



**Preparation of Regional Pre-Investment Studies in the Eastern Sector of the Russian Arctic**

**Mothballing of the Tailings of the Deputatsky Tin Ore Mining and Processing Plant Based on Sound Environmental and Health & Safety Principles**

**Pre-Investment Study**

April 5, 2010

**FINAL REPORT**

**Preparation of Regional Pre-Investment Studies in the Eastern Sector  
of the Russian Arctic**

**Final stage of consulting services provided under Contract  
No. CS-NPA-Arctic-08/2008 dated 20 August, 2008**

**Mothballing of the Tailings of the Deputatsky Tin Ore  
Mining and Processing Plant Based on Sound  
Environmental and Health & Safety Principles**

**Pre-Investment Study**

Project 0090016

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This document has been prepared in accordance with the terms of the Contract concluded with the Client and in conformity with the commonly adopted practice of environmental consulting for the purposes foreseen in the Contract.

The conclusions and recommendations made in this document are based upon information obtained directly by the ERM Eurasia Ltd, as well as information provided by third parties, which we believe to be accurate.

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*SUMMARY*

<b>PROJECT NAME</b>	Mothballing of Tailings of the Deputatsky Tin Ore Mining and Processing Plant Based on Sound Environmental and Health & Safety Principles
<b>PROJECT DEVELOPER AND PROPOSED BENEFICIARY</b>	State organisation “Executive Directorate for Elimination of Consequences of Spring-Time Floods and Organisation of Restoration Work in the Republic of Sakha (Yakutia)”
<b>LOCATION</b>	5 km to the north of the centre of the settlement of Deputatsky, within the Nemkuchen Range, in the Irgichen River basin, approximately 250 km from the Laptev Sea coast.
<b>OBJECTIVES</b>	The main objective of the Project is to ensure mothballing of the tailings of the Deputatsky tin ore mining and processing plant (GOK), partial land remediation and reconstruction of the ash disposal area of the block boiler station and upgrade and maintenance of water diversion tunnels and clean-up of historic industrial pollution sources in the upper reaches of the Deputatka River with subsequent remediation of disturbed lands.
<b>PROJECT CATEGORY</b>	Priority II: Clean-up of past environmental liabilities with actual or significant future major potential to add to Arctic pollution loads. Non-resolution of the issue associated with the Deputatsky GOK tailings storage facility implies high environmental risks and might result in adverse consequences for the whole region.
<b>DESCRIPTION OF THE PROJECT ACTIVITIES</b>	The following measures are proposed (taking into account already initiated engineering surveys and preparation work for the tailings storage facility mothballing project: <ol style="list-style-type: none"> <li>1. Development and approval of a detailed Declaration of Intent on the basis of this Pre-Investment Study;</li> <li>2. Preliminary assessment of scope of work, timing and a detailed stakeholder engagement plan;</li> <li>3. Development and implementation of a monitoring programme for all stages of the Project;</li> </ol>

	<ol style="list-style-type: none"> <li>4. Baseline, engineering geodetic, geological (geotechnical) and environmental surveys;</li> <li>5. Preparation of the Project Design and Detailed Engineering Design, as well as adjustment of the Project Design to the relevant international requirements;</li> <li>6. Preparation of the environmental sections and action plans according to the applicable international format;</li> <li>7. A series of public consultations and hearings;</li> <li>8. Obtaining of required licenses, approvals and permits;</li> <li>9. Supply of required equipment and machinery;</li> <li>10. Preparatory and construction works covering the following aspects: <ul style="list-style-type: none"> <li>○ Tailings pond remediation;</li> <li>○ Remediation of mine workings and waste rock dumps in the upper reaches of the Deputatka River;</li> <li>○ Upgrade and maintenance of the water diversion tunnels;</li> <li>○ Treatment of contaminated wastewater;</li> <li>○ Partial remediation and modernisation of the ash disposal area near the boiler station.</li> </ul> </li> <li>11. Measures for clean-up of the area;</li> <li>12. Development and implementation of a monitoring programme for the period after completion of the planned work;</li> <li>13. Organisation of long-term operation and maintenance of the wastewater treatment facilities.</li> </ol>
<b>TECHNOLOGIES USED</b>	<p>Similar experience in application of advanced technologies for toxic waste disposal under consistent permafrost conditions can be proposed on the basis of innovative developments in the field of highly toxic waste freezing in the Nikolay Chersky Northern Mining Institute under the</p>

	<p>Siberian Division of the Russian Academy of Sciences, in Yakutsk:  <a href="http://www.igds.ysn.ru/page.php?18">http://www.igds.ysn.ru/page.php?18</a>).</p> <p>In accordance with the technical specifications developed the tailings pond mothballing procedure can comprise the following phases:</p> <ul style="list-style-type: none"> <li>• Removal of excess water from the tailings pond through wastewater treatment facilities and a water discharge ditch while backfilling the tailings with a layer of inert rock from waste rock dumps;</li> <li>• Grading and freezing of the ground during winter period;</li> <li>• Formation of an ice shield and laying of thermal insulating materials and hydroinsulating layers of sandy silt soil;</li> <li>• Drilling of geothermal boreholes;</li> <li>• Covering with a fertile topsoil layer;</li> <li>• Remediation, including sowing of grass and planting of shrubs to help protect the former tailings against erosion and create a natural landscape.</li> </ul> <p>Conventional technical and biological remediation techniques can be proposed for <i>in situ</i> remediation of waste rock dumps, including the following:</p> <ul style="list-style-type: none"> <li>• Mixing of acidic rock containing heavy metals in waste rock dumps with carbonaceous rock (de-acidification and lime treatment of waste rock dumps), filling with inert soil and fertile topsoil;</li> <li>• Subsequent bioremediation (sowing of grass and planting of shrubs).</li> </ul> <p>More detailed description of the technologies to be applied for mothballing of the tailings and waste rock dumps, as well as maintenance of the water diversion tunnels can be provided at the stage of the project design and engineering design preparation.</p>
<p><b>PROJECT PREPARATION LEVEL</b></p>	<p>Topographic and geodesic surveys were carried out as required for the project design development for tailings mothballing; the project</p>



	design is being prepared.
<b>PRELIMINARY COST ESTIMATE</b>	12,510,000 Euros
<b>EXPECTED ENVIRONMENTAL AND SOCIAL BENEFITS</b>	<p>Implementation of the Project will ensure mothballing of the tailings storage facility of the Deputatsky GOK, as well as abandoned tin mining operations in the upper reaches of the Deputatka River, which are a significant source of contamination of the Indigirka River basin, and prevention of environmental damage caused by the Indigirka River basin contamination.</p> <p>The target indicators for assessing the project results are:</p> <ul style="list-style-type: none"> <li>• Reduction in the release of chemically contaminated surface waters to the Indigirka River basin, including: <ul style="list-style-type: none"> <li>○ Termination of discharge of contaminated water from the tailings via the siphon outlet;</li> <li>○ Minimisation of release of chemically contaminated surface water from abandoned mining operations in the upper reaches of the Deputatka River to the Indigirka River basin;</li> </ul> </li> <li>• Mothballing of the tailings based on sound environmental and health &amp; safety principles, ensuring thereby: <ul style="list-style-type: none"> <li>○ Land remediation with restoration of favourable conditions for natural vegetation growth and wildlife habitats;</li> <li>○ Possibility for people to visit the area without any limitations.</li> </ul> </li> </ul>

## ***1 INTRODUCTION***

This document has been prepared by ERM Eurasia Ltd. (ERM) in accordance with Contract on Consulting Services No. CS-NPA-Arctic-08/2008 dated 20 August 2008 with the Executive Directorate of the National Pollution Abatement Facility (NPAF) within the framework of the Project “Preparation and Implementation of Regional Pre-Investment Studies in the Eastern Sector of the Russian Arctic”.

This Project is Component 2 of the Project “Russian Federation – Support for National Programme for the Protection of the Arctic Marine Environment” (The NPA-Arctic Project) and is funded by the Global Environment Facility (GEF). The Executing Agency is the Ministry of Economic Development of the Russian Federation.

The main objective of the NPA-Arctic Project is to develop and establish a sustainable framework to reduce environment degradation of the Russian Arctic from land-based activities on a systematic basis by implementation of a Strategic Action Programme (SAP), which is being developed to comply with obligations of the Russian Federation under international conventions and agreements and taking into account decisions and programmes of the Arctic Council.

The ultimate goal of this Project was to prepare pre-investment studies (PINS) on the investment proposals selected by the NPA-Project in the Eastern Sector of the Russian Arctic, i.e. in the Republic of Sakha (Yakutia) and Chukchi (Chukotka) Autonomous Okrug.

## **2 PROJECT DESCRIPTION**

### **2.1 BACKGROUND AND OBJECTIVES OF THE PROJECT**

The Project proposes the mothballing of the Deputatsky tin ore mining and processing plant based on sound environmental and health & safety principles, partial land remediation and reconstruction of the ash disposal area of the block boiler station and upgrade and maintenance of water diversion tunnels and clean-up of historic industrial pollution sources in the upper reaches of the Deputatka River with subsequent remediation of disturbed lands.

The Project has the following objectives and goals:

- Clean-up of current pollution sources and prevention of further pollution of surface waters in the Indigirka River basin;
- Minimisation of risks of washout and destruction of the tailings facility;
- Improvement of the sanitary and epidemiological situation;
- Reduction of adverse impact on biological resources in the Indigirka River basin;
- Bringing the tailings facility into compliance with the Russian and international standards and requirements for remediated tailings facilities.

### **2.2 HISTORY**

Ust-Yansk Ulus (District) of the Republic of Sakha (Yakutia) is the most industrially developed Arctic area of the Republic. A number of major tin ore and alluvial deposits (Deputatskoye, Churpunnya, Tirekhtyakh, Tenkeli, etc.) and gold deposits (Kular and Selennyakh gold fields) were developed in an intensive way during the period from the 1960s until the 1990s. There are tens of facilities associated with the mining sector, including the Deputatsky tin ore mining and processing plant (Deputatsky GOK), Kular gold mill, the mines of Tenkeli, Churpunnya, Tirekhtyakh, etc. Currently, most of the gold and tin mining facilities in the district have been abandoned without taking any closure and land remediation measures. The tailings disposal facilities of the Kular gold mill and the Deputatsky GOK have not been used for over ten years and pose a substantial threat to the environment.

The Deputatskoye tin ore and alluvial deposit is situated within the Yana-Indigirka tungsten and tin area (North Yana ore and alluvial district). It was

discovered in 1947 by geologist G. Kolmakov, member of the Irgichen Geological Party (headed by D. Kats) of the All-Union Arctic Institute.

Due to the high metal concentration and high quality of tin, the Deputatskoye deposit is rated as one of the leading sources of tin in Russia. The commercial tin reserves have been estimated at 255,800 tonnes (33% of the commercial reserves in Yakutia), including the proven reserves of 198,300 tonnes. The ore bodies in the deposit constitute veins and vein-like mineralised zones, the most considerable of which are from 250m to 2100m long with an average thickness of ore bodies varying from 1.2 m to 4.4 m. The ore is mainly of quartz, cassiterite-turmaline-sulphide composition with an average tin content of 1.15%, which is twice as high as the average tin content of tin ore deposits currently being developed in Russia.

Ore production at Deputatskoye was commenced in 1951 by building of three mines, which were integrated in 1954 in one Deputatsky mine under YakutZoloto Association of the USSR Ministry of Nonferrous Metals. In the same year the settlement of Deputatsky was constructed and a power plant put into operation. In 1977, the Deputatsky tin mine was commissioned, including a central ore processing plant (GOK) and a lime kilning plant. In 1990 a joint stock company DeputatskOlovo was established (since 2000 SakhaOlovo LLC).

Over the past years, the local ore production has been decreasing. In 1997, Zapadny, the main mine was closed. In comparison with the annual mining production level of 1986 (6,000 tonnes of tin), the production dropped in 2008 down to 186 tonnes produced at the Churpunnya ore mine and the Tirekhyakh alluvial mine.

The mining and ore processing technologies foreseen in the design were based on a high degree of ore dilution and low tin recovery from ore. Due to this reason, the operation of the facility has been considered unprofitable.

No land remediation of the mining areas was carried out.

### **2.3 DESCRIPTION OF THE FACILITY. TECHNICAL AND TECHNOLOGICAL CHARACTERISATION. SITE LOCATION**

The Deputatsky GOK and the tailings storage facility are located at a distance of 5 km to the north of the settlement of Deputatsky, within the outlines of the Nemkuchensky Mountain Range, Polousny Upland, in the Irgichen River basin (the basin of Indigirka River – East-Siberian Sea), approximately 250 km from the Laptev Sea coast.

The location of the site is shown in Figure 1.1.

The tailings storage facility of the Deputatsky GOK was put into operation in 1983. Its total area is 340,000 m<sup>3</sup>. The facility is located within the old riverbed

of the Deputatka River with a pilot dam consisting of thawed rock with a sandy silt core and toe wall. The dam body was built of local thawed alluvial soil. The structure has a pilot dam and an upstream dam, two water diversion tunnels 1300m long for diversion of the Deputatka River stream, a drainage station for recycled water (currently out of operation) and a siphon-type water discharge with a throughput rate of 600 m<sup>3</sup>/hour.

There is also a system for hydraulic transport of tailings slurry to the tailings pond; the system comprises a trunk slurry pipeline and distribution pipeline network. Tailings were pumped to the tailings pond via three trunk pipelines made of steel tubes installed on steel piles. The tailings slurry distribution pipeline network is installed over the crest of the pilot plant with outlets at 10m intervals with shutoff gate valves. Since 1997, the hydraulic transport system has been mothballed and no tailings have been discharged to the tailings pond since that time.

**The pilot dam** was designed for creating a tailings pond. It is of thawed soil type consisting of a sandy silt core and toe wall. The dam body is constructed of local thawed alluvial gravelly soil containing 31% of pebbles, 20% of gravel and 49% of sandy silt. The dam crest is at an elevation of 329.50 m; the core top has an elevation of 325.50m. The maximum dam height is 13.5 m; the dam is 945 m long; the crest width is 12 m. The slope of the dam back is 1:2.5 and the slope of the downstream side is 1:2.0.

**The upstream dam** is designed for diversion of the Deputatka River. The dam consists of thawed soil with a sandy silt core and toe wall. The dam body is constructed of local thawed alluvial gravelly soil containing 31% of pebbles, 20% of gravel and 49% of sandy silt. The dam crest is at an elevation of 348.00 m; the core top has an elevation of 343.50m. The maximum dam height is 15 m; the dam is 1275 m long; the crest width is 10 m. The slope of the dam back is 1:2.5 and the slope of the downstream side is 1:2.0.

The base of the dams is composed of pebble and gravel soils with sand, boulders and sand layers more than 12 m thick underlain by unconsolidated rock (sandstones) with interbeds of marl.

Both dams are classified as dams of Class IV.

**Two water diversion tunnels** were designed for diversion of the Deputatka River and sanitary wastewater discharge via a pipeline laid along the upper part of the upstream dam to the Irgichen River. The cross-sectional area of each tunnel is  $S = 16 \text{ m}^2$  and the length is 1340 m. The maximum water level in front of the inlet portals of the tunnels at the back of the upstream dam in case of the design flow rate is at an elevation of 343.00 m. The upstream dam crest elevation is 348.00 m.

**The riverbed diversion canal** is designed for diversion of the Poiskovy Stream and for collection and diversion of flood water from the catchment

area of the water reservoir afterbay. The canal was constructed within the natural ground with wall slopes reinforced with large-size detrital material.

**The drainage ditch** is located in the afterbay of the pilot dam and is designed for reception of seepage water from the dam and its diversion to the riverbed diversion canal.

**The water recycling pump station** is located at the afterbay of the pilot dam. It is equipped with four pumps (two operating pumps and two stand-by pumps). The pump station is designed for recycling of clarified water to the ore processing plant. It comprises four water discharge wells, a water discharge sewer line and recycled water pipeline (two runs). Water collection wells are of shaft-type 10m high and are made of monolithic reinforced concrete with water discharge openings. The water collection pipeline for clarified water is made of steel tubes with a diameter of 530mm and 10 mm wall thickness. Currently, the pump station is used for discharge of flood water from the tailings pond.

**The siphon-type water discharge facility** is designed for discharge of flash flood and storm water. Its throughput capacity is 600 m<sup>3</sup> per hour; pipe diameter is 530 mm.

The layout of the tailings storage facility and the surrounding facilities is shown in Figure 1.2.

#### **2.4** *HYDROGEOLOGICAL, ENGINEERING GEOLOGICAL AND SEISMIC CONDITIONS OF THE AREA*

The geological structure of the area consists of Jurassic marine sedimentary rocks and unconsolidated Quaternary deposits of various geneses. The Jurassic deposits are represented by interbedding sandstones, siltstones and clay shale. The rocks are generally oriented in latitudinal direction and form major and minor folds. The rocks are significantly metamorphosed as a result of thermal contact metamorphosis processes. Quaternary deposits occur extensively; in relation to their genesis they are divided into alluvial, deluvial-alluvial, lacustrine-alluvial and delluvial-solifluxion deposits.

The area is located within the massive permafrost zone. The depth of the tailings pond freezing varies from 1m to 1.8m (as of May 1991). No data relating to any engineering surveys is available.

The seismicity of the region is 7 on the international MSK scale.

There is no hydrometric monitoring network to monitor the hydrologic and seepage conditions in the surrounding areas.

There are no data available in relation to physical and mechanical properties of the material composing the dam bodies and dam bases.

## 2.5 OVERVIEW OF THE RISK ASSESSMENT AND ACCIDENT RISK PROBABILITY

According to the accident and emergency risk assessment data contained in the Safety Declaration of the tailings storage facility of the Deputatsky GOK (2004) and a Safety Passport of the tailings storage facility of the Deputatsky GOK (2007), a hydrodynamic accident at the facility can potentially occur as a result of the following events:

- deformation of the pilot dam walls, and
- overfilling of the tailing pond.

An accident can be caused also by rupture of the pipeline laid inside the pilot dam body.

An emergency response plan should have been developed. But according to the available information, no such plan had been elaborated for the tailings facility.

The level of risk of a hydrodynamic accident at the tailings facility was assessed in the Declaration of Industrial Safety as follows:

- For the pilot dam as **low** with a safety level rated as **normal**;
- For the siphon water discharge facility as **low** with a safety level rated as **normal**.

In case of the most probable accident the dam will fail with formation of an opening with a maximum width of 22 m in the area, where the water discharge sewer line is laid. Despite the fact that the sewer line is currently plugged and decommissioned, it is not ruled out that concentrated water seepage would occur with release of 270 m<sup>3</sup> of the earth material from the dam body and 680 m<sup>3</sup> of contaminated water. The flooded area in this case will be insignificant because the bulk of released water will flow to the old riverbed of the Deputatka River. Certain damage would be inflicted to the environment and biological resources of the Irgichen River.

The most severe accident can potentially take place in case of the pilot dam washout as a result of water overflow over the dam crest.

For a scenario of the most probable accident, which will not result in a hydrodynamic accident, an emergency situation is considered to be an **unlikely** event in relation to the frequency of occurrence.

For a scenario of the most severe accident, which will result in a hydrodynamic accident, an emergency situation is considered to be a **unique** event in relation to the frequency of occurrence with a potential humanitarian damage assessed as **insignificant**.

In general, the risk level of an hydrodynamic accident at the tailings facility is assessed as **low** and the risk as **negligible**. The Industrial Safety Declaration states that there is no need for any additional risk mitigation measures.

At the same time, the risk of failure of the water diversion tunnels had not been analyzed in the Industrial Safety Declaration. The current condition of the pilot dam and the water diversion tunnels following ERM's inspection in June 2009 is described in Section 2.9 below.

According to the SanPiN Standard 2.2.1/2.1.1200-03 "Sanitary Protection Zones and Sanitary Classification of Industrial Enterprises, Installations and Facilities", a tailings storage facility is categorised as a sludge disposal facility associated with mining production of nonferrous metals. The width of a regulatory sanitary protection zone (SPZ) for such facilities is 500 m. A hazardous zone (an area that can be potentially affected by flooding) in case of the most dangerous scenario of emergency situations is 20m to 50m wide and approximately 3.5 km long.

There are no commercially significant facilities, lands of specific value or protected nature areas within the SPZ and the potential flooded zone.

## ***2.6 PRIORITY CATEGORY FOR THE NPA-ARCTIC PROJECT***

Priority II: Clean-up of past environmental liabilities with actual or significant future major potential to add to Arctic pollution loads.

Non-resolution of the issue associated with the Deputatsky GOK tailings storage facility implies high environmental risks and might result in adverse consequences for the whole region.

## ***2.7 APPLICABLE NATIONAL AND INTERNATIONAL REGULATIONS AND STANDARDS***

### ***2.7.1 Applicable Russian Legislation***

The proposed activities for the mothballing of the tailings storage facility of the Deputatsky GOK are subject to the following Russian laws, regulatory acts and standards:

- Federal Law No.7-FZ dated 10.01.2002 "On Environmental Protection" (enacted by the State Duma on 20.12.2001);
- Federal Law No.52-FZ dated 30.03.1999 "On Sanitary and Epidemiological Welfare of Population" (enacted by the State Duma on 17.03.1999);
- Federal Law No.68-FZ dated 21.12.1994 (as amended on 30.10.2007) "On Protection of Population and Territories against Emergencies of Natural and Man-made Origin" (enacted by the State Duma on 11.11.1994);



- Federal Law No.117-FZ dated 21.07.1997 (as amended on 14.07.2008) “On Safety of Hydraulic Engineering Facilities” (enacted by the State Duma on 23.06.1997);
- Regulation on Composition of Sections of Project Design Documentation and Requirements to Their Contents (Approved by the Russian Government Decree No. 87 dated 16.02.2008);
- Decree No.33 dated 02.06.1999 by the Federal Mining and Industrial Inspection Agency “On Approval of the Instruction on Procedures for Closure and Mothballing of Hazardous Industrial Facilities Associated with Use of Subsoil Resources”;
- Government Decree No.876 dated 18.12.2001 “On Approval of the Rules for Estimating Required Financial Security for Civil Liability for Damage Caused by Accidents at Hydraulic Engineering Facilities”;
- Government Decree No.490 dated 23.05.1998 (as amended on 18.04.2005) “On Procedure for Establishment and Keeping the National Register of Hydraulic Engineering Facilities”;
- Safety Rules for Hydraulic Engineering Facilities Designed for Accumulation of Liquid Industrial Waste (PB 03-438-02);
- Safety Rules for Operation of Tailings, Sludge and Hydraulic Waste Disposal (PB 06-123-96);
- Methodological guidelines for organisation of supervision over operational safety of hydraulic engineering structures at enterprises and facilities subject to supervision by the Russian Gosgortekhnadzor Agency (RD 03-141-97);
- Instruction on the procedure for monitoring of safety of hydraulic engineering facilities of enterprises and organisations subject to supervision by the Russian Gosgortekhnadzor Agency (RD 03-259-98);
- Guidelines for development of a design for monitoring of safety of hydraulic engineering facilities subject to supervision by the Russian Gosgortekhnadzor Agency (RD 03-417-01);
- Guidelines for risk analysis of hazardous industrial facilities (RD 03-418-01);
- Instruction on the procedure for assessment of safety criteria and status of hydraulic engineering facilities for accumulation of liquid industrial waste and subject to supervision by the Russian Gosgortekhnadzor Agency (RD 03-443-02);
- Procedure for estimation of damage potentially inflicted to life and health of individuals, property and legal entities as a result of accidents at a hydraulic engineering facility (RD 03-521-02);

- Recommendations for calculation of the process of occurrence of hydrodynamic accidents at liquid industrial waste accumulation facilities (RD 03-607-03);
- Procedure for estimation of the damage potentially inflicted to life and health of individuals, property and legal entities as a result of accidents at a hydraulic engineering facility (RD 03-626-03);
- Procedure for calculation of flooding zones in case of hydrodynamic accidents in industrial waste storage areas of chemical plants (RD 09-391-00);
- Instruction on issuance by the Federal Service for Supervision of Environment, Technology and Nuclear Management (Rostekhnadzor) of permits for operation of hydraulic engineering structures at industrial and energy facilities (RD-12-01-2004);
- Instruction on the procedure for registration by the Federal Service for Supervision of Environment, Technology and Nuclear Management of hydraulic engineering structures at industrial and energy facilities in the sectoral division of the National Register of Hydraulic Engineering Facilities (RD-12-02-2004);
- Decree No.105 dated 28.02.2003 by the Emergency Situations Ministry “On Approval of Requirements for Emergency Prevention at Potentially Hazardous Facilities and Life Support Systems” (Registered by RF Ministry of Justice, No.4291 dated 20.03.2003);
- Instruction on keeping the National Register of hydraulic engineering facilities (approved by the Ministry of Natural Resources, No.144; Ministry of Fuel and Energy, No.K-3357; Ministry of Transport, No.K-14/367-is; Gosgortekhnadzor No.01/229a of 12.07.1999) (Registered by Ministry of Justice, No.1858 dated 05.08.1999);
- Provisional guidelines for estimating the damage potentially possible as a result of an accident at a hydraulic engineering facility (RD 153-34.0-002-01);
- Provisional guidelines for estimation of prevented environmental damage, approved by the State Committee for Environment Protection on 09.03.1999;
- Guidelines for estimation of the environmental impact of hydraulic engineering facilities (RD 153-34.2-02.409-2003)
- Procedure for determination of safety criteria of hydraulic engineering facilities (RD 153-34.2-21.342-00);
- Instruction for Planning, Construction and Operation of Hydraulic Engineering Facilities in Areas Affected by Underground Mining Operations (SN 522-79);
- Determination of main calculated hydrologic characteristics (SP 33-101-2003);

- Hydraulic Engineering Facilities. Basic Provisions (Construction Norms and Rules SNIIP 33-01-2003).

### *2.7.2 Applicable International Requirements and Standards*

- Guide for Management of Tailings Facilities, The Mining Association of Canada, 1998
- Developing and Operations, Maintenance and Surveillance Manual for Tailings and Water Management Facilities, The Mining Association of Canada, 2003.

## *2.8 ANALYSIS OF ALTERNATIVES TO THE PROJECT*

### Zero Alternative

If the current situation continues, the tailings storage facility and abandoned tin mining areas in the vicinity of the settlement of Deputatsky will continue to exist as a source of persistent pollution of the Indigirka River basin with heavy metals. A certain level of risk of potential emergency situation at the tailings storage facility will also continue to exist including potential impacts to the Indigirka River basin.

### Resumption of operations

It has been declared by the Government of the Republic of Sakha (Yakutia) that the operation of the Deputatsky GOK will be resumed. Kola Mining, a Canadian mining company has plans to install a tailing processing facility at the Deputatsky GOK tailings. In July 2009, the company commissioned sample collection from the tailings to verify commercial tin grades. The analysis showed high tin grade in the Deputatsky tailings with ore content of 0.5%. Currently, the company is the process of developing the design for tailings processing at Deputatsky.

In the longer run, the company is planning to resume mining operations at Deputatsky and is currently on the lookout for potential investors and partners.

In case of resumption of mining operations, a new tailings storage facility will be required and measures for mothballing of the existing tailings facility needed to ensure compliance with all regulatory requirements for construction of tailings facilities involved in usage of subsoil resources as well as with all environmental regulations.

Tin mining in areas located in the upper reaches of the Deputatka River should be carried out in compliance with the applicable environmental requirements.

## 2.9 CURRENT STATUS OF THE FACILITY

Currently, the tailings storage facility is filled with tailings to 90% of its capacity. It is estimated that, with tailings generation of 120,000 tonnes annually, the remaining free storage of the facility will be sufficient for maximum two years of operation.

The tailings pond is filled during a year by snow-melt water, flood water and water drained from the ash disposal area of the local block boiler station. According to the data provided by the Ust-Yansk Environment Protection Inspection Agency, the volume of snow melt water and flood water is estimated at up to 300,000 m<sup>3</sup> per year. The volume of water released from the boiler station facilities during heating season amounts to 600,000 m<sup>3</sup>.

The area adjoining the tailings from the south, directly at the wastewater outlet from the boiler station is covered with coal ash. There are no wastewater treatment facilities at the boiler station.

According to a statement by the Republican Environmental Monitoring Centre, although the wastewater drained from the ash disposal area does not have any significant impact on the hydrochemical composition of the water released from the tailings facility, it causes significant rise in water level in the tailings pond.

The annual water discharge from the tailings via the siphon outlet is as high as 800,000 m<sup>3</sup>. Water is released to the Poiskovy Stream and then to the Irgichen River, which is a fishery watercourse of Category I. There are no protected nature areas within the zone impacted by the tailings storage facility.

Since there is no approved document specifying the permissible discharge norms, the actual release of pollutants from the tailings exceeds dramatically the proposed discharge level specified in the draft document establishing the discharge norms. There are no plans in place for construction of any wastewater treatment facilities for contaminated wastewater released from the tailings and it is not clear, therefore, how it is planned to reduce the actual pollutants concentrations in wastewater discharged from the tailings to the surface water bodies.

There is a water recycling system at the tailings storage facility. As a result of a fire at the power plant in February 2001, that caused freezing of the heating network of the settlement, the water recycling system was put out of order and the pipes were cut off. Currently, the water recycling system has been mothballed and was observed to be beyond repair.

During the reconnaissance visit, both entrances to the existing water diversion tunnels were examined. It was discovered that only the tunnel mouths had been cemented, with water flowing along the entire length of the tunnels along the bare rock surface. The tunnel ceiling is lined with a steel wire mesh,

which in some places is sagging under the weight of fallen rock fragments. According to the Ust-Yansk Environment Protection Inspection Agency, the tunnels have not been inspected and repaired for the past fifteen years. According to SakhaOlovo, the current condition of the tunnels causes concern due to the potential risk of failure and subsequent return of the Deputatka River to its original riverbed, resulting in the washout of the upstream dam and failure of the pilot dam.

The risk of failure of the water diversion tunnels had not been analyzed in the Declaration and Passport of Safety of the Deputatsky GOK's tailings storage facility.

In 2008, staff members of the Ust-Yansk Environment Protection Inspection Agency reported that the Poiskovy Stream had diverged from its stream bed (along the road located on the pilot dam) into the rock mass under the road. Several months later it was reported that the stream emerged again on the surface. During the reconnaissance visit, it was found that a road section of about 110 m long subsided for approximately 1 m where there is an ice lens under the road. The subsided ground area is situated at a distance of 100m from the tailings pond edge. No geological survey has been carried out in this area and no further details are available. In the early June 2009, a large-scale subsidence of the road was reported with formation of a number of deep ruptures preventing the traffic of vehicles. If no adequate measures will be taken, this incident can be qualified as a precursor of an emergency situation at the tailings storage facility.

Some industrial pollution sources (abandoned tin mining areas, including the Zapadny mine) are located at a distance of 3km to 5 km upstream of the settlement of Deputatsky on the Yastreb, Bezymyanny and Burevestnik streams, the tributaries of the Deputatka River, which is in turn a tributary of the Irgichen River.

The Burevestnik Stream runs across an area disturbed by overburden stripping operation and not properly remediated. The water in the stream is of brownish red colour. The water in the surface water bodies left over in the area of abandoned mining operations is also of red color. According to the Ust-Yansk Environment Protection Inspection Agency, the water quality in the Yastreb and Burevestnik streams upstream of the mine complies with the drinking water standards.

Despite regular visits and sampling conducted by the inspectors of the Ust-Yansk Environment Protection Inspection Agency and the staff of the Republican Environmental Monitoring Centre, no specific measures are planned within the framework of any regional environmental action programmes in order to address the issue of the existing pollution sources contaminating the Deputatka and Irgichen rivers. The issue of historic industrial pollution sources in the upper reaches of the Deputatka River has

not been addressed by the Design Project currently being developed for the mothballing of the Deputatsky GOK.

## **2.10 PROJECT PREPARATION LEVEL**

Some measures to ensure safety of the tailings storage facility at the Deputatsky GOK and prepare it for mothballing have been included in the regional target programmes “Environment Action Programme of the Republic of Sakha (Yakutia) for 2003-2006” and “Environment Action Programme of the Republic of Sakha (Yakutia) for 2007-2011”, as well as in the overall action plan of the Republican Environmental Protection Ministry for ensuring environmental safety of tailings ponds and wastewater settling ponds at industrial operations during the period of 2007-2011.

In 2008, some maintenance and preventive anti-flood measures and urgent repair work, as well as topographic and geodesic survey related to the development of the Project Design for mothballing of the tailings storage facility were conducted within the framework of the Sub-Programme “Mothballing of Tailings Storage Facilities” as an integral part of the Regional Target Programme “Environment Action Programme of the Republic of Sakha (Yakutia) for 2007-2011”. For 2009 it is planned to carry out engineering survey within the framework of the tailings storage facility mothballing project. The Project Design is being developed by Sprint LLC, who plans to complete the design development by the end of 2009.

There is a draft document in place specifying the maximum permissible release of pollutants and microorganisms from the tailings of the Deputatsky GOK to the Irgichen River (NDS document). This document was developed in 2009 by the Centre for Laboratory Analyses and Technical Measurements (CLATI) for the Republic of Sakha (Yakutia). Currently, this document has been approved only by the Yakutian Department of Hydrometeorology and Environmental Monitoring. At present, the NDS document has been submitted for approval to other relevant supervisory agencies. The required Permit for use of a water body entitling the holder to discharge wastewater to a water body has not been yet obtained. Given the threat of overflowing of the tailings, a decision to release water from the tailings pond via the siphon outlet is normally taken by the flood control commission headed by the head of the district administration.

## **2.11 PROPOSED MEASURES**

It is considered reasonable, in the process of the tailings storage facility mothballing planning, to plan for the mothballing of the overburden operations near the Zapadny mine in order to reduce the pollution load onto the Deputatka and Irgichen rivers and elaborate measures for prevention of release of wastewater from the ash disposal facility of the boiler station to the

tailings pond and appropriate upgrade of the ash disposal area. Measures on upgrading and maintenance of the water diversion tunnels should be developed within the framework of the tailings storage facility mothballing design project.

This Project proposes the following measures (taking into engineering surveys account already initiated and preparation work for the tailings storage facility mothballing):

1. Development and approval of a detailed Declaration of Intent on the basis of this Pre-Investment Study;
2. Preliminary assessment of scope of work, timing and a detailed stakeholder engagement plan;
3. Development and implementation of a monitoring programme for all stages of the Project;
4. Baseline, engineering geodetic, geological (geotechnical) and environmental surveys;
5. Preparation of the Project Design and Detailed Engineering Design, as well as adjustment of the Project Design to the relevant international requirements;
6. Preparation of the environmental sections and action plans according to the applicable international format;
7. A series of public consultations and hearings;
8. Obtaining of required licenses, approvals and permits;
9. Supply of required equipment and machinery;
10. Preparatory and construction works covering the following aspects:
  - Tailings pond remediation;
  - Remediation of mine workings and waste rock dumps in the upper reaches of the Deputatka River;
  - Upgrade and maintenance of the water diversion tunnels;
  - Treatment of contaminated wastewater;
  - Partial remediation and modernisation of the ash disposal area near the boiler station.
11. Measures for clean-up of the area;
12. Development and implementation of a monitoring programme for the period after completion of the planned work;
13. Organisation of long-term operation and maintenance of the wastewater treatment facilities.

## 2.12 TECHNOLOGIES APPLIED

Similar experience in application of advanced technologies for toxic waste disposal under consistent permafrost conditions can be proposed on the basis of innovative developments in the field of highly toxic waste freezing in the Nikolay Chersky Northern Mining Institute under the Siberian Division of the Russian Academy of Sciences, in Yakutsk: (<http://www.igds.ysn.ru/page.php?18>).

The tailings mothballing process can comprise the following phases:

- Removal of excess water from the tailings pond through wastewater treatment facilities and a water discharge ditch while backfilling the tailings with a layer of inert rock from waste rock dumps;
- Grading and freezing of the ground during winter period;
- Formation of an ice shield and laying of thermal insulating materials and hydroinsulating layers of sandy silt soil;
- Drilling of geothermal boreholes;
- Covering with a fertile topsoil layer;
- Remediation, including sowing of grass and planting of shrubs to help protect the former tailings against erosion and create a natural landscape.

Conventional technical and biological remediation techniques can be proposed for *in situ* remediation of waste rock dumps, including the following:

- Mixing of acidic rock containing heavy metals in waste rock dumps with carbonaceous rock (de-acidification and lime treatment of waste rock dumps), filling with inert soil and fertile topsoil;
- Subsequent bioremediation (sowing of grass and planting of shrubs).

More detailed description of the technologies to be applied for mothballing of the tailings and waste rock dumps, as well as maintenance of the water diversion tunnels can be provided at the stage of the project design and engineering design preparation.

## 2.13 REQUIRED SUPPLIES AND MATERIALS

The existing waste rock dumps and sandy silt material from quarries will be used for mothballing of the tailings. The amount of earth material required for filling the tailings and grading of the area will be determined during the project design development phase.



#### **2.14** *LABOUR REQUIREMENT*

It is expected that about 80 persons will be employed for the works related to the mothballing and clean-up of the area. It will be possible to employ local residents that will have a positive impact on the local employment situation.

#### **2.15** *REQUIRED WATER RESOURCES*

The limits for consumption of process water will be determined according to a legally prescribed procedure.

#### **2.16** *ELECTRIC POWER REQUIREMENT*

Electricity will be supplied using independent power supply sources with installed power of up to 100 kW.

#### **2.17** *REQUIRED LAND RESOURCES*

Earthmoving operations will be carried out within the boundaries of the land allocated for the tailings storage facility, mine workings and waste rock dumps, ash disposal area and water diversion tunnels.

The total area of the Deputatsky GOK tailings is 340,000 m<sup>2</sup>. Required land plots for execution of the planned work will be allocated in accordance with the current procedures.

Land required for earthmoving operations will be allocated on a temporary basis in accordance with the prescribed procedure.

Fertile soil will be required for land remediation. The required amounts and sources will be determined during the project design development phase.

#### **2.18** *TRANSPORTATION*

The main type of transport will be trucks and special earthmoving machinery. There is a network of gravel and winter roads in the area for all-year traffic of off-road and heavy vehicles.

#### **2.19** *ACCOMMODATION, SOCIAL AND GENERAL FACILITIES FOR PERSONNEL*

The involved personnel will be accommodated in an existing accommodation camp and in residential buildings in the settlement of Deputatsky.

## **2.20 WASTEWATER MANAGEMENT**

It is assumed that modular wastewater treatment facilities of ERSh type or similar equipment will be used:

(<http://www.inecs.org/content/production/sosv/bmos/index.phtml>).

## **2.21 WASTE MANAGEMENT**

Waste generated during construction will be disposed of to the existing landfill in the settlement of Deputatsky. Detailed elaboration of waste management procedures will be performed in the process of the Project design development.

### **3 ENVIRONMENTAL AND SOCIAL ASPECTS OF PROJECT IMPLEMENTATION**

#### **3.1 BASELINE ENVIRONMENTAL AND SOCIAL CONDITIONS IN THE AREA OF PROJECT IMPLEMENTATION**

##### **3.1.1 Environmental and Geographical Characteristics of the Area**

The area is located within the tundra and boreal forest low and high mountainous systems of the Chersky and Polousny ridges, at the foot of the Nemkuchen range, in the valley of the Oyun-Unguokhtakh River, a tributary of the Irgichen River.

The climate, soils, vegetative cover and other elements of the natural environment in the Chersky ridge area are rather similar in many respects to those of the Yana-Indigirka upland. Winter is long, severe, with frequent blizzards and strong winds. As a result of typical extensive inversions, winter ambient air temperature in the mountains is significantly higher than in the valleys. On the mountain range top the average monthly temperature in January is  $-36^{\circ}\text{C}$  to  $-38^{\circ}\text{C}$ , while in the valleys it is as low as  $-46^{\circ}\text{C}$  to  $-49^{\circ}\text{C}$ . Summer in the mountains is short and cold; there are no periods without ambient air temperature dropping below the freezing point or such periods are very short. In the valleys summer is relatively warm.

The coldest month is January with an average monthly air temperature of  $-46^{\circ}\text{C}$ . The absolute minimum air temperature recorded in January is  $-62^{\circ}\text{C}$ . The absolute maximum air temperature of  $+35^{\circ}\text{C}$  was recorded in August, but the warmest month is July with the average monthly temperature of  $+11^{\circ}\text{C}$ . The average annual air temperature is  $-14^{\circ}\text{C}$ . The average annual precipitation is up to 250 mm. The prevailing wind direction throughout a year is westerly and north-westerly; during the warm period of a year north-easterly winds prevail. The average annual wind velocity in the area is 2 m/s; the maximum wind velocity is 18 m/s and is reported in March and April.

The main watercourse in the area is the Irgichen River rising on the southern slopes of the Poluosny ridge. There is also a large number of minor watercourses and tributaries such as Oyun-Unguokhtakh, Deputatka, Kuranakh and other rivers. With respect to the hydrologic conditions, typical are the following features: high water level in summer and low water level in winter, a long period of river freezing, freezing of many rivers down to the bottom, and extensive occurrence of flood icing. The highest river discharge is recorded during the flash floods in summer/autumn period.

From the orographic viewpoint, the area constitutes a tundra middle land with well defined water divides and deep narrow valleys. Prevailing are open larch

forests. In the faunistic respect, the area is rather similar to the Yana-Indigirka upland.

### **3.1.2 Socioeconomic Characteristics of the Area**

Ust-Yansk Ulus (District) was established on May 5, 1967 and is the most industrially developed area in the Arctic part of the Republic of Sakha (Yakutia).

The area of the district is 120,300 square km. The permanent population is 8,503 people as of 01.01.2009, including 4,756 residents living in urban areas and 3,747 residents in rural areas. The density of population is 0.07 per 1 km<sup>2</sup>.

There are ten settlements in the district, including the settlements of Deputatsky (with a population of circa 3,000), Kazachye, Ust-Yansk, Tumat, Khaiyr, Syiylyk, Yukagir, and Uyandino.

All these settlements accommodate, on the permanent and temporary basis, the indigenous ethnic population, mainly Evens, involved in traditional use of natural resources, including reindeer husbandry, fishing, and fur hunting. A significant portion of the land resources is classified as agricultural land and is used as reindeer pastures. There are extensive areas of traditional lands.

The average life expectancy of the population in 2008 was 53 years. The average life expectancy of women exceeded that of men. In the death rate structure, there is a high percentage of men dying in an economically active age (as a result of alcoholism or accidents). In 2008, 117 persons died, including 73 men and 29 women.

In the morbidity structure in the district, in 2008 prevailing were diseases of blood-vascular system (16.1%), breathing diseases (15.6%) and digestive system diseases (11.2%). An overall trend toward an increase in morbidity rates is reported.

A characteristic feature of the demographic situation in the district during the past decade has been an annual decrease in the population as a result of out-migration from the district due to decommissioning of the Deputatsky GOK, which is the largest industrial enterprise in the district. As a result of the closure of a number of alluvial and ore mining operations a number of settlements located within the territory of the ulus (Kular, Severny, Vlasovo, Entuziastov, Tenkeli, etc.) were abandoned. Among the closed industrial enterprises are the Deputatsky GOK (SakhaOlovo LLC), KularZoloto, etc. SakhaOlovo stopped operations in mid 2009 and sacked personnel. As a result of the closure of the leading industrial enterprises, the economic situation in the district, which was based on the mining sector, is currently extremely difficult. The unemployment is growing at a high rate, especially among young people, the level of habitual alcoholism is high; youth crime is on the rise.

The settlement of Deputatsky was established in 1954. Since 1958 it has had a status of an industrial community. Its population is approximately 3,000 (2009).

The main occupation of the population is fishing. There is a fish processing cooperative. There are some administrative, logistics and transport organisations in the settlement, organisations in the housing and utilities supply sector, departments of the Ministry of Interior, Federal Security Service and the Ministry of Defense, as well as retail trading and catering firms. There is a local airport with three to four regular flights by Yakutia and Polar Airlines. It is planned to commission a thermal mini-power plant in 2009.

The length of motor roads in the district is 1,654.9 km, including 748.9 km of roads of regional significance (of which 224.3 km with hard paving) and 906.0 km of roads of municipal significance, of which 83 km of roads in settlements. There are the following infrastructure facilities available in the area:

- A network of permanent and winter roads, including an all-year road between Ust-Kuiga and Deputatsky;
- Diesel power plant of 26,250 kW capacity (owned by OAO SakhaEnergo) and a 35-kV power transmission line;
- Deputatsky Airport.

### **3.2** *CURRENT ENVIRONMENTAL AND SOCIAL IMPACTS ASSOCIATED WITH THE FACILITY*

According to the results of the studies conducted by the Republican Environmental Monitoring Centre in July to September 2008, extremely high level of contamination with heavy metals was revealed in the water samples collected in the local water bodies. This contamination is attributed to washout from abandoned mining operations. The reported concentrations exceeded the respective regulatory maximum permissible levels (MPC) by the following factors:

- in the Burevestnik Stream (downstream of the tin mining workings): zinc up to 4,100 MPC, copper up to 300 MPC, manganese up to 800 MPC, iron up to 4,000 MPC;
- In the Yastreb Stream (downstream of the tin mining workings): zinc up to 2,000 MPC, copper up to 7,800 MPC, manganese up to 8,000 MPC, iron up to 80 MPC.

In the course of regular studies of the water quality in the Irgichen River downstream of the Deputatka River mouth, consistent non-compliance with the maximum permissible concentrations of heavy metals was recorded: zinc up to 600 MPC, copper up to 500 MPC, manganese up to 400 MPC.

### **3.3 ENVIRONMENTAL AND/OR SOCIAL ISSUES TO BE ADDRESSED BY THE PROJECT**

The Project will address the following potential significant environmental and social issues:

- 1 Adverse environmental impacts associated with the tailings and waste rock dumps, persistent soil and surface water contamination with heavy metals;
- 2 Unsafe condition of the tailings storage facility and risk of hydrodynamic accidents;
- 3 Unfavourable psycho-emotional situation in connection with a potential accident at the tailings storage facility;
- 4 Impact on the quality of fish resources, limitations imposed on traditional use of natural resources, effects of factors associated with accumulation of heavy metals in tissues of living organisms.

### **3.4 ASSESSMENT OF ENVIRONMENTAL RISKS ASSOCIATED WITH THE CURRENT SITUATION**

Judged by its engineering and technical features, the Deputatsky tailings storage facility is perhaps the most complicated hydraulic engineering facilities within the territory of Arctic districts in the Republic of Sakha (Yakutia). The facility contains a large amount of contaminated water and unconsolidated waste generated as a result of tin ore processing. A potential accident at the facility would result in serious environmental damage to the Indigirka River basin.

In general, the environmental risks associated with the Deputatsky tailings pond as a historical pollution source have been assessed as **high** and of **regional** magnitude with respect to their potential impacts.

Environmental risks associated with potential accidents and emergency situations are covered in more detail in Section 1.5 of this PINS.

### **3.5 PRELIMINARY ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OF THE PROJECT**

Maximum environmental impact is expected in connection with construction and earthmoving operations associated with the mothballing of the tailings, remediation of the land disturbed by mining operations, and upgrade of the water diversion tunnels and the ash disposal area.

The major impact factor is expected to be the operation of construction and earthmoving machinery and hot works.

### **3.5.1 *Air Pollution Assessment***

The main emission sources in the process of the Project implementation will be internal combustion engines and dust generated as a result of earthmoving operations.

Taking into account the limited area within which construction works will be performed, the impacts related to air emissions will be of local scale and quite insignificant.

### **3.5.2 *Assessment of Impacts on Surface Waters***

Provided that the construction works will be performed in compliance with the applicable requirements and with the use of proper machinery and equipment, there will be no contamination of surface waters with petroleum hydrocarbons, except in case of accidental spills, which should be immediately cleaned up.

The positive impacts of the Project in relation to the watercourses in the area will be associated with the termination of regular release of contaminants from the tailings to the Poiskovy Stream and the Irgichen River.

### **3.5.3 *Assessment of Impact on Soils***

Adverse impacts will be in the form of partial mechanical disturbance of surface and local soil contamination.

No significant changes in the natural soil cover are expected in the process of construction and earthmoving operations.

Chemical impacts associated with exhaust gases and petroleum hydrocarbons released from construction machinery and transport vehicles will be insignificant and will not result in formation of any persistent anomalies of toxic microelements in soil.

### **3.5.4 *Assessment of Impacts on Ecosystems and Biological Resources***

#### ***Impact on Vegetation***

The Project will be implemented in an area already affected by human activities, where ruderal vegetation prevails. No valuable or rare plant species have been observed or reported at the site.

#### ***Impact on Wildlife***

The area is located near a residential area within an industrial estate. No valuable wildlife habitats have been reported in the vicinity of the site.

### **3.5.5 Assessment of Harmful Physical Factors**

Technological construction processes, operation of diesel generators and machinery potentially cause significant *noise impact* on the personnel's health. In order to abate such impact, the construction works shall be carried out in compliance with the applicable regulatory requirements.

Impact of *vibration sources* will be of local scale limited to the construction sites.

No potential sources of *radioactive contamination* have been identified. In general, any changes in the radiological situation will be insignificant in comparison with the fluctuations of the baseline values.

*Impact of electromagnetic fields* might be caused by communications systems and operation of transformer substations and alternators of internal-combustion engines. It is very unlikely that any electric equipment will be used, which causes strong electromagnetic fields, or any superhigh frequency (SHF) emission sources. No high voltage (500-700 kV) power networks causing intense impacts will be used.

### **3.5.6 Assessment of Impacts on Land Use and Residential Areas**

The Project is aimed at the clean-up of sources of long-term environmental pollution. No adverse impacts on public health and land use are expected.

### **3.5.7 Impacts on Socioeconomic and Cultural Environment**

Due to the absence of any sites of cultural, historical or architectural significance near the Project site, no adverse impacts on such sites are expected.

### **3.5.8 Assessment of Impacts on Protected Areas**

There are no protected areas in the vicinity of the area where the Project will be implemented.

### **3.5.9 Brief Analysis of Potential Accidents and Emergency Situations and Their Magnitude**

With respect to potential industrial accidents, most hazardous during the construction phase are storage tanks used for storage of potentially hazardous flammable substances (diesel fuel).

Industrial accidents can also take place in connection with:



- Upgrade of the water diversion tunnels and remediation of the areas affected by mining operations;
- Operation of construction machinery, or
- Traffic of vehicles.

The scale of such accidents may be rated as local and their consequences can be promptly addressed.

After the completion of construction and land remediation, all adverse impacts will become close to zero and, at the same time, environmental and social benefits of the Project implementation will be ensured (see Section 2.6 below).

### **3.6** *EXPECTED ENVIRONMENTAL AND SOCIAL BENEFITS OF THE PROJECT*

Implementation of the Project will ensure mothballing of the tailings storage facility of the Deputatsky GOK, as well as abandoned tin mining operations in the upper reaches of the Deputatka River, which are a significant source of contamination of the Indigirka River basin, and prevention of environmental damage caused by the Indigirka River basin contamination.

The indicators for assessing the project performance are:

- Reduction in the release of chemically contaminated surface waters to the Indigirka River basin, including:
  - Termination of discharge of contaminated water from the tailings via the siphon outlet;
  - Minimisation of release of chemically contaminated surface water from abandoned mining operations in the upper reaches of the Deputatka River to the Indigirka River basin;
- Mothballing of the tailings based on sound environmental and health & safety principles, ensuring:
  - Land remediation with restoration of favourable conditions for natural vegetation growth and wildlife habitats;
  - Possibility for people to visit the area without any limitations.

### **3.7** *NATIONAL AND INTERNATIONAL ENVIRONMENTAL PRIORITIES COMPLYING WITH OBJECTIVES AND TARGETS OF THE PROJECT*

Measures for mothballing of the tailings of the Deputatsky GOK agree with the main objectives and goals of the Strategic Action Programme for Protection of the Russian Arctic Environment (SAP-Arctic).

Within the framework of the main long-term goal of SAP-Arctic, i.e. implementation of measures for prevention, elimination and abatement of consequences of negative environmental impacts in the Russian Arctic, the Project addresses a number of issues within two main components of the SAP-Arctic, namely:

- Prevention and abatement of pollution of the coastal and marine environments in the Russian Arctic, including the transboundary transport of pollutants with aquatic and atmospheric flows oil, chemical, and radiation contamination;
- Conservation and improvement of the quality of the environment, living conditions of the indigenous small-in-numbers peoples and conditions for traditional nature use by native small nations of the North.

Under the first component, the Project follows the following objectives:

- Reducing the negative environmental impacts in the hot spots in the Russian Arctic;
- Developing/improving financial and economic mechanisms for attracting investments to solve environmental problems in the Russian Arctic;
- Developing international cooperation among the Arctic countries in the area of environmental protection in the Russian Arctic.

Under the second component, the following main objectives will be reached (in particular with respect to remedying past environmental damage on land and in the coastal zone of the Arctic seas):

- Expanding public-private partnerships to improve effectiveness of environmental protection;
- Developing and implementing investment projects aimed at remedying past environmental damage on land and in the coastal zone of the Arctic seas;
- Using the existing and developing new international instruments for attracting investments into the implementation of environmental projects in the Russian Arctic.

The Project also agrees with the main objectives of the Government Policy in the Arctic defined in the Basic Provisions for the National Policy of the Russian Federation to 2020 and onwards (approved by President on 18.09.2008). In particular, in the field of environmental safety the Project aims at one of the main objectives of the Russian Arctic Policy, i.e. conservation and protection of the natural environment in the Arctic, elimination of

environmental consequences of human activities under the conditions of intensification of economic efforts and global climate change. The Project shall ensure the following measures in order to reach the goals of the Russian Arctic Policy in the field of environmental safety in the Russian Arctic region:

- Remediation of natural landscapes;
- Processing of toxic industrial wastes;
- Ensuring of chemical safety.

The need for measures aimed at clean-up of environmental liabilities and remediation of areas in critical environmental condition, efficient control of threats to environmental safety and establishment of economic instruments for environmental liability clean-up is defined in the Programme of Socioeconomic Development of the Russian Federation on a Medium-term Perspective (2006-2008) approved by the Government Decree No. No.38-r dated 19.01.2006. The Programme sets out the following essential objectives of the governmental environmental policy:

- Efficient control of threats associated with deterioration of the environmental situation in connection with an increase in industrial waste generation;
- Implementation of measures for remediation of the areas in critical environmental condition, including governmental support for any work aimed at reducing the past environmental liabilities;
- Creation of economic instruments and mechanisms for clean-up of past environmental liabilities and appropriate compensation.

Mothballing of the Deputatsky tailings is one of the targets defined in the sub-programme “Mothballing of Tailings Ponds” under the governmental target-oriented programme “Environmental protection in the Republic of Sakha (Yakutia) in 2007-2011”. This sub-programme is aimed at ensuring safety of abandoned tailings ponds of closed mines, in particular, the tailings ponds of the Deputatsky GOK, the Kular gold mill, and the Lebedinskaya gold mill, as well as environmental safety of the adjacent areas.

The sub-programme includes, *inter alia*, also the following measures:

- Completion of the design studies for mothballing of tailings of closed mining operations;
- Mothballing and remediation of tailings.

The sub-programme’s target indicators include the following results:

- Tailings mothballing and remediation project designs;
- Industrial and environmental safety of tailings;

- Elimination of threats for the local residents living in the vicinity of tailings.

### 3.8 *STAKEHOLDER ENGAGEMENT PROCESS*

#### 3.8.1 *Administrative and Supervisory Organisations*

- **Government of the Republic of Sakha (Yakutia) and Administration of Ust-Yansk Ulus (District) Municipality**

Approvals relating to land issues, compliance with the objectives defined in the sub-programme “Mothballing of Tailings Ponds” within the governmental target-oriented programme “Environmental protection in the Republic of Sakha (Yakutia) in 2007-2011”.

- **Governmental organisation “Executive Directorate for Elimination of Consequences of Spring-time Floods and Organisation of Restoration Work in the Republic of Sakha (Yakutia)”**

Legal successor of SakhaOlovo

- **Ministry of Environmental Protection of the Republic of Sakha (Yakutia)**

Surveillance measures, permitting documents, state environmental review of projects at the regional level, environmental monitoring.

- **Department of the Federal Service for Supervision of Natural Resource Usage of the Republic of Sakha (Yakutia) (*RosPrirodNadzor*)**

Supervision over environmental protection measures, approval of survey programmes, issue of permitting documents, project review, environmental monitoring.

- **Department of Water Resources Management, Lena Basin Division of the Federal Agency of Water Resources**

Approval of survey programmes and projects, issue of permits and resolutions relating to water abstraction and water use.

- **Lena Department of the Federal Service for Supervision of Environment, Technology and Nuclear Management (*RosTekhNadzor*)**

Surveillance functions, approval of survey programmes, licensing, permitting documents, and experts’ review.

- **Yakutian Department of Hydrometeorology and Environmental Monitoring (*Yakutia UGMS*)**

Licensing of activities in the field of hydrometeorology and environmental monitoring, hydrometeorological review, collection of data from weather stations, provision of hydrometeorological data, performance of hydrometeorological surveys, and participation in monitoring programmes.

- **Yakutian Subsidiary of the Territorial Data Fund for the Far Eastern Federal Region, Ministry of Natural Resources**

Collection of archive data.

- **Territorial division of the Federal Service of State Statistics for the Republic of Sakha (Yakutia) (*RosStat*)**

Collection of statistical archive data.

- **Far Eastern Service for Supervision over compliance with legislation in the field of cultural heritage conservation (*RosOkhranKultura*)**

Approvals and collection of archive data.

- **Border Guard Service, Federal Security Service of Russia**

Approval of performance of surveys and other activities, issue of permits for entry of foreign citizens.

### ***3.8.2 Non-governmental organisations potentially operating in the area***

#### ***International and National NGOs:***

- Greenpeace Russia;
- WWF Russia;
- International Union for Conservation of Nature Russia;
- Socio-Ecological Union International (SEUI);
- Commission of the Public Chamber for Environmental Safety and Protection;
- Alliance of public organisations – Russian Ecological Congress (REC);
- Green Patrol;
- Russian Society of Ecological Economics (*ROEE*).

#### ***Regional NGOs:***

- **Center for Environmental Education of the Republic of Sakha (Yakutia) – Eige**

A non-governmental organisation promoting and implementing environmental education and research programmes (public environmental monitoring, consulting, publishing, etc.) and supporting public initiatives for sustainable development of the civil society in the Republic of Sakha (Yakutia).

- **Public Environmental Center of the Republic of Sakha (Yakutia)**

The oldest public environmental organisation in the Republic of Sakha (Yakutia). Currently, it performs public environmental monitoring of the construction of the trunk oil pipeline East Siberia – Pacific Ocean, major hydropower projects, and environmental impacts of the diamond and gold mining operations.

- **Yakutian division of the Russian Nature Conservation Society**

Projects on environmental education, public environmental surveillance, public environmental review of projects, etc.

- **Public Environmental Monitoring Network of the Republic of Sakha (Yakutia)**

Public environmental monitoring of conditions in residential areas, forests, water bodies, as well as supervision over environmental performance of enterprises using natural resources.

- **Association of Evenkis in the Republic of Sakha (Yakutia)**

Restoration and conservation of Evenki culture and language, activities aimed at expanding local self-government of Evenki communities, protection of legal rights of indigenous ethnic minorities in the Republic of Sakha (Yakutia).

### **3.8.3 Potential Sponsors**

- **Ministry of Natural Resources and Environment of the Russian Federation**

Evaluation of the PINS using criteria developed under the Elimination of Past Environmental Liabilities in Russia project, approval of putting the Deputatsky project on the list of PEL sites requiring urgent actions to eliminate historic pollution.

- **World Bank**

Co-financing of the Elimination of Past Environmental Liabilities in Russia project.

- **Nordic Environmental Finance Corporation (NEFCO)**

Fund Manager of the Arctic Council's Project Support Instrument which is likely to be used to finance development of pre-feasibility studies, environmental impact assessments, business plans, financing plans, technical projects, tender documents or supplies of equipment and services for the project.

#### 4 *DESCRIPTION OF PROJECT INITIATOR/BENEFICIARY*

The Project Initiator and Beneficiary is the State Organisation (GU) “Executive Directorate for Elimination of Impacts of Spring-time Flood and Organisation of Restoration Work in the Republic of Sakha (Yakutia)” (hereinafter referred to as the Executive Directorate, or ED).

The Executive Directorate was established in conformity with the Civil Code of the Russian Federation and pursuant to Decree No.1416 dated 22.05.2001 by the President of the Republic of Sakha (Yakutia) “On priority measures for economic recovery, indemnification of damage and protection of residential areas against natural disasters in connection with the spring-time flood of 2001”. It reports to the President and the Government of the Republic of Sakha (Yakutia), as well as to the Special Commission for Restoration Work in the city of Lensk and other residential areas of the Lensk Ulus (District).

The founder of the Executive Directorate is the Republic of Sakha (Yakutia). The functions of the founder in relation to the objectives, subject and type of activities and guidance of the Executive Directorate are performed by the President’s Administration and the Government of the Republic of Sakha (Yakutia); the functions relating to the Directorate’s property management are performed by the Ministry of Property Management of the Republic of Sakha (Yakutia), within the framework of their competence defined in the relevant legal acts specifying their status.

The main objective of the Executive Directorate is to coordinate and guide the work addressing consequences of floods, mobilise and use on a centralised basis the material, technical and financial resources allocated for restoration of vital facilities in residential areas affected by floods in the Republic of Sakha (Yakutia).

The Executive Directorate plans its activities and outlines the prospects for future operations in coordination with the President’s Administration and the Government of the Republic of Sakha (Yakutia).

The Executive Directorate is obliged to:

- consider and submit for approval to the President’s Administration and the Sakha Government all documents relating to industrial activities and social development;
- provide compensation for damage caused by any unsustainable use of land and natural resources, non-compliance with the safety rules, sanitary norms and requirements to protection of health of personnel and consumers of products.



The tasks to be fulfilled by the Executive Directorate include the following:

- implementation of measures aimed at preventing negative impacts of floods on residential areas;
- coordination of various aspects of investment and construction policy within the framework of the activities performed by the Executive Directorate;
- acting as a state client and developer in relation to facilities being constructed under federal and regional target programmes, and arrangement of emergency response and restoration work in the Republic of Sakha (Yakutia);
- participation in development and implementation of joint programmes and projects on prevention of, and response to, adverse impacts of floods in the Republic, including those implemented at the federal level; and
- implementation of measures aimed at ensuring environmental safety of hydraulic engineering facilities.

Within the framework of the above objectives the Executive Directorate ensures coordination of restoration work relating to motor roads, communications lines, residential properties and social facilities (such as hospitals, schools, pre-school educational institutions). Emergency response and restoration activities and measures for flood prevention are performed by external contractor organisations commissioned on the basis of tenders and in accordance with the Federal Law “On Placement of Orders for Supplies of Goods, Execution of Work and Provision of Services for Needs of the State” (No.94-FZ). The Executive Directorate also manages budget spending allocated as compensations for residents (certificates for housing, social benefits) and for state and municipal organisations (on a gratuitous basis) affected by floods.

The activities of the Executive Directorate are supervised by the President’s Administration and the Government of the Republic of Sakha (Yakutia), taxation and other agencies.

In the course of the permitted independent commercial activities, the Executive Directorate manages at its own disposal the profits obtained from its operations and property acquired at the cost of such profits which are accounted for on an independent basis within its overall accounting system.

**The legal details of the Executive Directorate:**

Full name:	State organisation “Executive Directorate for elimination of consequences of spring-time flash floods and organisation of restoration work in the
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	Republic of Sakha (Yakutia)”
Legal address:	13, Kirova Street, City of Yakutsk, 677022
Actual address:	11, Kirova Street, City of Yakutsk, 677022
Telephone/Fax:	Telephone: +7 (4112) 43 51 85 Fax: +7 (4112) 42 06 86
e-mail:	<a href="mailto:pavodok@gov.sakha.ru">pavodok@gov.sakha.ru</a>
State registration certificate of a legal entity:	No. 3845 dated 27.06.2001
OGRN	1021401058722
INN	1435120440
KPP	143501001
Director	Mr. Vladimir Lyubchenko
Chief accountant	Ms. Olga Voloshkina

### **Structure of financial and commercial operations of the Executive Directorate**

The property of the Executive Directorate is state-owned property of the Republic of Sakha (Yakutia) and is allocated to the Executive Directorate for operative management.

The sources of property and financial resources are as follows:

- budget and extrabudgetary funds;
- Profits obtained from services provided and other types of activities performed by the Executive Directorate;
- Depreciation deductions;
- Other sources in accordance with the applicable Russian and Sakha legislation.

In the process of the operative management the Executive Directorate is obliged to:

- utilise the available property in an efficient way;

- ensure good condition of the property and prevent any deterioration of its technical condition (except for rated depreciation);
- avoid transactions, which result in alienation or burdening of the property allocated for the needs of the Executive Directorate.

Any property can be withdrawn in the following cases:

- Liquidation or restructuring of the organisation;
- Failure to use any property or its use for purposes other than prescribed.

The Executive Directorate has a license for construction of buildings and structures of Categories I and II of responsibility in accordance with the relevant state standard within the territory of the Russian Federation.

### **Legal basis for assigning the tailings of the Deputatsky GOK to the Executive Directorate**

Pursuant to Para. 1 of the Decree by the Sakha Government No.1419-r of 12.11.2005 “On Measures Aimed at Ensuring Environmental Safety of Hydraulic Engineering Facilities of the Lebedinskaya Gold Mill, Kular Gold Mill and the Deputatsky GOK” the Sakha Ministry of Property Management issued an order (No.R-44 dated 18.01.2006) for transfer of the hydraulic engineering facilities of the above enterprises to the balance sheet of the Executive Directorate. On the basis of that order the tailings was turned over to the Executive Directorate for operative management in accordance with an acceptance act dated 16.01.2007 with the following estimate (in roubles):

Balance-sheet value	1,718,825.00
Depreciation	140,000.00
Salvage value	1,578,825.00

## 5 INVESTMENT FEASIBILITY AND FINANCING PLAN

### 5.1 TOTAL COST OF THE PROJECT

The total cost of the Project has been estimated preliminarily at approximately Euro 12,510,000.

### 5.2 PRELIMINARY PHASES FOR PROJECT IMPLEMENTATION AND BREAKDOWN OF THE PROJECT BUDGET

It is assumed that the Project will be implemented in three phases (taking into account the work already commenced in relation to the project design development for mothballing of the tailings financed from the regional budget):

- Phase 1 (First – second year of Project implementation): surveys and preparation of design and engineering documentation, including environmental protection sections in international format;
- Phase 2 (Third – sixth year of Project implementation): implementation of preparatory, engineering and construction measures and site remediation;
- Phase 3 (Seventh – twelfth year of Project implementation): an integrated set of final remediation operations and measures for long-term monitoring.

Ser. Nos.	Tentative deadline	Component	%% of the total amount of financing/ cost (Euro)	Source of financing
	1 <sup>st</sup> -2 <sup>nd</sup> year of Project implementation	Development on the basis of this PINS and approval of a detailed declaration of intent	0.1/10,000	Extrabudgetary
	1 <sup>st</sup> -2 <sup>nd</sup> year of Project implementation	Preliminary assessment of the scope and time schedule of the work and development of a detailed stakeholder engagement plan	0.1/10,000	Extrabudgetary
	1 <sup>st</sup> -2 <sup>nd</sup> year of Project implementation	Development and implementation of a monitoring programme for all phases of the Project	0.6/75,000	Extrabudgetary
	1 <sup>st</sup> -2 <sup>nd</sup> year of Project implementation	Baseline and engineering environmental surveys	2.8/350,000	Extrabudgetary

	1 <sup>st</sup> -2 <sup>nd</sup> year of Project implementation	Engineering topographic and engineering geological (geotechnical) surveys	0.5/65,000	Budget
	1 <sup>st</sup> -2 <sup>nd</sup> year of Project implementation	Preparation of design and engineering documentation for all facilities involved in the Project and adjustment of the Project design to bring it into compliance with the relevant international requirements	0.4/50,000 0.2/25,000	Budget Extrabudgetary
	1 <sup>st</sup> -2 <sup>nd</sup> year of Project implementation	Development of environmental protection sections and plans in conformity with the applicable international format	0.4/50,000	Extrabudgetary
	1 <sup>st</sup> -2 <sup>nd</sup> year of Project implementation	Public consultations and hearings	0.1/15,000	Extrabudgetary
	1 <sup>st</sup> -2 <sup>nd</sup> year of Project implementation	Arrangement needed to obtain required licenses, approvals and permits	0.1/10,000	Extrabudgetary
	1 <sup>st</sup> -2 <sup>nd</sup> year of Project implementation	Supplies of required equipment and machinery	2.4/300,000	Extrabudgetary
	3 <sup>rd</sup> – 6 <sup>th</sup> year of Project implementation	Preparatory, engineering and construction work, including the following:		Extrabudgetary
		• Tailings remediation	12/1,500,000	Extrabudgetary
		• Remediation of the mining sites and waste rock dumps in the upper reaches of the Deputatka River	16/2,000,000	Extrabudgetary
		• Upgrade and maintenance of water diversion tunnels	9.6/1,200,000	Extrabudgetary
		• Treatment of contaminated discharged water stream	16/2,000,000	Extrabudgetary
		• Partial land remediation and restoration of the ash disposal areas of the block boiler station	16/2,000,000	Extrabudgetary
	3 <sup>rd</sup> – 6 <sup>th</sup> year of Project implementation	Measures for the site clean-up	12/1,500,000	Extrabudgetary
	7 <sup>th</sup> – 12 <sup>th</sup> year of Project implementation	Completion of remediation work	7.9/1,000,000	Extrabudgetary
	7 <sup>th</sup> – 12 <sup>th</sup> year of	Development and implementation of a monitoring programme for the period after	2.8/350,000	Extrabudgetary

	Project implementation	the completion of the project		
		<b>Total:</b>	<b>100/12,510,000</b>	

\* RUR/Euro exchange rate 1/45 was assumed for the calculations.

### 5.3 *FINANCING SOURCES IDENTIFIED*

In identifying potential sources of financing for the Project, a number of factors critical for potential sponsors were taken into consideration as follows:

- Non-commercial nature of the Project which is basically unprofitable from the perspective of potential investments;
- Gaps in legal and regulatory base for the public finance of measures on elimination of environmental liabilities in Russia at the moment of preparation of the PINS;
- Lack of a uniform methodology for the risk assessment of environmental liability sites, and
- Limited regional budget financing.

#### 5.3.1 *Sources of Budget Financing*

The Project will be financed partially from the budget of the Republic of Sakha (Yakutia). The amount of the budget financing is indicated in the state target programme “Environmental Protection in the Republic of Sakha (Yakutia) for 2007-2011” and is approximately 115,000 Euros.

During the meeting with Mr. Andrei Peshkov of the Russian Ministry of Natural Resources and Environment and Mr. Vassili Rodionov of the World Bank in the World Bank office in Moscow on February 11, 2010 regarding potential funding of the Project under the the Elimination of Past Environmental Liabilities in Russia project, it was noted that evaluation of this PINS was necessary using criteria of environmental liability inventory that are currently being developed in the framework the Elimination of Past Environmental Liabilities in Russia project.

In case priority PEL elimination measures are considered necessary as a result of such evaluation, budget funding for the Project can be made available in the course of 2011 to 2012.

#### 5.3.2 *International Financing Sources*

Following discussions with Messrs. Henrik Förström and Amund Beitnes of NEFCO held in August 2009 to February 2010, it was confirmed that the Project is in line with the priorities of the Arctic Council’s Project Support Instrument which

will be managed by NEFCO as soon as the PSI is commissioned in the first half of 2010.

This PINS has been submitted to NEFCO and is currently under review in the PSU Unit headed by Amund Beitnes.

#### **5.4 ORGANISATIONS TO BE INVOLVED IN PROJECT IMPLEMENTATION**

The Project Developer (Beneficiary) will act through the Executive Organisation / Project Coordinator. Organisations for execution of the work will be commissioned by the Project Coordinator on the basis of sub-contracts for implementation of individual components of the Project:

1. During Phase 1, relevant research and design organisations will be commissioned on the basis of a tender:

- **Sprint LLC**

Project Design development for mothballing of the tailings

- **Yakutian Trust for Engineering and Construction Surveys (YakutTISIZ)**

Engineering surveys

- **Nikolay Chersky Northern Mining Institute of the Siberian Division of the Russian Academy of Sciences**

Participation in engineering surveys and design development work

- **Permafrost Research Institute, Siberian Division of the Russian Academy of Sciences**

Participation in engineering surveys and design development work

- **International engineering consulting company**

Project management, technical design development

- **International environmental consulting company**

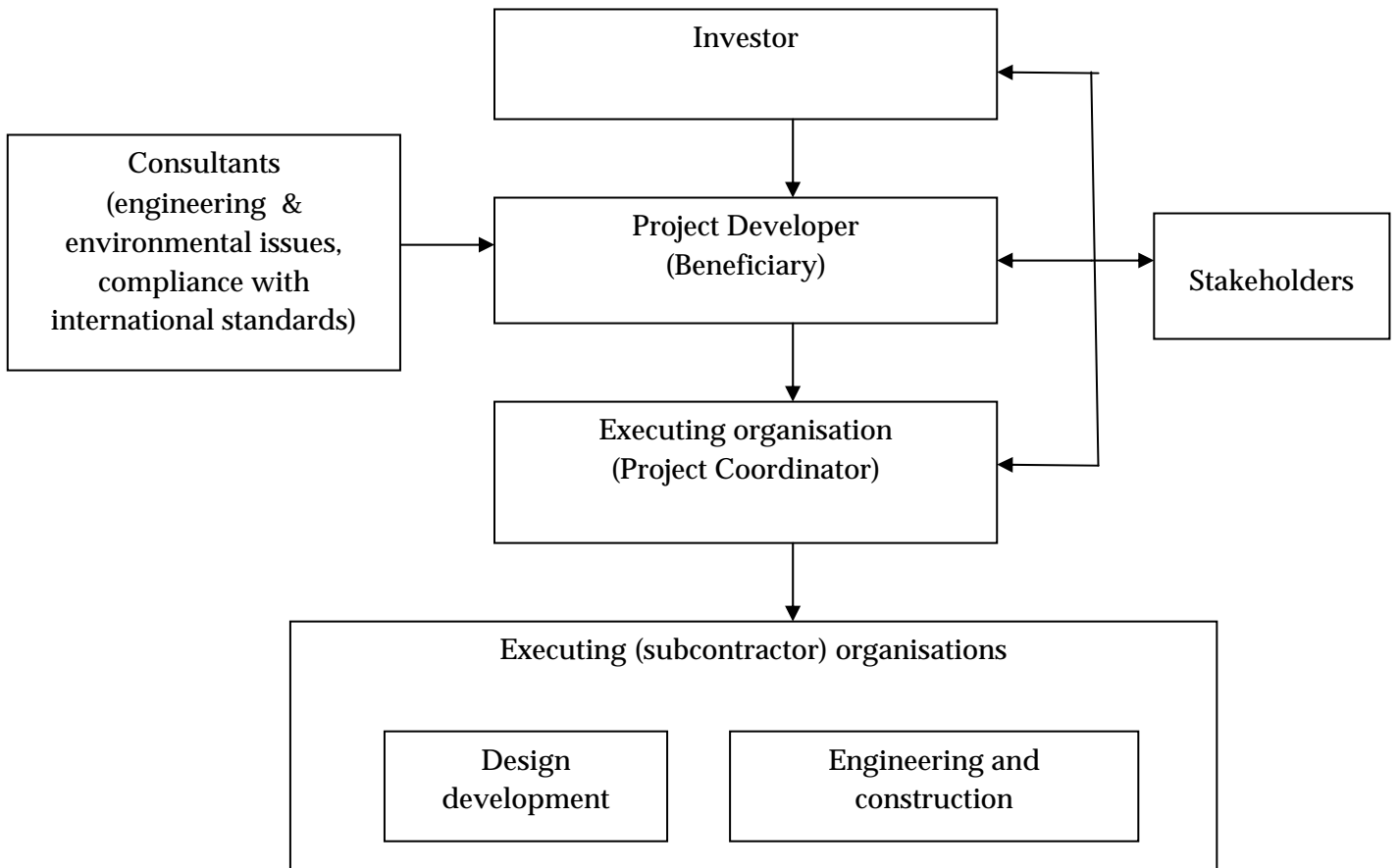
Participation in organisation of international financing, organisation and coordination of baseline and engineering environmental surveys, environmental and social due diligence, preparation of environmental protection sections of the Project design documentation in Russian and international formats.

2. During Phase 2 and partially Phase 3 (integrated final remediation work), relevant research engineering and construction firms and organisations will be commissioned on the basis of an open tender.

3. Monitoring within the scope of Phase 3 will be performed by the staff of the district inspection division of the Rospotrebnadzor Agency with target financing and with participation of recommended duly accredited laboratories.

The Project management structure is shown in Figure 4.1.





**6**      ***FINANCIAL AND ECONOMIC INDICATORS OF THE BENEFICIARY***

This information can be obtained from the NPA Arctic Project Office or from the Executing Agency

7.1 *ISSUES REQUIRING SPECIAL ATTENTION IN THE PROCESS OF THE PROJECT PLANNING*

7.1.1 *Financial and Economic Aspects*

- Remote location of the Project area in relation to main transport networks (there is only a single all-year road Ust-Kuyga – Deputatsky and air connection to the city of Yakutsk);
- High transportation cost and seasonal character of logistics plans;
- High operating costs;
- Need for a reliable mechanism for supervision over the target spending of the available financing.

7.1.2 *Technical Aspects*

- Extremely severe operating conditions for materials, equipment and machinery;
- Significant amount of wastewater released from the hydraulic ash-disposal areas of the block boiler station discharged to the tailings pond and causing its overflowing, contamination of the territory directly belonging to the tailings pond with coal ash;
- The actual filling of the facility with tailings is 90%.

7.1.3 *Institutional Aspects*

- Governmental procurement procedures are not open or transparent.

7.1.4 *Environmental Aspects*

- The current wastewater discharge to a surface water body (the Poiskovy Stream) without permits, including approved NDS document and a Decision for use of a water body, which is a serious non-compliance with the applicable environmental legislation;

- Extremely high level of pollutants in surface waters in the area of abandoned mine workings in the upper reaches of the Deputatka River;
- Vulnerability of tundra ecosystems;
- Long winter period and harsh weather conditions;
- Presence of dumped potentially toxic chemicals.

### **7.1.5 Social Aspects**

- Unfavourable economic situation attributed to termination of the commercial operation of the mine, out-migration of the population and possible closure of the settlement.

## **7.2 MAIN RISKS AND MITIGATION MEASURES**

### **7.2.1 Main Risks**

The following risks are associated with implementation (non-implementation) of the Project and able to have a significant effect on the outcome of the Project:

*Financial and Economic Risks:*

- Lack of interest from identified potential donors;
- Decision of one or several sponsors to withdraw from the Project;
- Shortage of the funds originally planned in the budget; unpredicted increase in the Project cost.

*Technical Risks:*

- Existence of two water diversion tunnels, which have not been inspected and maintained during the past fifteen years and lack of technical solutions for ensuring their proper working condition;
- Ongoing washout with the water from the Poiskovy Stream of the ice lens located under the road on the pilot dam and partially within the dam body.

### **7.2.2 Risk Mitigation Measures**

The implementation of the Project implies the following measures for mitigation of the identified risks:

*Financial and Economic Measures:*

- Consultations with a wide range of potential donors with due consideration of the geographic aspects of their financial assistance;
- Development and approval of acceptable time schedule of payments, elaboration of a procedure and timely adjustment of plans relating to financing of the Project;
- Expansion of the mechanisms of the public-private partnership and encouragement of involvement of national and foreign investors;
- Retaining reputable design development organisations and contractors for preparation of Project design and engineering documentation and for supply of equipment;
- securing guarantees of target spending of the raised funds from the Sakha Government.

*Technical Measures*

- Expedient elaboration of technical solutions for upgrade and maintenance of the water diversion tunnels in an working condition; allocation of required funds and selection of a contractor to achieve this objective;
- Measures for routine monitoring of the condition of the hydraulic engineering facility, timely response to and prevention of dam washout.

*FIGURES*

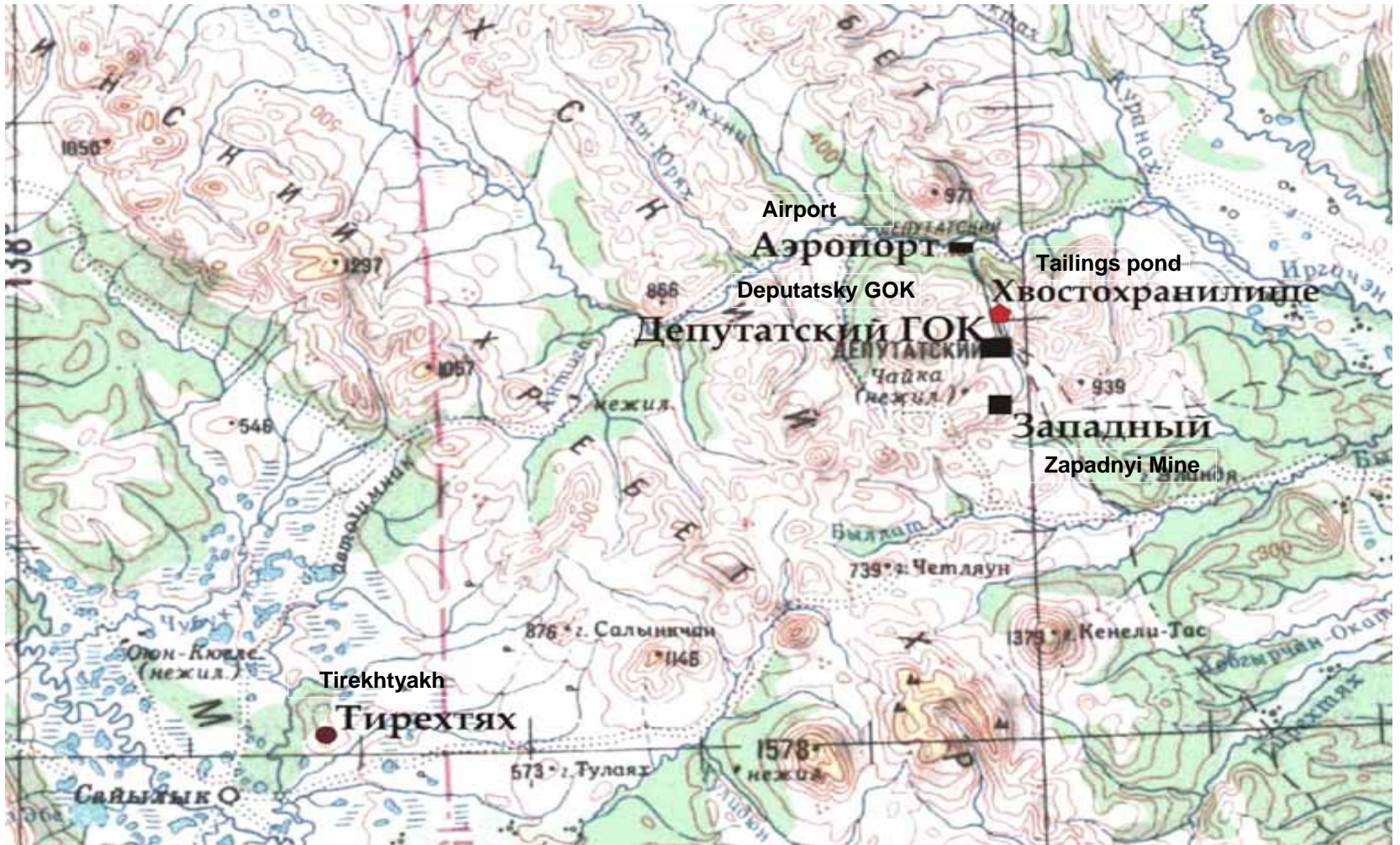
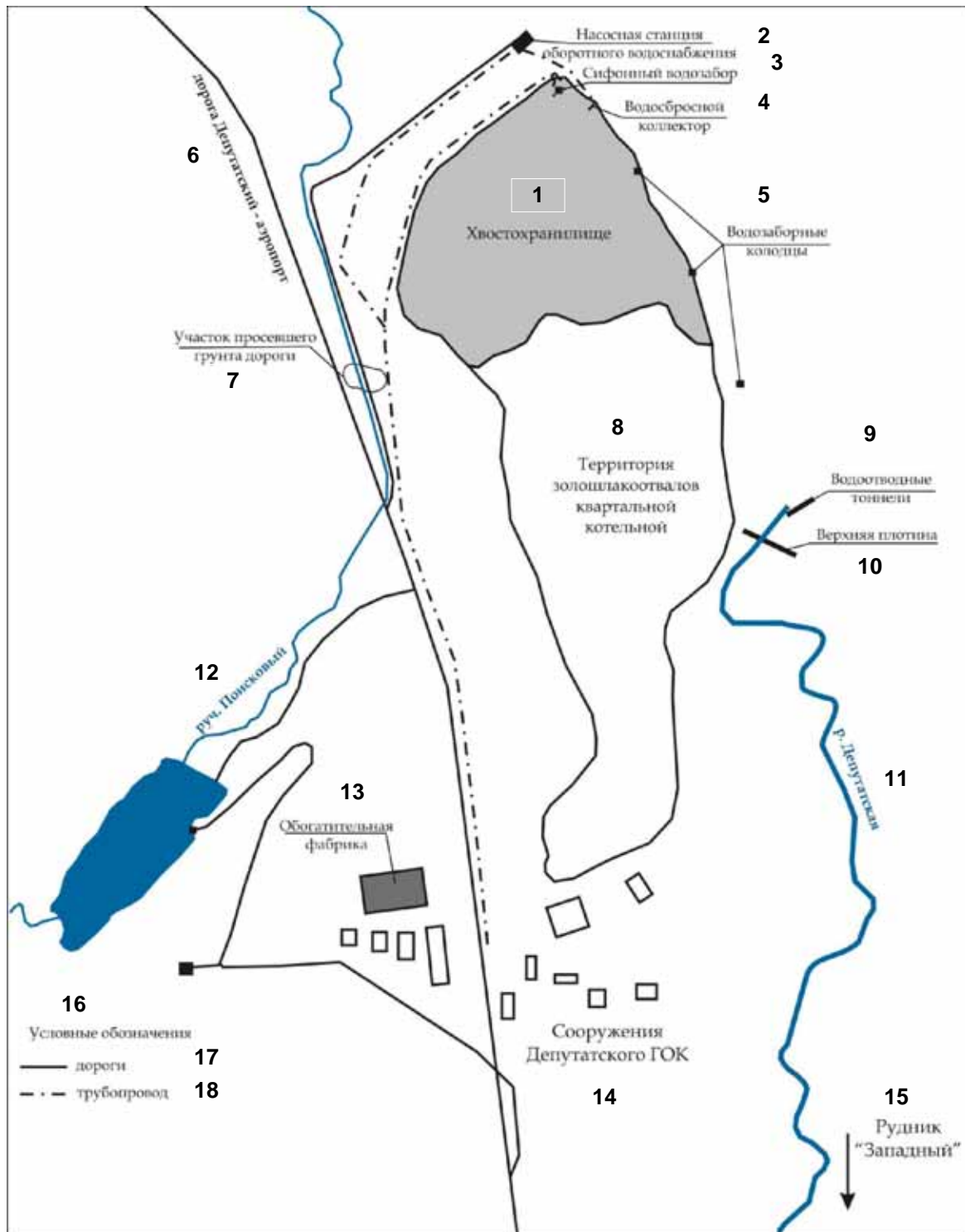


Figure 1.1. Geographic location of Deputatsky GOK



**Figure 1.2. Schematic layout plan of the tailings pond and surrounding facilities of Deputatsky Tin Mining and Ore Processing Plant**

- |  |                                  |
|--|----------------------------------|
| 1. Tailings                            | 10. Upstream dam                 |
| 2. Recycled water pump station         | 11. Deputatka River              |
| 3. Siphon water intake                 | 12. Poiskovy Stream              |
| 4. Water discharge sewage line         | 13. Ore processing plant         |
| 5. Water abstraction wells             | 14. Facilities of Deputatsky GOK |
| 6. Road from Deputatsky to the airport | 15. Zapadny mine                 |
| 7. Subsided road section               | 16. Legend:                      |
| 8. Ash disposal area of boiler station | 17. Roads                        |
| 9. water diversion tunnels             | 18. Pipelines                    |



*PHOTOLOG*

*Photo 1 Overview of the tailings of Deputatsky GOK (view from north-west)*



*Photo 2 Pilot dam*



**Photo 3** *Siphon water intake facilities at the tailings. At the time of the site visit, the water intake from the water surface (in the background) was out of order.*



**Photo 4** *Due to the corrosive medium of the tailings pond, the siphon tube (8mm thick) abstracting water from a depth of 1.2m deteriorates completely within 1.5 to 2 years.*



*Photo 5 Outlet for discharge of water via the siphon system to the Poiskovy Stream. Water is discharged without required permits.*



**Photo 6** *Entrances to the water diversion tunnels. The tunnels has not been maintained during the past 15 years.*



**Photo 7** *The area of discharge of wastewater from the ash disposal area of the boiler station adjacent to the tailings. There are no wastewater treatment facilities at the boiler station.*



*Photo 8 One of the areas used for tailings release.*



*Photo 9 Zapadny mine. Contamination of surface waters was visually observed.  
Photo 1*



*Photo 10 Zapadny mine. Contamination of surface waters was visually observed.*



*Photo 11 Zapadny mine. Contamination of surface waters was visually observed.*



*Photo 12*      *Access road section over the pilot dam leading to the tailings. The area of soil subsidence, where the Poiskovy Stream disappeared under the road. Photo 1*



*Photo 13*      *Access road section subsided as a result of a washout. Photo 2*





**Photo 14** *Access road section subsided as a result of a washout.  
Photo 3*



**Photo 15** *The point where the Poiskovy Stream disappeared under the road.  
This part of the road was just covered with crushed stone; the embankments  
and the dam had not been reinforced with concrete slabs.*

