg/%)	20000	15000	-		15000	30000		40000	10000
	- Leisure, hobbies etc. (Tg/%)	5000	-	-		-	-		An annual holiday (abroad)	30000

No.	Question	Sh1	Sh2	Sh3	Sh5	Sh6	Sh7	Sh8	Sh9	Sh10
	- Education (Tg/%)	-	-	-		-	-		-	5000
	- Interests on loans	-	-	-		-	-		-	-
	- Remaining amount (Tg/%)			-	-		-	-		
	Total	77000	53000	54000	45000	90000				
8	Does the household have:									
	- Washing machine	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	- Fridge	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	- TV set	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	- Computer, laptop	Yes	No	-	No	No	Yes	Yes	Yes	Yes
	- Mobile phone for each family member	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	- Car	Yes	Yes	No	No	Yes	2	No	3	Yes
	- Agricultural machinery (please specify)	No	No	No	No	No	-	No	Gazel vehicle	No
	- Internet	Yes	No	No	No	No	Yes	No	Yes	No
9	Type of water supply	Public well in the backyard	Public well in the backyard	Centralised water supply, public well	Privatel well with an engine	Private well	Private well	From water intake + well	Well + individual water supply line	Private well
10	What kind of heating system does the house have? Please specify the typical length of heating season, what months does it include	Coal stove 11-04	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04	Diesel fuel, 11-04	Coal stove, 11-04
11	How the food is cooked?	Gas cylinder, cooking range	Gas cylinder, cooking range	Gas cylinder, cooking range	Gas cylinder, cooking range	Gas cylinder, cooking range	Gas cylinder, cooking range	Gas cylinder, cooking range	Gas cylinder, cooking range	Gas cylinder, cooking range
12	Do you have a land plot or plots? Please specify the area of each plot. Please specify all	No	No		20 Ares: tomato, cucumber, edible greens.	30 Ares: potato, tomato, cucumber, edible	20 Ares under vegetable garden, 520 ha under	15 Ares: tomato, cucumber, beet, pepper, corn, cherry, peach, apricot	25 Ares +3 ha in Shalkiya (potato, vegetables,	10 Ares: cherry, apple, apricot, grapes

No.	Question	Sh1	Sh2	Sh3	Sh5	Sh6	Sh7	Sh8	Sh9	Sh10
	crops you grow in your plots				Fruit trees	greens. No fruit trees	highland pasture, fishing lake in lease		fruits); 12 ha in Kuttykozha (360 trees); 2000 ha of highland pasture	
13	Do you keep poultry/livestock, how many heads?	3 hens	No		15 sheep	2 cows, 10 goats	200 sheep	2 cows, 2 calves	Cows, horses, sheep	2 cows, 2 calves
14	Please describe your housing	4-room flat in a 5-storey building	3- room flat in a 5-storey building		Private house, 3 rooms	Private house, 3 rooms	Private house, 5 rooms, house in the mountains (2 rooms)	Private house, 5 rooms	2-storey private house (12 rooms + hall)	Private house, 4 rooms
15	Since when does your family live in the village?	1987			2007	1986	1999, from Kuttykozha	1986		1986, from Kentau
16	What was the purpose of moving the family to this place? What had your family done before?	Worked as a fireman and security officer at the health resort	Moved to his wife. She is from Jalyima, has disabilities, moved to Shalkiya	Bought a flat in 2001 to work at the health resort	Moved to work at the mine	Worked as a hole man. Worked at a collective farm before moving here	Worked at the ShalkiyaZinc canteen before 2014	Worked in construction sector. The family received a flat in Ulan and then moved to Shalkiya		Moved to work at the mine

Sh1: 5-storey semi-dilapidated house No. 1 where 15 of 60 flats are occupied. There are no centralized water supply and heating. The sewer system is gravity-driven and in poor condition. Residents install and use coal stoves in their flats. The head of household keeps poultry in the backyard.

Sh2: 5-storey dilapidated house No. 2 where only one of 53 flats is occupied. There are no centralized water supply and heating. The sewer system is gravity-driven and in poor condition. There is a coal stove in the flat.

House No. 3: 5-storey partially repaired house where 22 of 30 flats are occupied. There are no centralized water supply and heating. The sewer system is gravity-driven and in poor condition. Residents install and use coal stoves with smoke ducts running along the side of the building.

Sh3. Partially repaired house No. 4 where 20 of 30 flats are occupied. 2-3 flats are ruined. A smoke duct arranged in the communal hall. The household has an engine powered pump to lift water to the 3rd floor. A backyard well is a standby source of water. One son is an extramural student and lives with his mother.

Sh7: Private entrepreneur providing delivery services (food products, materials); construction, agriculture

18.2. Households in the former Pioneer Village

No.	Question	P1	P2	P3	P4	P5
1	How many persons live with you? How is each family member related to you?	**6**: Head of household with his wife, son with his wife and child, and another son who is a student	**7**: Head of household with his wife, son, daughter and 3 grandchildren	**6**: Female head of household, 3 sons, daughter-in-law, and a grandson	**11**: Female head of household 2 daughters, 4 sons, 2 wives, 2 grandchildren[215]	**6**: Head of household with his wife, 2 daughters, son and grandson
2	Of them:					
	Children below 18 years of age	1	3	1	3	2
	Working-age persons	4	2	3	7	3
	Persons not able to work (with disabilities)	-	-	1 (ICP)	-	-
	Retired pensioners	-	2	-	1	1
	Working pensioners	-	-	-		-
	Students (living in a town)	1	-	1		-
3	How many persons in your family have:					
	- Permanent work	3	-	1 (ShZ)	1	1 (water intake)
	- Seasonal or temporary work	-	2	1	2	1
4	How many persons in your family work:					
	- In agriculture			2		
	- In industry	2			1	2
	- In education / healthcare sector	1	1			
	- In other public institutions					
	- In trade and service sector					
	- In other sectors (please specify)		1			
5	Incomes:					
	- Wages in public sector	50000 Tg/30%	36000 Tg/40%			
	- Wages in private sector	120000 Tg/70% (ShZ)		100000	70000	60000
	- Private business, sale of their own products					
	- Pensions, allowances		50000 Tg/ 60%	22000	52000	50000
	- Interests on deposits, dividends					

[215] All children received grants to pay for their education

No.	Question	P1	P2	P3	P4	P5
	etc.					
	- Property for lease					
	- Other (please, specify)					
	Total	170000	86000	122000	122000	110000
6	Non-cash incomes (subsistence gardening, hunting etc.)	Cow	Land plot	None	Livestock	Cow
7	Monthly expenses					
	- Food (Tg/%)	25000Tg / 15%	60000 Tg / 70%	50000 Tg /	50000 Tg /	40000 Tg /
	- Utility bills (Tg/%)	12000 Tg / 7%	12000 Tg / 15%	8500 Tg/	11000 Tg /	14000 Tg /
	- Public transport (Tg/%)	-	?	-		5000 Tg /
	- Fuel and private transport maintenance (Tg/%)	10000 Tg/ 6%	-	15000	20000 Tg /	-
	- Leisure, hobbies etc. (Tg/%)	-	-	-	-	-
	- Education (Tg/%)	43000 Tg / 25%	-	-	-	-
	- Interests on loans	50000 Tg / 30%	-	-	-	
	- Remaining amount (Tg/%)	30000 Tg /17%	14000 Tg / 15%	-	-	-
	Total	140000	72000	73500		60000
8	Does the household have:					
	- Washing machine	Yes	Yes	No	No	No
	- Fridge	Yes	Yes	Yes	Yes	Yes
	- TV set	Yes	Yes	Yes	Yes	Yes
	- Computer, laptop	Yes	No	Yes	No	Yes
	- Mobile phone for each family member	Yes	Yes	Yes	Yes (7)	Yes
	- Car	Yes	No	Yes	Yes	No
	- Agricultural machinery (please specify)	No	No	No	No	No
	- Internet	No	No	No	No	No
9	Type of water supply	Yes, in the backyard	Yes, in the backyard	Street standpipe (50 m)	Street standpipe (50 m)	Standpipe in the backyard
10	What kind of heating system does the house have? Please specify the typical length of heating season, what months does it include	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04
11	How the food is cooked?	Cylinder gas, stove	Cylinder gas, stove	Cylinder gas, stove	Cylinder gas, stove	Cylinder gas, stove
12	Do you have a land plot or plots? Please specify the area of each plot. Please specify all crops you grow in your plots	Flowers, trees	10 Ares: cherry, apple, apricot	No	No	10 Ares, not growing any crops
13	Do you keep poultry/livestock,	1 cow, 4 hens	No	No	15 goats	Cow

No.	Question	P1	P2	P3	P4	P5
	how many heads?					
14	Please describe your housing	Private house, 3 rooms, no conveniences	Private house, 3 rooms, no conveniences	Многоквартирный дом, 5 комнат, б/у	Многоквартирный дом, 4 комнаты, б/у	Private house, 3 rooms, no conveniences
15	Since when does your family live in the village?	1985	1982	1989	1984	1989
16	What was the purpose of moving the family to this place? What had your family done before?	To work at the mine	To work at the mine		To build the mine	Moved from Kuttykozha

18.3. Households in Kuttykozha

No.	Question	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11
1	How many persons live with you? How is each family member related to you?	**9**: Head of household with his wife, 5 children, son's wife, a grandson	**12**: Head of household with his wife, 4 sons, 4 daughters, 2 grandsons	**8**: Head of household with his wife, son with his wife, 4 grandsons	**6**: Head of househol d, female head of househol d, 3 children, mother	**5**: Head of househol d with his wife, 4 children	**8**: Head of household with his wife, 2 sons, 1 daughter in law, 3 grandsons	**9**: Grandfath er (WW2 veteran), head of househol d with his wife, brother, 4 children	**7**: Head of household with his wife, 5 children	**6**: Head of household with his wife,, 4 children	**9**: Head of household with his wife, 7 children	**8**: Head of household, female head of household, 6 children
2	Of them:											
	Children below 18 years of age	2	4	4	3	4	4	2	5	2	3	4
	Working-age persons	7	8	2	2	2	3	4	2	2	3	2
	Persons not able to work (with disabilities)	-	-				-	-	-	-	-	
	Retired pensioners	-	-	2	1		-	-	-	-	1	
	Working pensioners	-	-				1	1	-	-		
	Students (living in a town)		-				-	2	-	2	2	2
3	How many persons in your family have:											
	- Permanent work	1	-	Yes	2	-[216]	2	1	1 (ShZ)	2	1	1
	- Seasonal or temporary work	1	1		-	1	-	-	-	-	Private farm	-

[216] Worked as a rescue man at the ShalkiyaZinc Mining Rescue Service before 2007, now has a seasonal job as furnace tender at school

No.	Question	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11
4	How many persons in your family work:											
	- In agriculture			2				All			2	
	- In industry								1	1 (ShZ)		
	- In education / healthcare sector	1			2	1	1		-	1 (teacher)	1	1
	- In other public institutions				-				-			
	- In trade and service sector								-			
	- In other sectors (please specify)		Construction				1 (security guard)		-			
5	Incomes:			Private farm				Private farm			Private farm	
	- Wages in public sector	60000 Tg/ %		-	135000	35000	43000			100000	70000	43000
	- Wages in private sector			?			45000	39000	100000 Tg	100000		
	- Private business, sale of their own products			Yes				5000-6000 (milk)		-		
	- Pensions, allowances	20000 Tg /		140 000	30000	8500	49000	90000+13 000	10000 Tg	-	14000	9000
	- Interests on deposits, dividends etc.									-		
	- Property for lease									-		
	- Other (please, specify)									-		
	Total	80000			165000		137000	150000		200000		
6	Non-cash incomes (subsistence gardening, hunting etc.)	Vegetable garden	Vegetable garden	Vegetable garden, livestock	Vegetable garden, cow	Vegetable garden	Vegetable garden, livestock	Vegetable garden, livestock	Vegetable garden, livestock	Vegetable garden, cow	Vegetable garden, mountain garden, livestock	Vegetable garden, cow
7	Monthly expenses											
	- Food (Tg/%)	Затрудн.	40000 Tg	150000 Tg	50000 Tg /	35000 Tg /	40000 Tg	40000 Tg	40000 Tg	40000 Tg		30000
	- Utility bills (Tg/%)	14000 Tg /	11000 Tg / 15%	22000 Tg/	9000 Tg /	11000 Tg /	14000 Tg	20000 Tg	14000 Tg	12000 Tg		17000
	- Public transport (Tg/%)		-	-		-	-	-	-	-		
	- Fuel and private	10000 Tg/	10000	?	12000 Tg	-		50000 Tg	10000	20000 Tg		20000

No.	Question	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11
	transport maintenance (Tg/%)				/							
	- Leisure, hobbies etc. (Tg/%)	-	-	-	[217])	-	20000 Tg	40000 Tg	-[218])	-		-
	- Education (Tg/%)		-	-	-	-		15000 Tg	-	40000 Tg	100000	20000
	- Interests on loans		-	-	-		35000[219])Tg	15000 Tg	-	160000 Tg, стройка		-
	- Remaining amount (Tg/%)			-	-	-			-			
	Total						110000	180000		200000		
8	Does the household have:											
	- Washing machine	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	- Fridge	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	- TV set	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	- Computer, laptop	No	No	No	Yes	No	No	No	No	No	No	Yes
	- Mobile phone for each family member	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	- Car	Yes	Yes	UAZ and GAZ51 cars	Yes	ZIL car	Yes	2 (Pops and Zhiguli)	Yes	Yes	Yes	Yes
	- Agricultural machinery (please specify)	No	No	No	No	Yes	No	No	No	No	No	Tractor
	- Internet	No	No	No	Yes	No	No	No	No	No	No	No
9	Type of water supply	Private well	Private well	Private well	Private well	Private well	Private well	Private well	Private well + artesian well	Private well	Private well + artesian well	Private well
10	What kind of heating system does the house have? Please specify the typical length of heating season, what months does it include	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04	Coal stove, 11-04
11	How the food is cooked?	Cylinder gas, stove	Cylinder gas, stove	Cylinder gas, stove	Cylinder gas, stove	Cylinder gas,	Cylinder gas, stove	Cylinder gas,	Cylinder gas, stove	Cylinder gas, stove	Cylinder gas, stove	Cylinder gas, stove

[217] Attend holiday events 1-2 times per month; spend holiday away from home 2 times

[218] Go to the mountains, travel to Turkestan

[219] Construction loan

No.	Question	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10	K11
						stove		stove				
12	Do you have a land plot or plots? Please specify the area of each plot. Please specify all crops you grow in your plots	3 Ares: cucumber, tomato, apricot, cherry, apple	25 Ares: cucumber, tomato, pepper, greens, cherry, apple, apricot	7 Ares +7 Ares: cherry, apricot, cucumber, tomato	30 Ares: corn, cucumber, tomato, cherry, apple, apricot, currant	25 Ares, cucumber, tomato, pepper, egg-plant, apricot, apple	25 Ares: carrot, cucumber, tomato, pepper, apricot, 50 apple trees	25 Ares: corn, carrot, potato, onion, cucumber, egg-plant, tomato, apricot, cherry, apple	25 Ares, cucumber, tomato, carrot, pepper, egg-plant, apricot, apple, cherry	25 Ares, cucumber, tomato, greens, apricot	Apple garden in the mountains	50 Ares: cucumber, tomato, pepper, apricot, cherry, peach
13	Do you keep poultry/livestock, how many heads?	No	No	10 cows, 50 sheep, 500 horses, camels. Livestock rearing on pastures	Cow	No[220]	4 cows, 4 calves, 6 goats, 10 hens	50 sheep, 2 cows, 2 horses, 10 hens[221]	Cow and a calf	1 cow	40 cows, 30 horses, 30 camels	1 cow
14	Please describe your housing	3 houses, 7 rooms, no conveniences	2 houses, 9 rooms, no conveniences	2 private houses and a summer house in the mountains	Private house, 5 rooms, no conveniences	Private house, 7 rooms, no conveniences	Private house, 5 rooms, no conveniences	Private house, 6 rooms, no conveniences	Private house, 5 rooms, no conveniences	Private house, 6 rooms, no conveniences	Private house, 6 комнат, no conveniences mountain house	Private house, 5 rooms, no conveniences
15	Since when does your family live in the village?	Native	Native	Native	1956	Born here	Native	Native	Native	1996	Native	Native
16	What was the purpose of moving the family to this place? What had your family done before?	Born in Kuttykozha, household head worked at the ShZ	Worked at the collective farm	Livestock breeders	Maintained nomadic lifestyle in the past	Livestock breeders		Farmers	Livestock breeders	Arrived to work at the mine	Livestock breeders	Farmers

[220] Sold livestock to build a house

[221] Produce milk for family needs and relatives

ANNEX 20 RESIDENTIAL HOUSING IN THE SHALKIYA AUL OKRUG

20.1. Shalkiya Settlement

Low-Rise Housing

(a) A private house in Shalkiya

(b) A farmstead in Shalkiya. Livestock sheds

(c) Private houses in Shalkiya

(d) Two-storey ShalkiyaZinc Company Hotel in Shalkiya

	
(e) One-storey ShalkiyaZinc Company Hotel in Shalkiya	(g) Corporate residential houses commissioned in 2008

(h) Corporate residential houses under construction in Shalkiya

High-Rise Housing

(a) A high-rise house classified as being in dangerous condition of disrepair where approximately 15 households continue to reside.

Semi-dilapidated houses Semi-dilapidated house where 15 of 60 flats are occupied Hens kept at the basement of a semi-dilapidated house

(e) A high-rise house classified as being in dangerous condition of disrepair where 1 household resides

(f) Partially renovated house. Improvised smoke duct. Coal-fired stove in a high-rise building

Figure 82**. **High-Rise Housing Condition in Shalkiya

Housing in the Former Pioneer Settlement

Figure 83. Residential Housing in the Former Pioneer Settlement

20.2. Residential Housing in Kuttykozha

Figure 84. Residential Housing in Kuttykozha

ANNEX 21. INFORMATION ON POTENTIAL SERVICE PROVIDERS IN THE FIELD OF THE PRODUCTION AND CONSUMER WASTE DISPOSAL

Company	**Types of waste**	**Permitting documents**	**Availability of technological equipment and regulations on waste disposal**	**Information on landfills and waste disposal**		
				lifetime	Project capacity	actual capacity as of 01.01.2016
1. LLC Ibriham and LTD. Kyzylorda,, Toraygyrov St., 140	- Solid domestic waste. Polymer waste. Waste oil. - Car tires. -Used batteries. - Oil contaminated soils. - Sludge. - Oily water. Polymer containers of chemicals and fertilizers. - Metal containers of chemicals and fertilizers. - Drilling sludge. - Oiled rags. - Bio and agriculture disturbed lands. - Oil spill response,	1. Permission to emissions for 2013-2017 (№ 0000016 dated 11.01.2013	In the company since the beginning of the year check is conducted in connection with the materials in the landfill is not represented.			

	Samoilovich wells, neftepererab on land. - Processing of oily waste. - Transportation of hazardous waste. - Medical waste.			
2. LLP "Recycling-Kazakhstan", Karaganda, Alikhanov str., 8	- Mercury-containing wastes (thermometers, lamps, etc.). - Waste contaminated with petroleum products (soil, sludge, rags, etc.). Waste generated during the maintenance of vehicles and equipment (batteries, filters, tyres, scrapped vehicles). - Industrial waste (cinders electrodes, produce and boxes of paints, abrasive wheels, waste polymers). - Clinical waste	1. The permit for emissions into the environment for processing plant waste for 2013-2017 (№ 0003009 from 12.09.2013. 2. The permit for emissions into the environment for temporary storage of waste 2015-2019 (No. 0004446 from 18.03.2015 3. The conclusion of the state ecological expertise (see): - technical EIA for the project operation production of wastes of production and	Equipment and technologies of waste management is given in technical project manual for the production of waste from production and consumption, as well as in the technical project for removal from storage, transportation and disposal (recycling) of chemical waste.	No landfill for permanent disposal

	(medical waste, expired medicines, decommissioned medical equipment). - Waste and electronic appliances. Paper and electronic archives, credit cards and discs. - Chemical waste (acids, alkalis, reagents, reagents, resins). - Waste of workwear and PPE (masks, respirators, protective suits, etc.). - Waste of hairdressers and beauty salons (hair, nails, containers of the cosmetics and aerosols). - Waste containing polychlorinated biphenyls (PCBs) and persistent organic pollutants (POPS).	consumption; - for EIA of the technical project on carrying out of works for the removal from storage, transportation and disposal (recycling) of chemical waste. 4. Sanitary-epidemiological conclusions: - vehicles for transportation of waste production; - containers for storage and transportation of mercury-containing lamps; 5. Certificate ST RK ISO 14001-2006. The environmental management system. 6. Certificate ST RK OHSAS 18001-2008 management System of occupational safety and health.		

	- Expired food. - Customs waste (substandard, seized substandard).	7. The control program of wastes of production and consumption. 8. Action plan in emergency situations. 9. License for activity connected with turnover of precursors.		
3. LLP "ECO-SERVICE". Kyzylorda, Baiseitova str., 13	- Oil sludge, - Oil contaminated soils, - Drilling waste.	1. State license No. 15020422 from 20.11.2015 year on the management of radioactive waste. 2. See conclusion: - on MPE project of the production base and the site of temporary storage and disposal of oil waste; project disposal of drilling and oil production, production wastes and consumption. 3. The waste management program for 2014-2018.	Technological equipment and technologies for waste disposal is given in: Project disposal of drilling and oil production, production wastes and consumption; Technology regulations, technology recycling (disposal of oil contaminated soils; The waste management program for 2014-2018.	No landfills for permanent waste disposal. A private landfill for temporary storage and disposal of waste with an area of 12 hectares, located to the address: Karaganda region, Ulytau district, land long-term use of Syrdarya district of Kyzylorda region, 175 km of the highway Kyzylorda-Kumkol

		4. Technological regulations of technology of processing (recycling) oil contaminated soil.		
4. LLP "Temir Jas Group. Kyzylorda, Abay Ave., 62/9	- Tires and tyres. - The batteries. - Waste oil. - Scrap metals. - Construction waste. - Used packaging. - Emulsions and mixtures of oil products. - Waste paint and varnish vehicles. Plastic, plastic containers from pesticides, disinfectants and detergents. - Container, metal, paint contaminated materials, petroleum products, chemical reagents. Household appliances, office equipment. - Medical waste	Has Permission on emissions into the environment		No landfills for permanent waste disposal. There is a leased area (4.2 hectares), situated at the Landfill site temporary storage of oily waste, located at the address: Kyzylorda oblast, Syrdarya district, right side 116 km of the highway Kyzylorda-Kumkol. Rent area of the polygon is carried out under contract # TS-42/2013 dated 30.09.2013 with LLP "Timur Company" (owner of site)

	(class BV). - Mercury-containing lamps. - Oiled rags. - Oil and fuel filters. - Oil contaminated soil.			
5. Akimat of Zhanakorgan district,the the village Zhanakorgan				Allocated land area of 20 ha. are currently under preparation of project documentation for landfill. Akimat annually on a tender basis determines a company for the export of solid waste. The company concludes contracts with legal and natural persons on the disposal of solid waste and garbage the waste to the dedicated landfill land. The permit for emissions into the environment prepares each legal company separate to their arisings of MSW.

ANNEX 22. SUMMARY OF THE DATA OF INDUSTRIAL MONITORING VEGETATION FOR 2012-2015

Parameter	Unit	Sampling						
		21.06.2012		10.06.2013		23.05.2014		
		Point 15	Point 19	Point 5	Point 19	Integrated sample (Points 15,16,19)	Integrated sample (Points 18,9)	Point 3
1. pH of the aqueous extract		7,56	7,1			5,87	6,2	5,71
2. Organic Carbon	%					82,4	84,5	81,3
3. Total nitrogen	mg/kg	8850	9225			427	507	941
4. Phosphorus pentoxide	mg/kg	17,18	34,35			45,8	650	126
5. Potassium Oxide	mg/kg	9300	8500			8640	9500	6860
6. Lead	mg/kg	6,47	3,47		9,0	5,62	6,44	4,21
7. Zinc	mg/kg	16,5	14,5		34,8	10,2	20,7	8,91
8. Copper	mg/kg	33,2	9,48		6,6	21,7	38,5	33,2
9. Cadmium	mg/kg	0,53	0,41		0,12	0,659	0,258	0,205

Note: 1. The points №№ 15,16,19 - sampling points of soil and vegetation around the pond storage of mine water.
2. Points №№ 18, 9 - background sampling point land cover
3. Point number 3 - the selection of a point of land cover in the impact zone.

ANNEX 23. NATURAL AND MINE WATER ANALYSIS RESULTS (2016)

Испытательная лаборатория
ТОО РНПИЦ "КАЗЭКОЛОГИЯ"

Аттестат аккредитации № KZ.И.02.0640
от 26.12.2014 г

050010, РК, г. Алматы, ул. Айтеке би, 27
Тел: 727-291-06-53, Факс 727-291-72-20
E-mail: office@kazecology.kz

KZ.И.02.0640 **Протокол испытания заказа № 105-16/ 181 от 07.06.2016 г**

Всего стр. 2
стр 1 из 2

№ заказа:	105-16 от 23.05.16 г
Заказчик и его адрес:	АО "ШалкияЦинк ЛДТ", г.Алматы, проспект Аль-Фараби 7, Блок 4 А, офис 38
Объект испытания:	Вода природная
Наименование водопункта:	Водозаборная скважина № 6г-бис (Куттыкоджа) рудника Шалкия
Дата отбора проб:	19.05.2016 г
Дата поступления проб:	23.05.2016 г
Дата проведения испытания:	24 - 07.06.2016 г
Вид испытания:	исследование физико-химических параметров воды
НД на продукцию:	СанПиН № 209 от 16.03. 2015 г
Условия проведения испытаний:	температура 23 °С, относительная влажность 52%

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба № 1
Запах при 20 °С, балл	СТ РК ИСО 7027-2007 ГОСТ 3351-74	0
Цветность, град	СТ РК ИСО 7027-2007 ГОСТ 3351-74	0
Мутность, мг/л	СТ РК ИСО 7027-2007 ГОСТ 3351-74	0
pH	ГОСТ 26449.1-85, п. 4	7,8
Сухой остаток	ГОСТ 18164-72	467,7
Жесткость общая, мг-экв/л	СТ РК 1514-2006	5,65
Окисляемость перм., мг/л	СТ РК 1498-2006	н.о.
Нефтепродукты, мг/л	ПНД Ф 14.1:2:4.128-98	н.о.
ПАВ, мг/л	СТ РК 1983-2010	н.о.
Фенолы, мг/л	ПНД Ф 14.1:2:4.182-02	н.о.
Алюминий, мг/л	СТ РК ИСО 1956-2010	н.о. (<0,02)
Бериллий, мг/л	ГОСТ 18294-2004	н.о. (<0,0001)
Бор, мг/л	СТ РК 1016-2000	0,015
Железо общ.	СТ РК ИСО 6332-2008	0,072
Кадмий, мг/л	СТ РК ИСО 8288-2005	н.о.
Марганец, мг/л	ГОСТ 4974-72	н.о.
Медь, мг/л	СТ РК ИСО 8288-2005	н.о.
Молибден, мг/л	ГОСТ 18308-72	н.о.
Мышьяк, мг/л	ГОСТ 4152-89	н.о. (<0,005)
Никель, мг/л	СТ РК ИСО 8288-2005	0,006
Нитраты, мг/л	СТ РК 7890-3-2006	6,14
Ртуть, мг/л	СТ РК ГОСТ Р 51212-2003	н.о.(<0,0002)
Свинец, мг/л	СТ РК ИСО 8288-2005	0,014
Селен, мг/л	ГОСТ 19413-89	н.о.(<0,0001)
Стронций, мг/л	ГОСТ 23950-88	н.о.

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба №1
Гидрокарбонаты, мг/л	ГОСТ 26449.2-85, п. 5	207,5
Сульфаты, мг/л	СТ РК 1015-2000	152,3
Хлориды, мг/л	СТ РК ИСО 9297-2008	20,80
Фториды, мг/л	СТ РК ИСО 10359-1-2008	0,76
Хром+6, мг/л	СТ РК 1511-2006, п. 9.6	н.о.(<0,001)
Цинк, мг/л	СТ РК ИСО 8288-2005	н.о.
Кремний, мг/л	СТ РК 1511-2006, п. 9.9	н.о.(<0,001)
Кальций, мг/л	ГОСТ 26449.2-85, п. 19	5,34
Магний, мг/л	ГОСТ 26449.2-85, п. 7.1	73,10
Натрий, мг/л	ГОСТ 23268.5-78	24,30
Калий, мг/л	ГОСТ 26449.2-85, п. 13.1	39,33
Нитриты, мг/л	ГОСТ 26449.2-85, п. 14.1	1,16
γ-ГХЦГ (линдан), мг/л	СТ РК 1963-2010	н.о.
ДДТ (сумма изомеров), мг/л	СТ РК 2010-2010	н.о.
2,4-Д, мг/л	СТ РК 2010-2010	н.о.
Альфа-активность, Бк/л	СТ РК 2010-2010	н.о.
Бета-активность, Бк/л	ГОСТ 31864-2012	0,03
	СТ РК ИСО 9697-2006	0,130

Исполнитель:

подпись — Божевальная Н.К. Ф.И.О.

подпись — Абенбай А.Е. Ф.И.О.

Директор ИЛ — Жайсакова Г.Е.

Протокол распространяется только на пробы, подвергнутые испытаниям
Перепечатка документа частичная или полная запрещена без разрешения лаборатории

Испытательная лаборатория
ТОО РНПИЦ "КАЗЭКОЛОГИЯ"

Аттестат аккредитации № KZ.И.02.0640
от 26.12.2014 г

050010, РК, г. Алматы, ул. Айтеке Би, 27
Тел.: 727-291-06-53, Факс 727-291-72-20
E-mail: office@kazecology.kz

KZ.И.02.0640 **Протокол испытания заказа № 105-16/ 182 от 07.06.2016 г**

Всего стр. 2
стр.1 из 2

№ заказа:	105-16 от 23.05.16 г
Заказчик и его адрес:	АО "ШалкияЦинк ЛДТ", г.Алматы, проспект Аль-Фараби 7, Блок 4 А, офис 38
Объект испытания:	Водозаборная в пос. Жанакорган
Наименование водопункта:	Самоизливающая скважина
Дата отбора проб:	19.05.2016 г
Дата поступления проб:	23.05.2016 г
Дата проведения испытания:	24 - 07.06.2016 г
Вид испытания:	исследование физико-химических параметров воды
НД на продукцию:	СанПиН № 209 от 16.03. 2015 г
Условия проведения испытаний:	температура 23 °С, относительная влажность 52%

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба № 2
Запах при 20 °С, балл	СТ РК ИСО 7027-2007 ГОСТ 3351-74	0
Цветность, град	СТ РК ИСО 7027-2007 ГОСТ 3351-74	0
Мутность, мг/л	СТ РК ИСО 7027-2007 ГОСТ 3351-74	0
pH	ГОСТ 26449.1-85, п, 4	7,8
Сухой остаток	ГОСТ 18164-72	487,1
Жесткость общая, мг-экв/л	СТ РК 1514-2006 ,	4,20
Окисляемость перм., мг/л	СТ РК 1498-2006	н.о.
Нефтепродукты, мг/л	ПНД Ф 14.1:2:4.128-98	н.о.
ПАВ, мг/л	СТ РК 1983-2010	н.о.
Фенолы, мг/л	ПНД Ф 14.1:2:4.182-02	н.о.
Алюминий, мг/л	СТ РК ИСО 1956-2010	н.о. (<0,02)
Бериллий, мг/л	ГОСТ 18294-2004	н.о. (<0,0001)
Бор, мг/л	СТ РК 1016-2000	0,010
Железо общ.	СТ РК ИСО 6332-2008	0,032
Кадмий, мг/л	СТ РК ИСО 8288-2005	н.о.
Марганец, мг/л	ГОСТ 4974-72	н.о.
Медь, мг/л	СТ РК ИСО 8288-2005	н.о.
Молибден, мг/л	ГОСТ 18308-72	н.о.
Мышьяк, мг/л	ГОСТ 4152-89	н.о. (<0,005)
Никель, мг/л	СТ РК ИСО 8288-2005	
Нитраты, мг/л	СТ РК 7890-3-2006	6,16
Ртуть, мг/л	СТ РК ГОСТ Р 51212-2003	н.о.<0,0002)
Свинец, мг/л	СТ РК ИСО 8288-2005	0,016
Селен, мг/л	ГОСТ 19413-89	0,00035
Стронций, мг/л	ГОСТ 23950-88	н.о.

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба № 2
Гидрокарбонаты, мг/л	ГОСТ 26449.2-85, п. 5	170,8
Сульфаты, мг/л	СТ РК 1015-2000	107,0
Хлориды, мг/л	СТ РК ИСО 9297-2008	82,10
Фториды, мг/л	СТ РК ИСО 10359-1-2008	0,63
Хром+6, мг/л	СТ РК 1511-2006, п. 9.6	н.о.(<0,001)
Цинк, мг/л	СТ РК ИСО 8288-2005	н.о.
Кремний, мг/л	ГОСТ 26449.2-85, п. 19	5,67
Кальций, мг/л	ГОСТ 26449.2-85, п. 7.1	49,10
Магний, мг/л	ГОСТ 23268.5-78	21,30
Натрий, мг/л	ГОСТ 26449.2-85, п. 13.1	76,08
Калий, мг/л	ГОСТ 26449.2-85, п. 14.1	2,83
Нитриты, мг/л	СТ РК 1963-2010	н.о.
γ-ГХЦГ (линдан), мг/л	СТ РК 2010-2010	н.о.
ДДТ (сумма изомеров), мг/л	СТ РК 2010-2010	н.о.
2,4-Д, мг/л	СТ РК 2010-2010	н.о.
Альфа-активность, Бк/л	ГОСТ 31864-2012	0,060
Бета-активность, Бк/л	СТ РК ИСО 9697-2006	0,099

Исполнитель: ______ подпись Божевальная Н.К. Ф.И.О.

______ подпись Абенбай А.Е. Ф.И.О.

Директор ИЛ Жайсакова Г.Е.

ИСПЫТАТЕЛЬНАЯ ЛАБОРАТОРИЯ

Протокол распространяется только на пробы, подвергнутые испытаниям
Перепечатка документа частичная или полная запрещена без разрешения лаборатории

Испытательная лаборатория
ТОО РНПИЦ "КАЗЭКОЛОГИЯ"

Аттестат аккредитации № KZ.И.02.0640 от 26.12.2014 г

050010, РК, г. Алматы, ул. Айтеке Би, 27
Тел.: 727-291-06-53, Факс 727-291-72-20
E-mail: office@kazecology.kz

KZ.И.02.0640

Протокол испытания № 105-16/ 183 от 07.06.2016 г

Всего стр. 1
стр.1

№ заказа:	105-16 от 23.05.16 г
Заказчик и его адрес:	АО "ШалкияЦинк ЛДТ", г.Алматы, проспект Аль-Фараби, 7, Блок 4 А, офис 38
Объект испытания:	Сточная вода
Наименование водопункта:	Труба сброса хозяйственно-бытовых сточных вод
Дата отбора проб:	19.05.2016 г
Дата поступления проб:	23.05.2016 г
Дата проведения испытания:	24 - 07.06.2016 г
Вид испытания:	исследование физико-химических параметров сточной воды
НД на продукцию:	Правила приема сточных вод в системы водоотведения населенных пунктов (Приказ Мин НЭ РК № 546 от 20.07.2015 г)
Условия проведения испытаний:	температура 23 °С, относительная влажность 50%

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба № 3
pH	ГОСТ 26449.2-85, п. 2	7,65
Температура, °С		21,5
Запах при 20 °С, балл	ГОСТ 3351-74	5
Прозрачность, см	СТ РК ИСО 7027-2007	15,37
Жесткость общая, мг-экв/л	ГОСТ 26449.1-85, п. 10	6,0
Взвешенные вещества, мг/л	СТ РК 2015-2010	10,0
Сухой остаток	ГОСТ 26449.1-85 п. 3.1	682,4
Хлориды, мг/л	СТ РК 1496-2006	50,80
Сульфаты, мг/л	СТ РК 1015-2000	156,4
Гидрокарбонаты, мг/л	ГОСТ 26449.1-85, п. 7	427,1
Кальций, мг/л	ГОСТ 26449.1-85, п. 11	70,10
Магний, мг/л	ГОСТ 26449.1-85, п. 12*	30,40
Азот аммонийный, мг/л	ГОСТ 26449.1-85, п. 24	5,7
Нитриты, мг/л	СТ РК 1963-2010	н.о.
Нитраты, мг/л	СТ РК 7890-3-2006	н.о.
Железо общее, мг/л	СТ РК ИСО 6332-2008 п.7.1	0,33
Кадмий, мг/л	СТ РК ИСО 8288-2005	н.о.
Нефтепродукты, мг/л	ПНД Ф 14.1:2:4.128-98	0,02
СПАВ, мг/		0,5
Марганец, мг/л	ГОСТ 4974-2014	н.о.
Стронций, мг/л	ГОСТ 23950-88	н.о.
Калий, мг/л	ГОСТ 26449.1-85, п. 18.1	8,66
Натрий, мг/л	ГОСТ 26449.1-85, п. 17.1	61,36
Альфа-активность, Бк/л	ГОСТ 31864-2012	0,02
Бета-активность, Бк/л	СТ РК ИСО 9697-2006	0,35
БПК, мгО/л	СТ РК ИСО 5815-2-2010	8,0

Исполнители: подпись Божевальная Н.К. Ф.И.О.
подпись Абенбай А.Е. Ф.И.О.

Директор ИЛ Жайсакова Г.Е.

Протокол распространяется только на пробы, подвергнутые испытаниям
Перепечатка документа частичная или полная запрещена без разрешения лаборатории

Испытательная лаборатория
ТОО РНПИЦ "КАЗЭКОЛОГИЯ"

Аттестат аккредитации № KZ.И.02.0640
от 26.12.2014 г

050010, РК, г. Алматы, ул. Айтеке Би, 27
Тел.: 727-291-06-53, Факс 727-291-72-20
E-mail: office@kazecology.kz

ilac-MRA NCA

KZ.И.02.0640 **Протокол испытания заказа № 105-16/ 184 от 07.06.2016 г**

Всего стр. 2
стр.1 из 2

№ заказа:	105-16 от 23.05.16 г
Заказчик и его адрес:	АО "ШалкияЦинк ЛДТ", г.Алматы, проспект Аль-Фараби 7, Блок 4 А, офис 38
Объект испытания:	Вода природная. Река Сырдарья
Наименование водопункта:	В точке предполагаемого сброса
Дата отбора проб:	19.05.2016 г
Дата поступления проб:	23.05.2016 г
Дата проведения испытания:	24 - 07.06.2016 г
Вид испытания:	исследование физико-химических параметров воды
НД на продукцию:	СанПиН № 209 от 16.03. 2015 г
Условия проведения испытаний:	температура 23 °С, относительная влажность 52%

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба № 4
Запах при 20 °С, балл	СТ РК ИСО 7027-2007 ГОСТ 3351-74	1
Цветность, град	СТ РК ИСО 7027-2007 ГОСТ 3351-74	0
Мутность, мг/л	СТ РК ИСО 7027-2007 ГОСТ 3351-74	11,31
pH	ГОСТ 26449.1-85, п. 4	8,45
Сухой остаток	ГОСТ 18164-72	932,9
Жесткость общая, мг-экв/л	СТ РК 1514-2006	11,00
Окисляемость перм., мг/л	СТ РК 1498-2006	2,96
Нефтепродукты, мг/л	ПНД Ф 14.1:2:4.128-98 ,	н.о.
ПАВ, мг/л	СТ РК 1983-2010	н.о.
Фенолы, мг/л	ПНД Ф 14.1:2:4.182-02	н.о.
Алюминий, мг/л	СТ РК ИСО 1956-2010	н.о. (<0,02)
Бериллий, мг/л	ГОСТ 18294-2004	н.о. (<0,0001)
Бор, мг/л	СТ РК 1016-2000	н.о.
Железо общ	СТ РК ИСО 6332-2008	0,19
Кадмий, мг/л	СТ РК ИСО 8288-2005	н.о.
Марганец, мг/л	ГОСТ 4974-72	н.о.
Медь, мг/л	СТ РК ИСО 8288-2005	н.о.
Молибден, мг/л	ГОСТ 18308-72	н.о.
Мышьяк, мг/л	ГОСТ 4152-89	н.о. (<0,005)
Никель, мг/л	СТ РК ИСО 8288-2005	0,015
Нитраты, мг/л	СТ РК 7890-3-2006	2,4
Ртуть, мг/л	СТ РК ГОСТ Р 51212-2003	н.о.(<0,0002)
Свинец, мг/л	СТ РК ИСО 8288-2005	0,036
Селен, мг/л	ГОСТ 19413-89	0,00086
Стронций, мг/л	ГОСТ 23950-88	н.о.

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба № 4
Гидрокарбонаты, мг/л	ГОСТ 26449.2-85, п. 5	134,2
Сульфаты, мг/л	СТ РК 1015-2000	481,6
Хлориды, мг/л	СТ РК ИСО 9297-2008	104,20
Фториды, мг/л	СТ РК ИСО 10359-1-2008	0,67
Хром+6, мг/л	СТ РК 1511-2006, п. 9.6	н.о.(<0,001)
Цинк, мг/л	СТ РК ИСО 8288-2005	н.о.
Кремний, мг/л	ГОСТ 26449.2-85, п. 19	3,04
Кальций, мг/л	ГОСТ 26449.2-85, п. 7.1	114,20
Магний, мг/л	ГОСТ 23268.5-78	64,40
Натрий, мг/л	ГОСТ 26449.2-85, п. 13.1	112,50
Калий, мг/л	ГОСТ 26449.2-85, п. 14.1	5,35
Нитриты, мг/л	СТ РК 1963-2010	0,040
γ-ГХЦГ (линдан), мг/л	СТ РК 2010-2010	н.о.
ДДТ (сумма изомеров), мг/л	СТ РК 2010-2010	н.о.
2,4-Д, мг/л	СТ РК 2010-2010	н.о.
Альфа-активность, Бк/л	ГОСТ 31864-2012	0,020
Бета-активность, Бк/л	СТ РК ИСО 9697-2006	0,110

Исполнитель: ________ Божевальная Н.К.
подпись Ф.И.О.

________ Абенбай А.Е..
подпись Ф.И.О.

Директор ИЛ ________ Жайсакова Г.Е.

испытательная лаборатория

Протокол распространяется только на пробы, подвергнутые испытаниям
Перепечатка документа частичная или полная запрещена без разрешения лаборатории

Испытательная лаборатория
ТОО РНПИЦ "КАЗЭКОЛОГИЯ"

Аттестат аккредитации № KZ.И.02.0640
от 26.12.2014 г

050010, РК, г. Алматы, ул. Айтеке би, 27
Тел.: 727-291-06-53, Факс 727-291-72-20
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KZ.И.02.0640 **Протокол испытания заказа № 105-16/ 185 от 07.06.2016 г**

Всего стр. 2
стр 1 из 2

№ заказа:	105-16 от 23.05.16 г
Заказчик и его адрес:	АО "ШалкияЦинк ЛДТ", г.Алматы, проспект Аль-Фараби 7, Блок 4 А, офис 38
Объект испытания:	Шахтная вода с подземных горизонтов
Наименование водопункта:	Горизонт + 40м
Дата отбора проб:	19.05.2016 г
Дата поступления проб:	23.05.2016 г
Дата проведения испытания:	24 - 07.06.2016 г
Вид испытания:	исследование физико-химических параметров воды
НД на продукцию:	СанПиН № 209 от 16.03. 2015 г
Условия проведения испытаний:	температура 23 °С, относительная влажность 52%

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба № 5
Запах при 20 °С, балл	СТ РК ИСО 7027-2007 ГОСТ 3351-74	0
Цветность, град	СТ РК ИСО 7027-2007 ГОСТ 3351-74	0
Мутность, мг/л	СТ РК ИСО 7027-2007 ГОСТ 3351-74	0,17
pH	ГОСТ 26449.1-85, п. 4	7,95
Сухой остаток	ГОСТ 18164-72	2299,3
Жесткость общая, мг-экв/л	СТ РК 1514-2006	24,60
Окисляемость перм., мг/л	СТ РК 1498-2006	0,24
Нефтепродукты, мг/л	ПНД Ф 14.1:2:4.128-98	0,013
ПАВ, мг/л	СТ РК 1983-2010	0,1
Фенолы, мг/л	ПНД Ф 14.1:2:4.182-02	н.о.
Алюминий, мг/л	СТ РК ИСО 1956-2010	н.о. (<0,02)
Бериллий, мг/л	ГОСТ 18294-2004	н.о. (<0,0001)
Бор, мг/л	СТ РК 1016-2000	н.о.
Железо общ.	СТ РК ИСО 6332-2008	0,064
Кадмий, мг/л	СТ РК ИСО 8288-2005	0,003
Марганец, мг/л	ГОСТ 4974-72	н.о.
Медь, мг/л	СТ РК ИСО 8288-2005	н.о.
Молибден, мг/л	ГОСТ 18308-72	н.о.
Мышьяк, мг/л	ГОСТ 4152-89	н.о. (<0,005)
Никель, мг/л	СТ РК ИСО 8288-2005	0,025
Нитраты, мг/л	СТ РК 7890-3-2006	1,48
Ртуть, мг/л	СТ РК ГОСТ Р 51212-2803	н.о.(<0,0002)
Свинец, мг/л	СТ РК ИСО 8288-2005	0,05
Селен, мг/л	ГОСТ 19413-89	0,001
Стронций, мг/л	ГОСТ 23950-88	н.о.

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба № 5
Гидрокарбонаты, мг/л	ГОСТ 26449.2-85, п. 5	183,1
Сульфаты, мг/л	СТ РК 1015-2000	1196,1
Хлориды, мг/л	СТ РК ИСО 9297-2008	317,90
Фториды, мг/л	СТ РК ИСО 10359-1-2008	1,81
Хром+6, мг/л	СТ РК 1511-2006, п. 9.6	н.о.(<0,001)
Цинк, мг/л	СТ РК ИСО 8288-2005	н.о.
Кремний, мг/л	ГОСТ 26449.2-85, п. 19	3,74
Кальций, мг/л	ГОСТ 26449.2-85, п. 7.1	276,60
Магний, мг/л	ГОСТ 23268.5-78	131,20
Натрий, мг/л	ГОСТ 26449.2-85, п. 13.1	286,95
Калий, мг/л	ГОСТ 26449.2-85, п. 14.1	4,00
Нитриты, мг/л	СТ РК 1963-2010	н.о.
γ-ГХЦГ (линдан), мг/л	СТ РК 2010-2010	н.о.
ДДТ (сумма изомеров), мг/л	СТ РК 2010-2010	н.о.
2,4-Д, мг/л	СТ РК 2010-2010	н.о.
Альфа-активность, Бк/л	ГОСТ 31864-2012	0,010
Бета-активность, Бк/л	СТ РК ИСО 9697-2006	0,110

Исполнитель: ________ Божевальная Н.К.
подпись Ф.И.О.

________ Абенбай А.Е.
подпись Ф.И.О.

Директор ИЛ Жайсакова Г.Е.

ТОО ... "..." ИСПЫТАТЕЛЬНАЯ ЛАБОРАТОРИЯ

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Перепечатка документа частичная или полная запрещена без разрешения лаборатории

Испытательная лаборатория
ТОО РНПИЦ "КАЗЭКОЛОГИЯ"

Аттестат аккредитации № KZ.И.02.0640
от 26.12.2014 г

050010, РК, г. Алматы, ул. Айтеке Би, 27
Тел.: 727-291-06-53, Факс 727-291-72-20
E-mail: office@kazecology.kz

KZ.И.02.0640

Протокол испытания заказа № 105-16/ 186 от 07.06.2016 г

Всего стр. 2
стр.1 из 2

№ заказа:	105-16 от 23.05.16 г
Заказчик и его адрес:	АО "ШалкияЦинк ЛДТ", г.Алматы, проспект Аль-Фараби 7, Блок 4 А, офис 38
Объект испытания:	Водосборник шахтных вод
Наименование водопункта:	В точке слива
Дата отбора проб:	19.05.2016 г
Дата поступления проб:	23.05.2016 г
Дата проведения испытания:	24 - 07.06.2016 г
Вид испытания:	исследование физико-химических параметров воды
НД на продукцию:	СанПиН № 209 от 16.03. 2015 г
Условия проведения испытаний:	температура 23 °С, относительная влажность 52%

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба № 6
Запах при 20 °С, балл	СТ РК ИСО 7027-2007 ГОСТ 3351-74	0
Цветность, град	СТ РК ИСО 7027-2007 ГОСТ 3351-74	0
Мутность, мг/л	СТ РК ИСО 7027-2007 ГОСТ 3351-74	111,36
pH	ГОСТ 26449.1-85, п. 4	7,85
Сухой остаток	ГОСТ 18164-72	1747,6
Жесткость общая, мг-экв/л	СТ РК 1514-2006	19,20
Окисляемость перм., мг/л	СТ РК 1498-2006	2,1
Нефтепродукты, мг/л	ПНД Ф 14.1:2:4.128-98	0,017
ПАВ, мг/л	СТ РК 1983-2010	0,2
Фенолы, мг/л	ПНД Ф 14.1:2:4.182-02	н.о.
Алюминий, мг/л	СТ РК ИСО 1956-2010	н.о. (<0,0)2
Бериллий, мг/л	ГОСТ 18294-2004	н.о. (<0,0001)
Бор, мг/л	СТ РК 1016-2000	н.о.
Железо общ.	СТ РК ИСО 6332-2008	0,088
Кадмий, мг/л	СТ РК ИСО 8288-2005	0,003
Марганец, мг/л	ГОСТ 4974-72	н.о.
Медь, мг/л	СТ РК ИСО 8288-2005	н.о.
Молибден, мг/л	ГОСТ 18308-72	н.о.
Мышьяк, мг/л	ГОСТ 4152-89	н.о. (<0,005)
Никель, мг/л	СТ РК ИСО 8288-2005	0,026
Нитраты, мг/л	СТ РК 7890-3-2006	26,15
Ртуть, мг/л	СТ РК ГОСТ Р 51212-2003	н.о.(<0,0002)
Свинец, мг/л	СТ РК ИСО 8288-2005	0,069
Селен, мг/л	ГОСТ 19413-89	0,00125
Стронций, мг/л	ГОСТ 23950-88	н.о.

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба № 6
Гидрокарбонаты, мг/л	ГОСТ 26449.2-85, п. 5	195,3
Сульфаты, мг/л	СТ РК 1015-2000	841,3
Хлориды, мг/л	СТ РК ИСО 9297-2008	172,00
Фториды, мг/л	СТ РК ИСО 10359-1-2008	1,65
Хром+6, мг/л	СТ РК 1511-2006, п. 9.6	н.о.(<0,001)
Цинк, мг/л	СТ РК ИСО 8288-2005	н.о.
Кремний, мг/л	ГОСТ 26449.2-85, п. 19	5
Кальций, мг/л	ГОСТ 26449.2-85, п. 7.1	212,40
Магний, мг/л	ГОСТ 23268.5-78	104,50
Натрий, мг/л	ГОСТ 26449.2-85, п. 13.1	152,17
Калий, мг/л	ГОСТ 26449.2-85, п. 14.1	5,00
Нитриты, мг/л	СТ РК 1963-2010	2,900
γ-ГХЦГ (линдан), мг/л	СТ РК 2010-2010	н.о.
ДДТ (сумма изомеров), мг/л	СТ РК 2010-2010	н.о.
2,4-Д, мг/л	СТ РК 2010-2010	н.о.
Альфа-активность, Бк/л	ГОСТ 31864-2012	0,020
Бета-активность, Бк/л	СТ РК ИСО 9697-2006	0,030

Исполнитель: ________ подпись — Божевальная Н.К. Ф.И.О.

________ подпись — Абенбай А.Е. Ф.И.О.

Директор ИЛ — Жайсакова Г.Е.

ТОО ... "Каз..." испытательная лаборатория

Протокол распространяется только на пробы, подвергнутые испытаниям
Перепечатка документа частичная или полная запрещена без разрешения лаборатории

Испытательная лаборатория
ТОО РНПИЦ "КАЗЭКОЛОГИЯ"

Аттестат аккредитации № KZ.И.02.0640 от 26.12.2014 г

050010, РК, г. Алматы, ул. Айтеке Би, 27
Тел.: 727-291-06-53, Факс 727-291-72-20
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ilac-MRA

NCA

KZ.И.02.0640

Протокол испытания № 105-16/187 от 07.06.2016 г

№ заказа:	105-16 от 23.05.16 г
Заказчик и его адрес:	АО "ШалкияЦинк ЛДТ", г.Алматы, проспект Аль-Фараби, 7, Блок 4 А, офис 38
Объект испытания:	Пруд - накопитель шахтных вод
Наименование водопункта:	В точке выпуска шахтных вод в пруд-накопитель
Дата отбора проб:	19.05.2016 г
Дата поступления проб:	23.05.2016 г
Дата проведения испытания:	24 - 07.06.2016 г
Вид испытания:	исследование физико-химических параметров сточной воды
НД на продукцию:	Правила приема сточных вод в системы водоотведения населенных пунктов (Приказ Мин НЭ РК № 546 от 20.07.2015 г)
Условия проведения испытаний:	температура 23 °С, относительная влажность 50%

Всего стр. 1
стр.1

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба № 7
pH	ГОСТ 26449.2-85, п, 2	7,75
Температура, °С		21,5
Запах при 20 °С, балл	ГОСТ 3351-74	0
Прозрачность, см	СТ РК ИСО 7027-2007	145,99
Жесткость общая, мг-экв/л	ГОСТ 26449.1-85, п. 10	18,2
Взвешенные вещества, мг/л	СТ РК 2015-2010	20,8
Сухой остаток	ГОСТ 26449.1-85 п. 3.1	1415,2
Хлориды, мг/л	СТ РК 1496-2006	177,20
Сульфаты, мг/л	СТ РК 1015-2000	835,5
Гидрокарбонаты, мг/л	ГОСТ 26449.1-85, п. 7	195,3
Кальций, мг/л	ГОСТ 26449.1-85, п. 11	206,40
Магний, мг/л	ГОСТ 26449.1-85, п. 12	96,00
Азот аммонийный, мг/л	ГОСТ 26449.1-85, п. 24	2,2
Нитриты, мг/л	СТ РК 1963-2010	3,050
Нитраты, мг/л	СТ РК 7890-3-2006	30,06
Железо общее, мг/л	СТ РК ИСО 6332-2008 п.7.1	0,3
Кадмий, мг/л	СТ РК ИСО 8288-2005	0,003
Нефтепродукты, мг/л	ПНД Ф 14.1:2:4.128-98	0,036
Свинец, мг/л	СТ РК ИСО 8288-2005	0,06
Цинк, мг/л	СТ РК ИСО 8288-2005	н.о.
Медь, мг/л	СТ РК ИСО 8288-2005	н.о.
Марганец, мг/л	ГОСТ 4974-2014	н.о.
Стронций, мг/л	ГОСТ 23950-88	н.о.
Калий, мг/л	ГОСТ 26449.1-85, п. 18.1	4,33
Натрий, мг/л	ГОСТ 26449.1-85, п. 17.1	178,26
Альфа-активность, Бк/л	ГОСТ 31864-2012	0,016
Бета-активность, Бк/л	СТ РК ИСО 9697-2006	0,02
БПК, мгО/л	СТ РК ИСО 5815-2-2010	н.о.

Исполнители: ______ подпись Божевальная Н.К. Ф.И.О.

______ подпись Абенбай А.Е. Ф.И.О.

Директор ИЛ ______ Жайсакова Г.Е.

Испытательная лаборатория
ТОО РНПИЦ "КАЗЭКОЛОГИЯ"

Аттестат аккредитации № KZ.И.02.0640 от 26.12.2014 г

050010, РК, г. Алматы, ул. Айтеке Би, 27
Тел.: 727-291-06-53, Факс 727-291-72-20
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KZ.И.02.0640

Протокол испытания № 105-16/188 от 07.06.2016 г

№ заказа:	105-16 от 23.05.16 г	Всего стр. 1 стр.1
Заказчик и его адрес:	АО "ШалкияЦинк ЛДТ", г.Алматы, проспект Аль-Фараби, 7, Блок 4 А, офис 38	
Объект испытания:	Пруд - накопитель шахтных вод	
Наименование водопункта:	С южной стороны дамбы	
Дата отбора проб:	19.05.2016 г	
Дата поступления проб:	23.05.2016 г	
Дата проведения испытания:	24 - 07.06.2016 г	
Вид испытания:	исследование физико-химических параметров сточной воды	
НД на продукцию:	Правила приема сточных вод в системы водоотведения населенных пунктов (Приказ Мин НЭ РК № 546 от 20.07.2015 г)	
Условия проведения испытаний:	температура 23 °С, относительная влажность 50%	

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено
		проба № 8
pH	ГОСТ 26449.2-85, п, 2	7,66
Температура, °С		21,5
Запах при 20 °С, балл	ГОСТ 3351-74	1
Прозрачность, см	СТ РК ИСО 7027-2007	3,48
Жесткость общая, мг-экв/л	ГОСТ 26449.1-85, п. 10	20,0
Взвешенные вещества, мг/л	СТ РК 2015-2010	59,0
Сухой остаток	ГОСТ 26449.1-85 п. 3.1	1971,0
Хлориды, мг/л	СТ РК 1496-2006	234,50
Сульфаты, мг/л	СТ РК 1015-2000	1091,5
Гидрокарбонаты, мг/л	ГОСТ 26449.1-85, п. 7	61
Кальций, мг/л	ГОСТ 26449.1-85, п. 11	218,40
Магний, мг/л	ГОСТ 26449.1-85, п. 12	110,60
Азот аммонийный, мг/л	ГОСТ 26449.1-85, п. 24	н.о.
Нитриты, мг/л	СТ РК 1963-2010	0,19
Нитраты, мг/л	СТ РК 7890-3-2006	5,65
Железо общее, мг/л	СТ РК ИСО 6332-2008 п.7.1	0,17
Кадмий, мг/л	СТ РК ИСО 8288-2005	0,003
Нефтепродукты, мг/л	ПНД Ф 14.1:2:4.128-98	0,03
Марганец, мг/л	ГОСТ 4974-2014	н.о.
Стронций, мг/л	ГОСТ 23950-88	н.о.
Калий, мг/л	ГОСТ 26449.1-85, п. 18.1	5,66
Натрий, мг/л	ГОСТ 26449.1-85, п. 17.1	243,75
Альфа-активность, Бк/л	ГОСТ 31864-2012	0,02
Бета-активность, Бк/л	СТ РК ИСО 9697-2006	0,05
БПК, мгО/л	СТ РК ИСО 5815-2-2010	н.о.

Исполнители: подпись Божевальная Н.К.
Ф.И.О.
подпись Абенбай А.Е.
Ф.И.О.

Директор ИЛ Жайсакова Г.Е.

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Перепечатка документа частичная или полная запрещена без разрешения лаборатории

Испытательная лаборатория
ТОО РНПИЦ "КАЗЭКОЛОГИЯ"

Аттестат аккредитации № KZ.И.02.0640 от 26.12.2014 г

050010, РК, г. Алматы, ул. Айтеке Би, 27
Тел.: 727-291-06-53, Факс 727-291-72-20
E-mail: office@kazecology.kz

KZ.И.02.0640

Протокол испытания № 105-16/ 189 от 07.06.2016 г

№ заказа:	105-16 от 23.05.16 г
Заказчик и его адрес:	АО "ШалкияЦинк ЛДТ", г.Алматы, проспект Аль-Фараби, 7, Блок 4 А, офис 38
Объект испытания:	Наблюдательные скважины вокруг пруда - накопителя шахтных вод
Наименование водопункта:	Фоновая наблюдательная скважина
Дата отбора проб:	19.05.2016 г
Дата поступления проб:	23.05.2016 г
Дата проведения испытания:	24 - 07.06.2016 г
Вид испытания:	исследование физико-химических параметров сточной воды
НД на продукцию:	Правила приема сточных вод в системы водоотведения населенных пунктов (Приказ Мин НЭ РК № 546 от 20.07.2015 г)
Условия проведения испытаний:	температура 23 °C, относительная влажность 50%

Всего стр. 1
стр.1

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба № 9
pH	ГОСТ 26449.2-85, п. 2	7,4
Температура, °C		21,5
Запах при 20 °C, балл	ГОСТ 3351-74	1
Прозрачность, см	СТ РК ИСО 7027-2007	157,06
Жесткость общая, мг-экв/л	ГОСТ 26449.1-85, п. 10	25,7
Взвешенные вещества, мг/л	СТ РК 2015-2010	26,1
Сухой остаток	ГОСТ 26449.1-85 п. 3.1	2573,8
Хлориды, мг/л	СТ РК 1496-2006	302,30
Сульфаты, мг/л	СТ РК 1015-2000	1091,5
Гидрокарбонаты, мг/л	ГОСТ 26449.1-85, п. 7	79,3
Кальций, мг/л	ГОСТ 26449.1-85, п. 11	228,50
Магний, мг/л	ГОСТ 26449.1-85, п. 12	173,80
Азот аммонийный, мг/л	ГОСТ 26449.1-85, п. 24	3,56
Нитриты, мг/л	СТ РК 1963-2010	0,10
Нитраты, мг/л	СТ РК 7890-3-2006	н.о.
Железо общее, мг/л	СТ РК ИСО 6332-2008 п.7.1	0,55
Кадмий, мг/л	СТ РК ИСО 8288-2005	0,003
Нефтепродукты, мг/л	ПНД Ф 14.1:2:4.128-98	н.о.
СПАВ, мг/		0,2
Марганец, мг/л	ГОСТ 4974-2014	0,31
Стронций, мг/л	ГОСТ 23950-88	н.о.
Калий, мг/л	ГОСТ 26449.1-85, п. 18.1	2
Натрий, мг/л	ГОСТ 26449.1-85, п. 17.1	368,75
Альфа-активность, Бк/л	ГОСТ 31864-2012	0,016
Бета-активность, Бк/л	СТ РК ИСО 9697-2006	0,05
БПК, мгО/л	СТ РК ИСО 5815-2-2010	н.о.

Исполнители: _______ подпись Божевальная Н.К. Ф.И.О.

_______ подпись Абенбай А.Е. Ф.И.О.

Директор ИЛ _______ Жайсакова Г.Е.

Протокол распространяется только на пробы, подвергнутые испытаниям
Перепечатка документа частичная или полная запрещена без разрешения лаборатории

Испытательная лаборатория
ТОО РНПИЦ "КАЗЭКОЛОГИЯ"

Аттестат аккредитации № KZ.И.02.0640 от 26.12.2014 г

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KZ.И.02.0640

Протокол испытания № 105-16/190 от 07.06.2016 г

№ заказа:	105-16 от 23.05.16 г
Заказчик и его адрес:	АО "ШалкияЦинк ЛДТ", г.Алматы, проспект Аль-Фараби, 7, Блок 4 А, офис 38
Объект испытания:	Наблюдательные скважины вокруг пруда - накопителя шахтных вод
Наименование водопункта:	Контрольная наблюдательная скважина
Дата отбора проб:	19.05.2016 г
Дата поступления проб:	23.05.2016 г
Дата проведения испытания:	24 - 07.06.2016 г
Вид испытания:	исследование физико-химических параметров сточной воды
НД на продукцию:	Правила приема сточных вод в системы водоотведения населенных пунктов (Приказ Мин НЭ РК № 546 от 20.07.2015 г)
Условия проведения испытаний:	температура 23 °С, относительная влажность 50%

Всего стр. 1
стр.1

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба № 10
pH	ГОСТ 26449.2-85, п. 2	6
Температура, °С		21,5
Запах при 20 °С, балл	ГОСТ 3351-74	2
Прозрачность, см	СТ РК ИСО 7027-2007	150,8
Жесткость общая, мг-экв/л	ГОСТ 26449.1-85, п. 10	41,2
Взвешенные вещества, мг/л	СТ РК 2015-2010	21,6
Сухой остаток	ГОСТ 26449.1-85 п. 3.1	3419,0
Хлориды, мг/л	СТ РК 1496-2006	312,30
Сульфаты, мг/л	СТ РК 1015-2000	1091,5
Гидрокарбонаты, мг/л	ГОСТ 26449.1-85, п. 7	12,2
Кальций, мг/л	ГОСТ 26449.1-85, п. 11	485,00
Магний, мг/л	ГОСТ 26449.1-85, п. 12	206,60
Азот аммонийный, мг/л	ГОСТ 26449.1-85, п. 24	2,73
Нитриты, мг/л	СТ РК 1963-2010	0,11
Нитраты, мг/л	СТ РК 7890-3-2006	н.о.
Железо общее, мг/л	СТ РК ИСО 6332-2008 п.7.1	0,64
Кадмий, мг/л	СТ РК ИСО 8288-2005	0,004
Нефтепродукты, мг/л	ПНД Ф 14.1:2:4.128-98	0,01
СПАВ, мг/	СТ РК 1983-2010	0,14
Марганец, мг/л	ГОСТ 4974-2014	0,4
Стронций, мг/л	ГОСТ 23950-88	н.о.
Калий, мг/л	ГОСТ 26449.1-85, п. 18.1	10
Натрий, мг/л	ГОСТ 26449.1-85, п. 17.1	66,25
Альфа-активность, Бк/л	ГОСТ 31864-2012	н.о.
Бета-активность, Бк/л	СТ РК ИСО 9697-2006	0,008
БПК, мгО/л	СТ РК ИСО 5815-2-2010	7,0

Исполнители: _______ подпись Божевальная Н.К. Ф.И.О.
_______ подпись Абенбай А.Е. Ф.И.О.

Директор ИЛ Жайсакова Г.Е.

Протокол распространяется только на пробы, подвергнутые испытаниям
Перепечатка документа частичная или полная запрещена без разрешения лаборатории

Испытательная лаборатория
ТОО РНПИЦ "КАЗЭКОЛОГИЯ"

Аттестат аккредитации № KZ.И.02.0640
от 26.12.2014 г

050010, РК, г. Алматы, ул. Айтеке Би., 27
Тел.: 727-291-06-53, Факс 727-291-72-20
E-mail: office@kazecology.kz

KZ.И.02.0640

Протокол испытания № 105-16/ 191 от 07.06.2016 г

№ заказа:	105-16 от 23.05.16 г
Заказчик и его адрес:	АО "ШалкияЦинк ЛДТ", г.Алматы, проспект Аль-Фараби, 7, Блок 4 А, офис 38
Объект испытания:	Вода
Наименование водопункта:	Горячая вода со столовой в общежитии
Дата отбора проб:	19.05.2016 г
Дата поступления проб:	23.05.2016 г
Дата проведения испытания:	24 - 07.06.2016 г
Вид испытания:	исследование физико-химических параметров воды
НД на продукцию:	СанПиГ № 209 от 16.03.2015 г
Условия проведения испытаний:	температура 23 °С, относительная влажность 50%

Всего стр. 1
стр.1

Наименование показателей, ед. изм.	НД на методы испытаний	Найдено проба № 11
Нефтепродукты, мг/л	ПНД Ф 14.1:2:4.128-98	н.о.

Исполнитель(и:) ________ Абенбай А.Е.
подпись Ф.И.О.

Директор ИЛ ________ Жайсакова Г.Е.

Протокол распространяется только на пробы, подвергнутые испытаниям
Перепечатка документа частичная или полная запрещена без разрешения лаборатории

ANNEX 24. EXPLANATORY NOTE TO PP WATER BALANCE

Explanatory Note to the PP Water Management Balance

Projected water inflows to the Shalkiya Mine site estimated using the hydrogeological analogy method (the Karatau Geological Exploration Team Report, 1994) are as follows:

Wet year: 144 dm^3/s (518 m^3/hour);

Average year: 114 dm^3/s (410 m^3/hour).

As the Shalkiya deposit is localized in an isolated setting limited by tectonic disturbances from all sides, there is risk that projected water outflows will remain the same without any increase.

From March 2003 to date, the mine dewatering pumping has taken place at the +40 m level. In 2004-2005, pumped water flow rates ranged from 122.4 to 172.6 m^3/h. The average annual flow rates were 166.9 m^3/h in 2004, 146.1 m^3/h in 2005, and 133 m^3/h from 2006 to 2015.

To minimize risk, the mine water removal rate in the future should be maintained at the existing level, i.e. 133 m^3/h.

Yu. Pirmakhanov, Chief Geologist

ANNEX 25. STUDY RESULTS FROM THE TAILINGS CHEMISTRY DATA FROM THE KENTAU PP (2003-2005)

Наряд на анализ воды в ЦХЛ
от "12" апреля 2005г.

№ п/п	Место отбора проб	Количество проб по компонентам							
		pH	Fe (мг/л)	CN	KSt	Pb	Cu	Zn	СПАВ
1	Пульпа с зумпфа ПНС-2	9.24	н/о	н/о	н/о	0.19	0.04	0.61	н/о
2	Коллектор	6.88	н/о	н/о	н/о	0.15	0.03	0.44	н/о
3	Биологический прудок № 3	7.70	н/о	н/о	н/о	0.10	0.03	0.38	н/о
4	Пос. Жарбаскан								

Мастер хвостового хозяйства ОФ ____________ Асилбеков У.

15.04.05г лаборант ЦХЛ
Нартаева Нартаева

Наряд на анализ воды в ЦХЛ
от "16" мая 2005г.

№ п/п	Место отбора проб	Количество проб по компонентам							
		pH	Fe (мг/л)	CN	KSt	Pb	Cu	Zn	СПАВ
1	Пульпа с зумпфа ПНС-2	7.52	н/о	н/о	н/о	0.83	0.01	0.19	н/о
2	Коллектор	7.10	н/о	н/о	н/о	0.20	0.01	0.38	н/о
3	Биологический прудок № 3	7.45	н/о	н/о	н/о	0.08	след	0.40	н/о
4	Пос. Жарбаскан								

Мастер хвостового хозяйства ОФ ____________ Асилбеков У.

18.05.05г.
лаборант ЦХЛ Нартаева Нартаева

Наряд на химанализ в ЦХЛ ТОО « Шалкия Цинк ЛТД»
от ОТК от 21.04, см сток ОФ и Баялдырского хвостохранилища

18.04.2008

№ пробы	Объем пробы, л	Концентрация, мг/л							
		Pb	Zn	Cu	Ксантогенат	CN	Fe общее	Взв.в-ва	Сухой остаток
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1	1,5	0,07	0,26	н/о	нет реактив	н/о	н/о	16.2	526
2	1,5	0,13	0,57	н/о	-"-	н/о	н/о	15.5	1224
3	1,5	0,13	0,43	н/о	-"-	н/о	н/о	3.6	1066

№1-из зумпфа насосной хвостового хозяйства - 1,5 литр
№2 - рядом водоприемного колодца №2
№3 – биопрудка № 4 - 1,5 литр.

Инженер-эколог Meirb. Мейрбеков Б.П.
Нач.ОТК Дуйсенова Ж.С.
Зав.ЦХЛ Имангалиева Т.Д.

Наряд на химанализ в ЦХЛ ТОО « Шалкия Цинк ЛТД»
от 28.08, см сток ОФ и Баялдырского хвостохранилища

28.08.2008

№ пробы	Объем пробы, л	Концентрация, мг/л							
		Pb	Zn	Cu	Ксантогенат	CN	Fe общее	Взв.в-ва	Сухой остаток
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1	1,5	0,09	не работает	полярограф	нет реактива	н/о	н/о	217	994
2	1,5	0,09			нет реактива	н/о	н/о	7.2	1392
3	1,5	0,03			нет реактива	н/о	н/о	7.6	1720

№1- из зумпфа насосной хвостового хозяйства (жидкая фаза пульпы) - 1,5 литр

№2 – из водоприемного колодца №2 (сточная вода после механической очистки – отстаивания жидких отходов в хвостохранилище) -1,5 литр

№3 – из биопрудка № 4 (сточная вода после биологической очистки в системе биопрудов – на выпуске очищенных сточных вод в окружающую среду – рельеф местности) - 1,5 литр.

Инженер-эколог
ОФ ТОО «ШалкияЦинкЛТД» — Мейрбеков Б.П.

Зав.ЦХЛ ТОО «ШалкияЦинкЛТД» — Имангалиева Т.Д.

Наряд на химанализ в ЦХЛ ТОО « Шалкия Цинк ЛТД»
от ОТК от 25.04, см сток ОФ и Баялдырского хвастохранилища

24.04.2008

№ пробы	Объем пробы, л	Концентрация, мг/л							
		Pb	Zn	Cu	Ксантогенат	CN	Fe общее	Взв.в-ва	Сухой остаток
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1	1,5	0.09	0.04	н/о	нет реактив	н/о	н/о	16.6	594
2	1,5	0.15	0.13	н/о	-"-	н/о	н/о	4.8	1178
3	1,5	0.21	0.57	н/о	-"-	н/о	н/о	6.0	916

№1-из зумпфа насосной хвостового хозяйства - 1,5 литр
№2 - рядом водоприемного колодца №2
№3 – биопрудка № 4 - 1,5 литр.

Инженер-эколог Мейрбеков Б.П.
Нач.ОТК Дюсенова Ж.С.
Зав.ЦХЛ Имангалиева Т.Д.

Наряд на химанализ в ЦХЛ ТОО « Шалкия Цинк ЛТД»
от исс. лаб. от 07.05.2008 г. сток ОФ и Баялдырского хвостохранилища
06.05.2008 г.

№ пробы	Объем пробы, л	Концентрация, мг/л							
		Pb	Zn	Cu	Ксантогенат	CN	Fe общее	Взв.в-ва	Сухой остаток
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1,2	3	0,06	0,06	Не обнар.	Нет реактива	Не обнар.	Не обнар.	8,0	906
3,4	3	0,05	0,10	Не обнар.	Нет реактива	Не обнар.	Не обнар.	5,2	909
5,6	3	0,035	0,12	Не обнар.	Нет реактива	Не обнар.	Не обнар.	0,8	739

№1,2-из зумпфа насосной хвостового хозяйства - 3 литр
№3,4 - рядом водоприемного колодца №2- 3 литра
№5,6 – биопрудка № 4 - 3 литра .

Инженер-эколог Мейрбеков Б.П.
Зав. исс. лаб. Трофимова В.И.
Зав.ЦХЛ Имангалиева Т.Д.

ANNEX 26. ZHANAKORGAN AKIMAT MINUTES OF MEETING AND AKIMAT REPLY

Minutes of Meeting No. 03-14/1991

Meeting with the Private Land Users with the Deputy Akim of Zhanakorgan District

Date: 03 June 2016
Venue: Zhanakorgan District Akimat
Time: 10-15 a.m.
Participants: the list of participants is attached

The meeting was chaired by G. Sopbekov, Deputy Akim of Zhanakorgan District.

Meeting Agenda:

1. Negotiate and agree on the resettlement/relocation of the private land user (Aidos Collective Farm, represented by N. Toleuov) outside the boundaries of the industrial zone.
2. Negotiate and agree on the resettlement/relocation of the private land user (Ai-Takh LLC, represented by A. Umbetov) outside the boundaries of the industrial zone.
3. Negotiate and agree on the resettlement/relocation of the private land user (Baiterek Collective Farm, represented by M. Myrzakhanov) outside the boundaries of the industrial zone.

Key speaker to present the agenda issues: G. Sopbekov, Deputy Akim of Zhanakorgan District.

It is known that the industrial zone comprising the Sanitary Protection Zones of existing stone crushing plants and the mining allotment of JSC ShalkiyaZinc LTD currently has land parcels owned/used by Aidos Collective Farm (N. Toleuov), Ai-Takh LLC (A. Umbetov), and Baiterek Collective Farm (M. Myrzakhanov).

On 30 April 2016, the field meeting to discuss the planned construction of the processing plant at the Shalkiya Mine site was held under the chairmanship of K. Kusherbayev, Kyzylorda Oblast Akim, and U. Shukeev, Chairman of the Board of JSC FNB Samruk-Kyzyn. One of key issues discussed was ensuring that third-party land users are not affected by industrial activity impacts within the boundaries of the mining allotment held by JSC ShalkiyaZinc LTD.

The following proposals were discussed to encourage the third party land users to vacate their land parcels located within the industrial zone including the Shalkiya Mine mining allotment:

1) Allocate a 50 ha land parcel located in Zhanakorgan District to Aidos Collective Farm (N. Toleuov) outside the industrial zone's area of influence;
2) Allocate a 70 ha land parcel located in Zhanakorgan District to Ai-Takh LLC (A. Umbetov) outside the industrial zone's area of influence;
3) The Baiterek Collective Farm (G. Esenbekova) received a 100 ha land parcel in Jalyima Village in Zhanakorgan District according to the Zhanakorgan District Akimat decision No. 615 of 16 March 2016. The meetings participants therefore agreed that this issue was resolved.

In his speech, **N. Toleuov, Chairman of the Aidos Collective Farm**, said, "If a new relocation site is located in Zhanakorgan district and is similar in size, I have no objections".

A. Umbetov, Director of Ai-Takh LLC, also said that he would have no objections as long as a new site is located in Zhanakorgan District and has a similar size.

After addressing each item of the agenda, the meeting participants have decided as follows:

1. Advise the Zhanakorgan District Land Relations Department as the relevant authority responsible for managing land use issues to consider the allocation of 50 ha of land to Aidos Collective Farm (N. Toleuov) and 70 ha of land to Ai-Takh LLC (A. Umbetov) outside the area of influence of the industrial zone and within the boundaries of Zhanakorgan District.

G. Sopbekov, Deputy Akim of Zhanakorgan District (signature)
G. Baiuzakuly, Acting Head of Land Relations Department (signature)
N. Toleuov, Chairman of Aidos Collective Farm (signature)
A. Umbetov, Director of Ai-Takh LLC (signature)
G. Esenbekova, Chairman of Baiterek Collective Farm (signature)

ҚЫЗЫЛОРДА ОБЛЫСЫНЫҢ ӘКІМДІГІ

ЖАҢАҚОРҒАН АУДАНЫ ӘКІМІНІҢ ОРЫНБАСАРЫ

АКИМАТ КЫЗЫЛОРДИНСКОЙ ОБЛАСТИ

ЗАМЕСТИТЕЛЬ АКИМА ЖАНАКОРГАНСКОГО РАЙОНА

120300, Жаңақорған кенті, М.Көкенов, №37
тел./факс: 8 (72435) 22-4-29,
e-mail: info@jnk.orda.gov.kz

120300, кент Жанакорган, ул.М.Кокенова, №37
тел./факс: 8 (72435) 22-4-29,
e-mail: info@jnk.orda.gov.kz

26.05.2016 № 01-4/1833

«ШалкияЦинк ЛТД» АҚ
Басқарма төрағасының
орынбасары А.С. Шабантаевқа

Сіздің, 2016 жылғы 19 мамырдағы №10-19/434 сұранысыңызға байланысты төмендегіні мәлімдеймін.

Хатта көрсетілген жалпы көлемі 20 гектарды құрайтын кадастр нөмірі – 10-149-140-12-28 ауылшаруашылық мақсатына арналған жер телімі 26.11.2013 жылдан №1 сатып алу келісім шарты негізінде «Ай-Тах» жауапкершілігі шектеулі серіктестігіне табысталған.

Осы уақытқа дейін, аталған жер телімі алынған мақсатта пайдаланылмаған.

Қазіргі таңда «Ай-Тах» ЖШС-нің келісімімен, оның орналасқан жер телімінің орнына, өндіріс алаңдарынан тыс жерден жер телімін бөлу жұмыстары жүргізілуде.

Жоғарыда көрсетілген жұмыстарды 01.08.2016 жылға дейін аяқтау жоспарлануда.

Аудан әкімінің орынбасары **Ғ.Сопбеков**

25 May 2016

To: A. Shabantayev, Deputy Chairman of the Board
JSC ShalkiyaZinc LTD

In response to your information request No. 10-19/434 of 19 May 2016, we would like to provide the following information:

The agricultural land parcel referred to in your request, occupying 20 ha and registered under the cadastral number 10-149-140-12-28 was purchased by Ai-Takh LLC based on the contract No. 1 of 26.11.2013.

Until the present time, this land allotment was not used for the designated purpose.

The allocation of an alternative site to Ai-Takh LLC, to be located outside the industrial site boundaries and replace the existing site subject to the Ai-Takh consent is currently underway.

The process is planned to be finalized by or before 1.08.2016.

G. Sopbekov,
Deputy Akim of Zhanakorgan District

ANNEX 27. ACTION PLAN TO PREVENT UNAUTHORISED ACCESS TO THE JSC SHALKIYAZINC LTD

Approved by:

B.M. Ramazanov, Chairman of the Board, JSC ShalkiyaMine LTD
02.06.2016

Action Plan to Prevent Unauthorised Access to the Shalkiya Mine Site

No.	Action	Responsibility	Structural Unit	Deadline	Documented Evidence of Completion
1	Identify paths used by people and animals to enter the mine site by taking a drive-around inspection along the entire perimeter of the mining allotment and near the mine water pond to ensure that unauthorized access is prevented.	A. Suleev	Economic Security Service jointly with Beibarys Security	04.06.2016	Internal memo
2	Using the Mine site map, identify locations where perimeter trenches will be dug all round the Mine site	A. Suleev M. Rysbayev	Economic Security Service jointly with the Surveying Unit	04.06.2016	Map produced
3.	Produce a cost estimate for establishing the perimeter trench around the Mine site	D. Urazgeldiev	UKS	04.06.2016	Summary cost estimate
4.	Use available mobile plant and equipment to build a trench according to the drawings	A. Vasiliev E. Abiltanov	TVSiK jointly with Motor Transport Unit	Stage 1 – 31.07.2016 Stage 1 – 15.10.2016	Work completion act for each stage
5.	As a preventative measure, establish No Access signs around the perimeter	I. Arzumetov M. Isakov	EHS department	30.06.2006	Work completion act
6.	Inform local authorities (akimats in Shalkiya, Birlik, Kuttykozha and Jalyima) about planned and taken action on ensuring the mine site security	Suleev Arzumetov Shalabayeva	Economic security dept EHS dept Legal dept	11.06.2016 – planned actions 31.07.2016 – completion of	Letters of notification

				Stage 1 15.10.2016 – completion of stage 2	
7	Compile the list of technical and other resources required to ensure the perimeter security	Suleev	Economic Security Service jointly with Beibarys Security	04.06.2016	Agreed list of technical resources
8	Develop the information leaflet (in the state language and international communication language) to raise awareness among local residents about the purpose of the mine water pond and ban on fishing and bathing uses of the pond	Arzumetov Shalabayeva	EHS dept Legal dept	04.06.2016	Information leaflet in two languages
9	Distribute and make the information leaflet available in the public places (shopping centres, banks, post offices, educational facilities etc.) in Shalkiya, Kuttykozha, Birlik and Jalyima	Toksanbayava Ernazarova	ORP	11.06.2016	Photo evidence of leaflets distributed in the public places