“OYU TOLGOI” LLC

# ENVIRONMENTAL PROTECTION PLAN AND MONITORING PROGRAM OF OYU TOLGOI PROJECT – 2011

Ulaanbaatar 2011

## Content

# 1. PREFACE

Oyu Tolgoi LLC has been conducting a mining project to extract copper and gold from Oyu Tolgoi deposit in Khanbogd soum, Umnugobi aimag. The project is under the construction phase aiming to begin the mining operation in 2013 as specified in the "Investment Agreement" between the Government of Mongolia, Ivanhoe Mines and its strategic partner Rio Tinto. The Investment Agreement was approved in October 2009 by the stakeholders.

## 1.1 Environmental policy

Oyu Tolgoi LLC recognizes its responsibilities and commitments to the environment and thus all activities of the project are in compliance with the environmental policy. The company's responsibilities and commitments include the following aspects:

- To ensure the compliance of the project activities with valid laws, legislations, regulations and standards of Mongolia and international best practices and standards for mining.
- To prevent environmental pollution and monitor environmental impacts caused by the project activities considering social economic factors.
- To introduce best practices of production in environmental activities and to monitor and assess own activities in order to improve environmental conditions on regular basis.

The following actions shall be taken to implement the above mentioned responsibilities:

- To develop and comply with Environmental Management System ISO 14001 in accordance with international standards.
- To conduct audit on the implementation of the Environmental Management System and then take further remedial actions on any neglect or failure if they are existing.
- To introduce Environmental Protection Plan. Report the implementation of the plan to the company's administration and authorized Governmental organizations.
- To improve understanding and awareness of all employees, contractors and suppliers about environmental policy as a result environmental protection principles shall be reflected in their daily operations.
- To provide accurate and truthful information to local residents in the project area about environmental impacts and to encourage creative cooperation by reflecting their comments and complaints in the operation.
- To provide all necessary possibilities to implement the Environmental Policy.
- To disclose the Environmental Policy to public at all times.

Oyu Tolgoi LLC has been conducting monitoring activities on water, soil, vegetation, and air in the project region according to the planned period based on the Environmental Monitoring Program and recommendations of the Detailed Environmental Impact Assessment within the framework of the Environmental Policy during exploration and construction activities since the beginning of the project.

## 1.2 Brief introduction to the project

Oyu Tolgoi project has started in the Javkhlant bagh of Khanbogd soum in Umnugovi province. The Oyu Tolgoi deposit is located 640 km south of Ulaanbaatar, 210 km east of Dalanzadgad city and 45 km west of Khanbogd soum.


Figure 1. Location of Oyu Tolgoi

At the moment activities relevant to the buildings and infrastructures required for the Oyu Tolgoi project are under the constructional and developmental phase. The following activities shall be continuously conducted or newly started in 2011:

- Explorations to find possibilities for the increase of geologic resources;
- Construction works for the permanent airport;
- Paved road between Oyu Tolgoi and Gashuun Sukhait;
- 220kV high voltage electric power transmission line from Oyu Tolgoi to Gashuun Sukhait;
- Radio communication tower;
- Pipeline to pump out groundwater, 35 kV electric power transmission line to the particular sites;
- Construction of the facilities for copper and gold concentrator;
- Preparation works for open-pit mining operation, initial stage of topsoil stripping, construction of the primary crusher;
- Construction of the shaft#2 facilities for the underground mining and crosscuts;
- Foundation for the facilities of waste disposal;
- Maintenance and service workshop of the heavy equipment and machinery for the open-pit mining;
- Construction of the main waste pit for the waste management;
- Construction of the administration office;
- Construction for the extension of the mining warehouse;
- Construction of Central Boiler Plant;
- Construction of Water treatment and bottling plant;
- Extension of the temporary camp for construction workers;
- Fuel station, explosive magazine, batch plants, utilization of Khaliv sand deposit and Dugat quarry deposit.

### 1.3 Laws, regulations and reports of the detailed environmental impact assessment

Since the beginning of exploration activities, 5 volumes and 10 additional clarifications of detailed environmental impact assessment reports have been systematically prepared. Oyu Tolgoi LLC obeys relevant laws, regulations, procedures, guidance, standards and recommendations of detailed environmental impact assessment report in all phases of the project.

**Table 1. Mongolian Laws and Regulations**

| | Mongolian Laws |
|---|---|
| 1. | Constitution of Mongolia |
| 2. | Law of Environmental Impact Assessment |
| 3. | Minerals Law of Mongolia |
| 4. | Law of Land |
| 5. | Law on Land Fees |
| 6. | Law on Air |
| 7. | Law on Water |
| 8. | Law of Special Protected Area |
| 9. | Law of Buffer Zone |
| 10. | Law of Fauna |
| 11. | Law of Flora |
| 12. | Law of Toxic Chemicals |
| 13. | Law of industrial and domestic (household) waste |
| 14. | Cultural Heritage Protection Law |
| 15. | Law to monitor the turnover of explosives and blasting devices |
| 16. | Vegetation Protection Law |
| 17. | Law for the use of water and mineral water |
| 18. | Law of Sanitary/Hygiene??? |
| | **Decrees and procedures of the Minister** |
| 1. | Use cash as a collateral to protect environment during geology and mining operation. |
| 2. | Regime for protection zones of health and drinking water supply of public. |
| 3. | Regulation to wastewater drainage. |
| 4. | Requirements and types of the facility for waste landfill and pit. Operational procedure of the organizations and individuals for waste management. |
| 5. | Regulation for the use and monitoring of water resource and permissions. |
| 6. | Regulation for risk assessment of hazardous and toxic substances. |
| 7. | Procedure to store, transport and use hazardous and toxic substances. |
| 8. | Procedure for utilization of wastewater drainage facility. |
| 9. | Procedure to protect water resources. |

**Table 2. Mongolian National Standards**

| | Standards |
|---|---|
| **Air** | MNS 4585:2007. Air quality. Technical general requirement |
| | MNS 4048:1988. Quality of air. Weighing/Measure???/ method to determine dust |
| | MNS 900:2005. Drinking water. Hygienic requirements and the monitoring |
| | MNS 4586:98. Quality characteristics of water environment |

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| **Water** | MNS 4943:2000. Quality of water. Wastewater |
| | MNS 4288:95. General requirements for the location of wastewater treatment plant and treatment technologies. |
| **Soil** | MNS 5850:2008. Quality of soil. Maximum allowed amount of the substances and elements that contaminate soil. |
| | MNS 5916:2008. Stockpile and strip off fertile soil |
| | MNS 5917:2008. Rehabilitation of disturbed land caused by mining operation |
| | MNS 5918:2008. Re-vegetation of disturbed land. Technical general requirement |

**Table 3. Status of the report for detailed environmental impact assessment**

| Components of environmental assessment project | Description | Status of environmental assessment project |
|---|---|---|
| *Volume -I*:<br>Oyu Tolgoi-Gashuun Sukhait infrastructural zone.<br>Report for the Detailed Environmental Impact Assessment, 2004. | It is reflected that the infrastructure of the paved road from Oyu Tolgoi to Gashuun Sukhait border point should be constructed along the current coal transportation road. | Approved in May of 2004. |
| *Volume -I (additional clarification)*: Oyu Tolgoi-Gashuun Sukhait infrastructural zone.<br>Additional clarification to the Report for the Detailed Environmental Impact Assessment, 2006. | It is reflected that the infrastructure of the paved road from Oyu Tolgoi to Gashuun Sukhait border point should not be constructed along the current coal transportation road but should be through a new alignment. | Approved in March of 2007. |
| *Volume -II*:<br>Project for using groundwater resources of Galbiin Gobi and Gunii Khooloi to the mining operation in Oyu Tolgoi.<br>Report for the Detailed Environmental Impact Assessment; 2005. | Impacts on regional climate, soil, flora and fauna, water supply to local herders and animals if significant amount of groundwater resources of Galbiin Gobi and Gunii Khooloi are used in long term period were specified. At that time, Water Agency of Mongolia provided recommendation to conduct further hydrogeological investigation and approved the water resource for consumption to as 210 l/sec. | Approved in September of 2005. |
| *Resource estimation and report of the exploration for the groundwater resource in Gunii Khooloi.*<br>*(A. Tuvdendorj and others, January, 2008)* | According to the request of Mongolian Water Agency, a hydrogeological investigation was carried out in Gunii Khooloi aquifer in 2007. Report of the hydrogeological investigation was discussed. Water consumption resource for Oyu Tolgoi deposit from Gunii Khooloi aquifer was approved as 870 l/sec. | Approved in January of 2009. |

| Components of environmental assessment project | Description | Status of environmental assessment project |
|---|---|---|
| *Volume -II (additional clarification):* Project for using groundwater resources of Galbiin Gobi and Gunii Khooloi to the mining operation in Oyu Tolgoi. Additional clarification to the Report for the Environmental Impact Assessment, 2010 | Reasons for additional clarifications include:<br>• Water consumption resource in Gunii Khooloi aquifer increased to 870 l/sec. Moreover, water demand for the project is also changed.<br>• Modify assessment of potential impacts to environment and risks.<br>• Make amendments in the Program of Water monitoring and exploration. | The documentation has been processed and it is at the reviewing stage. |
| *Volume -II (additional clarification)*: Water supply pipeline for Oyu Tolgoi. Report for the Detailed Environmental Impact Assessment, 2010 | Environmental impacts relevant to the construction and utilization of the water supply pipeline for the mine were clearly specified. | Approved in January of 2010. |
| *Volume -III:* Project for the extraction and exploitation of copper and gold in Oyu Tolgoi deposit. Report for the Detailed Environmental Impact Assessment; 2006. | Copper and gold extraction and exploitation, open-pit mining, all the equipment required for the open-pit mining, and objects in licensed site such as infrastructure, concentrator, waste-pit were included in the Volume 3 of the Report for the Detailed Environmental Impact Assessment. Assessment report is based on the Integrated Development Plan/ of 2005. Moreover it involves general plan of the project for the year of 2006. | Approved in December of 2007. |
| *Volume -IV:* Electric power supply of the mine, 2010 | In order to solve electric power supply to the project, report of the detailed environmental impact assessment was prepared for coal burning 3x150 MW power plant. The task to define location of the power plant is pending depending on the discussion with the Government of Mongolia. | Project and brief overview of the project's technical and economical assessment has been prepared in advance for general evaluation. |
| *Volume -V:* Project of the domestic airport relocation in Oyu Tolgoi. Report for the Detailed Environmental Impact Assessment, 2007 | Current domestic airport at the Oyu Tolgoi project site is going to be relocated to 10 km north of the licensed site as it is planned. Within the scope of this project activities as well as airstrip appropriate to aircrafts (Fokker 50 and Lockheed C130) to take off and land, road for vehicles to transport passengers to/from the aircraft, security zone, air traffic controllers tower, public parking, arrivals area with the size of 15x15 m, light for airstrip, electric generator with a capacity of 40 kV ampere for supplying electricity to the airport, drainage system for surface runoff and fence around the airport | Approved in September of 2007. |

| Components of environmental assessment project | Description | Status of environmental assessment project |
|---|---|---|
| | were specified. | |

**Table 4. Additional clarification for the Volume 3 of the detailed environmental impact assessment of Oyu Tolgoi**

| Supporting report | Description | Status of environmental assessment project |
|---|---|---|
| Fuel Station of Oyu Tolgoi, 2005. | Dedicated to the operation of the fuel station in Oyu Tolgoi. | Approved in 2005. |
| Fuel storage and extension of fuel station in Oyu Tolgoi, 2010. | Additional clarifying assessment was required because extension of the fuel station and fuel storage of Oyu Tolgoi were newly built in 2008. The fuel storage facility consists of 4 reservoirs with the volume of 25 $m^3$ and 10 reservoirs with the volume of 50 $m^3$ each installed underground. At one time the fuel storage facility can reserve fuel of 600 $m^3$ at its maximum capacity. Moreover monitoring equipment was installed and administrative building was constructed to support the operation of fuel station and fuel storage facility. | Approved in January, 2010. |
| Shaft#1, 2005. | Report of detailed environmental impact assessment of the Shaft#1, structure of the facility, waste stone and water drainage of the shaft. | Approved in June, 2005. |
| Shaft#2, 2006. | Report of detailed environmental impact assessment of the Shaft#2, structure of the facility, waste stone and water drainage of the shaft. | Approved in December, 2007. |
| Wastewater treatment facility, 2007. | Assessment report of the wastewater treatment facility with the capacity of 400PE at Oyu Tolgoi licensed field. | Approved in May, 2007. |
| Batch Plant, 2007. | Assessment of the batch plant located west side of the Oyu Tolgoi licensed site. | Approved in April, 2007. |
| 20 MW diesel electric power plant, 2007. | The electric power plant consists of diesel generators installed in the container. Install 6 diesel generators for 20 MW at the initial stage. Afterward, install 4 additional 20 MW generators. | Approved in September, 2007. |
| Chemical substances for the use of Oyu Tolgoi, 2007. | Import and utilization of the chemical substances for the construction activities. | Approved in April, 2008. |
| Mineral estimation of chemical substances used for construction activities in Oyu Tolgoi, 2010. | Detailed assessment of potential risks and danger levels of chemicals for the construction activities. | Approved in August, 2010. |

## 2. ENVIRONMENTAL PROTECTION PLAN

While developing the plan, we have aimed to determine realistic time frame and expenditures required to implement this plan and to specify relevant activities to minimize and stop negative environmental impacts and to structure management and organization for environmental protection taking into consideration the Environmental Monitoring Program and the Environmental Protection Plan which has/have been included in the report of the Detailed Environmental Impact Assessment.

Moreover "Mongolian Environmental Protection Law," "Mongolian Environmental Impact Assessment Law" and other relevant laws of Mongolia, "Procedure for developing environmental monitoring program and environmental protection plan" approved by the decree of the Minister of Environment, conclusions of both general and detailed assessments of environmental impact were used as references and guidance for the development of the plan. It is also based on the Environmental Protection Plan of 2010.

We shall monitor implementation of the Environmental Protection Plan on regular basis. We aim to reduce harmful impacts from the project activities to the environment as minimum as possible.

This is not an immutable legislative documentation, and therefore if necessary it can be modified to reflect additional provisions for environmental protection in accordance with clause 2.13 of the 87th decree of the Minister of Environment which became effective in 2000.

In total 109420.0 thousand (hundred nine million four hundred twenty thousand) MN₮ was allocated to the rehabilitation activities, environmental monitoring and Environmental Protection Plan of 2011.

In 2010, Oyu Tolgoi LLC successfully implemented the "Environmental Protection Plan of 2010" and "Environmental Monitoring Program" by carrying out the following activities:

- Monitoring for ground water and surface water in 262 spots;
- Research for vegetation and health of pastureland in 36 sites;
- Study for small species of animals in 12 spots;
- Monitoring of air dust in 16 sites;
- Monitoring of air quality in 36 sites;
- Chemical and physical characteristic of the soil in 50 sites;
- Monitoring of noise in 19 spots;
- Rehabilitation for 228,78 hectare land inclusive of biological rehabilitation covering 143.5 hectare land and technical rehabilitation covering 85,29 hectare land.

The implementation report of the "Environmental Protection Plan - 2010" has been submitted to the Ministry of Environment and Tourism, Specialized Inspection Agency in Umnugobi, Environmental and Tourism Department in Umnugobi province and to the Governor's office of Khanbogd soum.

The fulfillment of the Environmental Protection Plan and Monitoring Program of 2010 has been evaluated by the Environment and Tourism Department in Umnugobi province as "very good" with the completion of 97 percent. Professional recommendations of the evaluation shall be fully implemented. (Attachment x)

## 2.1 Potential negative impacts to environment

### 2.1.1 Impact on air quality

*Source:*

Dust from the activities of topsoil removal, transportation, drilling, explosion and soft soil during the project implementation is a main source for air pollution. Furthermore dusts in air relatively increase during dry seasons as well as spring and autumn. Dust sources include:

- Dust from removal of the fertile top soil;
- Dust during loading and unloading of the removed fertile top soil;
- Construction works of roads and buildings;
- Dust caused by the stripped off cover layer above the ore;
- Explosion of the open-pit mine;
- Movement of mining equipment and traffics;
- Disturbed lands by other activities;

Moreover explosions shall be carried out with certain frequencies once the open-pit mining operation starts. Therefore, noise impact is going to increase.

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| *Specification* | Dust from invisible to visible, mixture of wet soil from dry soil. |
| *Impact area* | Project site and its surrounding areas. |
| *Affected items* | People at workplaces with high level of dust. |
| *Approaches to minimize the impact* | Cover the external and internal roads of the project site with dust proof materials. Upgrade the earth road between Oyu Tolgoi and Gashuun Sukhait to paved road. Watering roads during dry period. Avoid from formation of several branch roads, define the speed limit on the road of the mine. |
| *Duration of the impact* | Even though the duration of impact is throughout the all phases of project implementation and construction activities, this plan only covers 1 year period. |

### 2.1.2 Impact on soil

*Source:*

Very large area will be disturbed by the project activities such as foundation of constructions, road constructions, channel for water pipeline, water drainage, waste pit, preparation works for the open-pit and underground mining. Besides soil erosion and degradation caused by stripped off topsoil and project activities, the fertile of soil shall be declined.

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| *Specification* | Landscape shall be changed due to the massive amount of waste rocks' stockpile and pits left from fertile top soil removal and development of the open-pit mining. Also a fuel station and storage of chemical substances are located at the |

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| | sites potentially vulnerable to soil contamination. If it is not possible to concrete the foundations, the surface shall be covered with polyethylene materials to prevent penetrations of the substances to the soil. |
| *Impact area* | Mining site and sites for some infrastructure outside of the mining site. |
| *Affected items* | Soil, vegetation and animals at the site. |
| *Approaches to minimize the impact* | Must have a precaution's plan to prevent leakage. Improve the monitoring on land utilization and minimize unnecessary operations on the lands. Deliver used oils to recycling and reproducing entities. Industrial and domestic wastes shall be backfilled to the designated sites. Prior to the construction work, fertile topsoil shall be stripped off. Subsequently, removal topsoil shall be stockpiled in order to use further land rehabilitation. Drainages and channels to accumulate precipitation water should be built to avoid from land disturbance due to the surface runoff. Employees shall be involved in the training about dumping. |
| *Duration of the impact* | Even though the duration of impact is throughout the all phases of project implementation and construction activities, this plan only covers 1 year period. |

### 2.1.3 Impact on water

*Source:*

Water shall be supplied to the construction activities from the 18 wells around the project area. The wastewater shall be basically produced from:

- Wastewater from the camp for employees. (Toilet, shower and sink)
- Dressing room for the employees.

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| *Specification* | Drawdown and emptiness can happen in the wells if water is used inefficiently for construction activities. |
| *Impact area* | Surface water and groundwater in mining site and sites for some infrastructure. |
| *Affected items* | Soil, vegetation and animals at the site. |
| *Approaches to minimize the impact* | According to the strategic policy of water, Environmental Monitoring Program shall be constantly implemented. Water consumption shall be kept as low as possible. Create buffer zones on water resources in order to comply hygienic and safety regulations. Investigate the possibility to re-use the water from wastewater treatment facilities for watering internal roads of the mine site and also for the batch plants. |

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| *Duration of the impact* | Even though the duration of impact is throughout the all phases of project implementation and construction activities, this plan only covers 1 year period. |

**2.1.4 Impact on vegetation and animals**

*Source:*

During the construction period particularly due to the stripping off topsoil vegetation cover will be destroyed. Moreover animals at that region will escape.

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| *Specification* | Mining operation mostly topsoil removal activities will greatly damage the vegetation cover. Because of the dramatic change of vegetation cover, climate of the region will become drier lacking precipitation in the air. |
| *Impact area* | Animals and vegetations in mining site and sites for some infrastructure. |
| *Affected items* | Soil, vegetation and animals at the site. |
| *Approaches to minimize the impact* | Rehabilitate the disturbed lands covering fertile topsoil layer during the constructional period or if not possible after completion of the project. Plant local perennial vegetations for complete rehabilitation. |
| *Duration of the impact* | Even though the duration of impact is throughout the all phases of project implementation and construction activities, this plan only covers 1 year period. |

**2.1.5 Impact of waste disposal**

*Source:*

Solid and liquid household wastes will be generated from warehouse, maintenance workshops, workstation, cafeteria and camp for employees while the project is under implementation.

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| *Solid waste* | Household waste, iron, used tires and spare parts etc. |
| *Liquid waste* | Household wastewater, used oil, chemical substance, waste of fuel and lubrication. |
| *Specification* | Solid and liquid wastes can contaminate groundwater and soil. |
| *Impact area* | Animals and vegetations in mining site and sites for some infrastructure. |
| *Affected items* | Soil, vegetation and animals at the site. |
| *Approaches to minimize the impact* | Prepare assessment for impact. Classify wastes. Re-using and recycling appropriate wastes. Eliminate chemical toxic |

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| | substances using safe and environmentally friendly manners at the fixed time in accordance with the relevant procedure. Train all the employees. |
| *Duration of the impact* | Even though the duration of impact is throughout the all phases of project implementation and construction activities, this plan only covers 1 year period. |

# 3. ACTIVITIES TO BE CONDUCTED IN LEASE AREA

## 3.1 Location and description of the project

**ONSITE –** OT project lease area.
This part of EPP covers construction activities on OT lease area in 2011.
In frame of draft plan 2011 says there will be numerous construction activities commence and accomplish such as fuel storage facility, concentrator overland conveyor, tailings pipeline, operation camp phase 1&2, operation warehouse, administration building and waste management facility.

## 3.2 Implementation time

- Fuel storage facility from 9 Sep 2010 to 12 May 2011
- Overland conveyor
- Transmission lines: February 2011 to September 2011
- DTR tower #2: December 2010 to March 2011.

Location map of OT-GS infrastructure corridor is attached.

### 3.3 Environmental Protection Plan – 2011

| # | Environmental Component | Potential impacts | Mitigation measures | Cost (thou.tug) | Responsibility |
|---|---|---|---|---|---|
| 1 | **Air and air quality** | The potential dust sources from the construction and operation are include:<br>• Land clearing during concentrator overland conveyor, tailings pipeline, operation camp, operation warehouse, administration building and waste management facility construction<br>• Traffic on unsealed roads and surrounding area of construction site<br>• Spillage from haulage trucks<br>• Potential for mine dust emissions to contribute to a worsening of localized airborne dust concentrations during dust storm conditions<br>• Potential for health impacts from contaminated dust emission from wind erosion of mine waste structures<br>• Potential for soil, surface or groundwater impacts from dust emissions from erosion of mine waste structures and open and | • The use of water trucks during construction to suppress dust from earthmoving equipment and vehicles by using dust suppressing compound which should be environmentally friendly,<br>• Limit vehicle speed on unsealed roads (before or during construction activities),<br>• Rehabilitate borrow pits and old unused tracks along the access route to encourage plants grow naturally,<br>• Limit land disturbance from onsite construction activities as low as practicable,<br>• Comply with Mongolian emission standards or appropriate international standards for all vehicles used on the project including: emissions from petrol engines (MNS 5031:2003) and emissions from diesel engines (MNS 5014:2003),<br>• Integration of effective and practical dust control contingencies and strategies in operational procedures for all aspects of the site operations<br>• The management of dust from mining operations, stockpiles, waste structures, roads, blasting and open areas will include:<br>- Suitable design of structures and stockpiles to minimize dust lift off during strong winds<br>- Stabilizing exposed areas through | During detailed design and operation stages<br>During the operation stage<br>Pre-operational and during operation stages | |

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| | | underground blasting activity | progressive mine restoration<br>- Treating loose surfaces with dust suppressants, rock armoring or restore local vegetation<br>- Maintaining dust treatments, predominantly water on road surfaces and open mining areas<br>- Managing tailings surfaces to maintain sufficient moisture to prevent dust lift off as much as practical<br>• Develop a comprehensive dust monitoring plan and program that will quantify the effectiveness of control strategies and clearly identify the emissions associated with the Oyu Tolgoi operation from other regional sources | | |
| **2** | **Noise** | Disturbing the locals and camp occupants | • Construct at a distance which won't affect wintering quarters and settlements of households<br>• Plan and do an extra noisy activities during day time | | |
| **3** | **Surface and groundwater** | Water diversion structures and pipes to be installed during the road construction activity might affect the dry riverbed structure and alter flow pattern of spring and ephemeral flows and may affect vegetation in the vicinity of riverbed | • Plan water passing structure in accordance with flow regime<br>• Plan water diversion structure so that it won't impact surface water flow | | |
| | | Natural surface water beds might get affected by temporary impacts like fuel, lubricant and construction material waste during the construction of the water diversion and passing structures, pipes and buildings | • Not to bunker petrol near the dry riverbed<br>• Place fuel and lubricant storages at a minimum distance of 100 m from the dry river bed<br>• Identify precautionary measures for emergency cases of fuel and lubricant leakages, to take preventive measures | | |
| | | Construction materials could washed out by rain or flood in to surface and | • Manage covered temporary storage for necessary materials | | |

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| | | groundwater during the construction activity | • Avoid keep in oversized materials at the construction site | | |
| **4** | **Soil** | The soil will be removed and disturbed during land preparation of construction site and road | • Focus on making sure to keep the soil disturbance from the construction activity, and their maintenance work as little as possible on the area of construction site; to take measures in maintaining vehicle traffic on the designated strip of operational area<br>• Strip and stockpile the topsoil of the construction site and to use it for rehabilitation afterwards<br>• Start rehabilitation works as soon as construction complete in surrounding area<br>• Conserve excavated topsoil in special stockpiles covered and constantly maintained<br>• | | |
| | | Water flow might get altered and soil might get disturbed around the dry river bed and in areas where water diversion pipes and culverts are installed | • Keep the soil disturbance as little as possible during construction of the water diversion and water-passing structures | | |
| | | Soil might get polluted due to the potential accidents during hazardous and harmful substance transportation | • Carry out transportation of hazardous materials in accordance with the national and international standards and requirements, fully implement precautionary measures against soil pollution resulting from incidents like accidents by transporters and leakages during the transportation | | |
| **5** | **Flora** | Disappearance of 4 rare species registered in red book of Mongolia, 4 endangered, 9 endemics, and 2 ancient desert relicts due to project impacts | • Soil stripping and flora removing is necessary and impacts are unavoidable. Thus, damaged area shall be shaped according to relevant standards and rehabilitation conducted | | |

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| | | Vegetation degradation and dust rise due to equipment used for construction. This will affect increase of dustiness which will cause loose soil fly in air which will indirectly affect flora<br><br>Soil sphere will be prone to erosion due to destruction of flora<br><br>Useful pasture vegetations will degrade due to project, and pastures will be deficient eventually | in order to prevent loose soil to fly in air and produce dustiness<br>• Pay high attention and conduct measures for reduction of negative construction impacts on flora, and keep impacts of traffic and equipment and automobiles within lease area<br>• Method of natural seed scatter is to be used during rehabilitation<br>• Involve botanists in case of existence of rare vegetations prior to construction, carry out detailed survey on vegetation and follow their recommendations<br>• Rare and very rare plants that could be affected by the construction should be fenced and protected temporarily during construction<br>• Rare and endangered species of vegetation of Mongolia shall be replanted in association with botanists in case the construction inevitably affects them<br>• Commerce monitoring circle with radius from KHBogd mountain peak to last borehall for future rehabilitation program | | |
| **6** | **Fauna** | Habitat of rodents and reptiles recorded in the project area will be destroyed during soil stripping and earthmoving activities<br><br>Insect habitat might get affected due to earthmoving activities in the construction stage of project implementation<br><br>Indirect impact of ecological food chain balance loss may appear due to loss | • Organize activities for the protection of regional biological diversity and population number in cooperation with the local authority, environmental office and specialists, provide assistance if necessary<br>• Implement certain measures to keep the noise generated during construction of road in the infrastructure corridor at low level. In particular, to use equipments with great technical parameters and those that produce less | | |

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| | | and flee of certain species<br><br>May have an increase in the number of species of insects in relation to the technology and human formed environment (insects attracted to lights) | noise<br>• Conduct trainings, educate and arrange protection activities among employees engaged in project construction and operators on red book enlisted and endangered regional animals and ones enlisted in Appendix II of CITES<br>• The restoration of vegetation cover needs to include local or endemic plants which were originally found in that area. This will support rehabilitation of endemic insect species such as *Curculionidae, Chrysomelidae, Nocbuidae and Acrididae* | | |
| **7** | **Preliminary estimate of the cost on environmental protection plan for infrastructure corridor environment to be implemented during construction of road, power line and radio communication towers and transportation** | | | | ОТ ХХК |

### 3.4 Environmental Monitoring Program 2011

| **Monitoring** | **Environmental factor** | **Monitoring Parameter** | **Location** | **Frequency** | **Budget million. tugreg** |
|---|---|---|---|---|---|
| ***Air quality*** | Climate | Temperature, wind speed, Direction, relative humid, Solar radiation, rainfall, evaporation, snow fall, sublimation and evaporation by weighting method | Mine Site | Daily | 120.0 |
| | Dust | PM2.5, PM10, and TSP | DMP-LA01, DMP-LA02, DMP-LA03, DMP-LA04, DMP-LA05, DMP-Emulsion plant, DMP-Quarry batch plant and DMP-Petrovis | Monthly | 600.0 |

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| | Gas Emissions | SO2, NOx, CO, | GEMP-Boilers, GEMP-DS01, GEMP-DS02, GEMP-DS03, GEMP-DS04, GEMP-DS05, GEMP-DS06, GEMP-DS07, GEMP-DS08, GEMP-DS09, and GEMP-Quarry Batch Plant | Bimonthly | 206.9 |
| | Noise | Noise level | Around licensed area: NMP-LA01, NMP-LA02, NMP-LA03, NMP-LA04, NMP-LA05, NMPLA06, NMP-LA07, NMP-LA08, NMP-LA09;<br>Diesel station: NMP-DS01, NMP-DS02 | Quarterly | 37.5 |
| | Noise | Noise level | Necessary some workplace: such as NMP-WWTP | Annually | 85.0 |
| ***Noise and ground vibration*** | Monitoring | Noise level during blast | At the nearby herders camp sites surrounding OT lease, nearby human settlements including mine camp and offices | To be established | 35.0 |
| | Monitoring | Ground vibration | At the nearby herders camp sites surrounding OT lease, nearby human settlements including mine camp and offices | To be established | 55.0 |
| ***Soil quality*** | soil conditions - quality | Erosion, fertility, moisture, temperature, pH, salinity, soil stratum thickness, Heave metals | SMP-LA01, SMP-LA02, SMP-LA03, SMP-LA04, SMP-LA05 | Annually | 160.0 |

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|---|---|---|---|---|---|
| | Physical, Chemical characteristics | Temperature, moisture, contamination, mechanical texture, carbonate, Ca, Mg, P2O5, K2O, Soil pH, fertility, N, P, heave metals | Around Diesel station: SMP-DS01, SMP-DS02, SMP-DS03, SMP-DS04, SMP-DS05, SMP-DS06, SMP-DS07, SMP-DS08, SMP-DS09, SMP-Quarry batch plant, SMP-Warehouse, SMP-Petrovis, SMP-Emulsion plant, SMP-Explosive magazine | Twice per year | 34.5 |
| | Soil health, hygiene | Bacteria and infection in 1cm3 | Around Diesel station: SMP-DS01, SMP-DS02, SMP-DS03, SMP-DS04, SMP-DS05, SMP-DS06, SMP-DS07, SMP-DS08, SMP-DS09, SMP-Quarry batch plant, SMP-Warehouse, SMP-Petrovis, SMP-Emulsion plant, SMP-Explosive magazine | Twice per year | 10.0 |
| | Physical, Chemical and Bacteriological characteristics | pH, N, P, Heave metals, Bacteria and infections in 1cm3. | Clay from WWTP | Annually | 12.5 |
| Vegetation | Monitoring | Average height, biomass [kg/ha], cover in 25mx25m area, species composition, abundance, | 6 plots GPS location provided in EIA | Annually | 450.0 |
| | Restoration | Plant restoration condition and rehabilitation status | TSF, WRD, closed roads, and other rehabilitated areas | Annually | 120.0 |
| | Tree | Elm tree quantity and survival condition | in east of OT lease | Annually | 45.0 |
| Fauna | Rare plant | rare plant, distribution, density | in OT lease and project areas | Annually | 45.0 |

| | | | | | |
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| | Birds | Biodiversity; population dynamics, movement and migration and life style | Around licensed area: FMP-LA01, FMP-LA02, FMP-LA03, FMP-LA04, FMP-LA05, FMP-LA06, FMP-LA07, FMP-LA08, FMP-LA09, FMP-LA10, FMP-LA11, and FMP-LA12 | Annually | 170.0 |
| | Migratory species | Biodiversity, population dynamics, movement and migration and life style | Ulaan tolgoi, Ulaan tolgoi well, Khukh khad, Maanit spring, Burkhant spring, and near to Ikh ger | Annually | |
| | Reptiles | Biodiversity, population dynamics, movement and migration and life style | Dugat well and its surrounding | Annually | |
| | Invertebrates | Biodiversity, population dynamics, movement and migration and life style | Around licensed area: FMP-LA01, FMP-LA02, FMP-LA03, FMP-LA04, FMP-LA05, FMP-LA06, FMP-LA07, FMP-LA08, FMP-LA09, FMP-LA10, FMP-LA11, and FMP-LA12 | Annually | |
| Water quality | Shallow dug wells | Depth to water level, discharge, cross sectional area | Streams: Bor ovoo, Khukh khad, Maanit, Burkhant, Elgen, Nogoon dov, Guni<br><br>Wells: Khers, Khaliv, Hoyor mod, Khukh Khad, Maanit wells, HW138, and HW14 boreholes | Monthly | 160.0 |
| | Surface water | Flood measurement | Undai river, and its mouths and other rivers | every hour (during the flood) | 150.0 |

| | | | | | |
|---|---|---|---|---|---|
| | Physical and Chemical characteristics | pH, tem, DO, TDS, EC, taste, smell, color, cat, anion, nutrients, trace metal, CaCO3, Ca, Mg, Na, K, SO4, NO2, NO3, NH4, As, Cd, Cu, Hg, Pb, Zn, Cr, Fe, Ni, CN,taste, color, smell | Streams: Bor ovoot, Khukh Khad, Maanit and Burhant<br><br>Wells: Khers, Khaliv Shand, Hoyor mod, khukh khad, and Maanit | Quarterly | 320.0 |
| | Physical, Chemical and Bacteriological characteristics | pH, O2, XXX-Mn, БXX5, cyanide, NH4, N, NO2, NO3, PO4, CL, F, SO3, SO4, Mn, Ni, Cu, Mo, Cd, Co, Pb, As, Cr, Cr6+, Zn, Hg, Se, Fe, phenol, Benzaperin, trichloreetalon SS, TDS, Temperature,taste, color, smell, Bacteria and infection in $1cm^3$ | Input and output water of WWTP | Quarterly | 16.0 |
| | **Acid rock drainage** | To be monitored Acid rock drainage at waste rock dumps. | Waste rock dumps. Waste storage facility, dumps of low grade ore | To be established | 320.0 |
| | | -to be drilled 9 monitoring well around waste rock dumps and waste storage facility. | Waste rock dumps and waste storage facility. | Monthly | 315.0 |
| | | pH, TDS, (CaCO3), dissolved $O_2$, БXX, XXX, Ca, Mg, Na, K, $SO_4$, $NO_2$, $NO_3$, $NH_4$, As, Cd, Cu, Hg, Pb, Zn, Cr, Fe, Ni, taste, smell, color | Monitoring wells around at land fill area. (which is included to the drawings and prepared wells); | Weekly and daily if there is any bad result | 110.0 |

# 4 GUNII HOOLOI GROUNDWATER RESOURCE AND PIPELINE

## 4.1 Location and description of the project:

One of the infrastructures that would support Oyu Tolgoi project activities is to build a complete water supply facility for water needs of concentrator in Oyu Tolgoi deposit. Deep aquifer of Gunii Hooloi located in the territory of Bayan bag in Khanbogd soum, Umnugobi province has been selected as a resource for water supply to the mine production based on several years' hydrogeological investigations, researches and detailed environmental impact assessment. The aquifer is located 82.2 km north east of the Oyu Tolgoi licensed area. The following activities shall be carried out covering 1030 hectare area within the scope of the project for Gunii Hooloi groundwater resource and pipeline:

- Major wells – 28;
- Reserve wells – 4;
- Emergency water tank with a capacity of 400,000 $m^3$;
- Pumping stations;
- Water reservoirs;
- Groundwater pipeline with the length of 148.9 km;
- 110 KV electric power transmission line;
- Gravel road for services and maintenances;

**Capacity:** During the peak operational period of the mine, 785 liter water will flow through the pipeline per a second. At the maximum capacity, it is estimated that 900 liter water can flow through the pipeline per a second.

**Implementer of Detailed Environmental Impact Assessment:** "Detailed Environmental Impact Assessment Report for Oyu Tolgoi water supply from Galbiin Gobi and Gunii Hooloi aquifers" was approved by the Ministry of Nature and Environment in 2005. The detailed environmental impact assessment was conducted by Eco-Trade LLC, a consulting firm specialized in Environmental Impact Assessment.

Moreover Eco-Trade LLC submitted an Environmental Impact Assessment report for "Supplying water from Gunii Hooloi aquifer through a pipeline for the needs of Oyu Tolgoi project" to the Ministry of Nature, Environment and Tourism in 2009-2010. Afterward the report was approved by the ministry.

Jamp LLC, a consulting firm for environment research and assessment, developed the most recent Environmental Monitoring Program and Environmental Protection Plan based on the further research, analysis and assessment due to the change of water resource for consumption to 870 l/sec in Gunii Hooloi aquifer in 2010.

**4.1 Environmental Protection Plan – 2011**

| No | Environment | Potential and apparent impacts | Actions to protect the environment and to minimize impacts of the project | Budget (Tugrug) | Responsible organizations |
|---|---|---|---|---|---|
| 1. | Air quality | Dust increases in the air because of heavy equipment operation and stripping off top soil for construction work.<br><br>Polluted smoke emission from machines and equipment causes air pollution.<br><br>Dust and toxic gas that have been spread to the air during project activities would settle on plants and soil.<br><br>The increase of the toxic gas in the air changes elements of precipitation. | Use specifically designated roads during the construction work. Cover the road with quarry and spray the road regularly with water. Close the roads that are no longer in use and rehabilitate them. (Measure amount of the dust during construction work.)<br><br>Construction materials such as sand and cement should be kept in an appropriate place in order to prevent from dust caused by wind.<br><br>Use machines and equipment that meet standard for emission of toxic gas. The machines should be checked regularly for the amount of toxic gas and for technical services and maintenance.<br><br>Dust reduction program helps to control negative impacts on the employees' health. | Specify in the Dust Reduction Program<br><br>Allocate in the operational expenses<br><br>Specify in the Dust Reduction Program | Environmental Department of OT LLC and a contracted supplier of the construction work<br><br>Project Administrative Unit<br><br>Environmental Department and Health and Safety Department. |
| 2. | Land surface | In total 60.7 hectare area (water reservoirs, pumping stations, emergency water tanks and deep wells) shall be used as a site for construction works.<br><br>142.7 km long and 0.2 m deep road to use for maintenances and services shall be built covering 71.2 hectare area. 142,400 $m^3$ area is stripped off top soil for the road construction.<br><br>In total 21.78 hectare area | Top soil should be separately removed and stockpiled during the construction work. After completion of the construction, the disturbed land should be rehabilitated and re-vegetated.<br><br>Disturbed areas from temporary roads that have been used for constructing electric power transmission lines and roads should be rehabilitated with the fertile top soil.<br><br>If the land is no longer for the operation, then rehabilitation should be done in accordance with the rehabilitation and mine closure planning. | Allocate in the Rehabilitation and Mine closure planning<br><br>Allocate in the operational expenses<br><br>Not possible to estimate in advance | Environmental Department of OT LLC<br><br>Environmental Department of OT LLC and a contracted supplier of the construction work<br><br>Environmental Department<br><br>Environmental |

| No | Environment | Potential and apparent impacts | Actions to protect the environment and to minimize impacts of the project | Budget (Tugrug) | Responsible organizations |
|---|---|---|---|---|---|
| | | shall be directly disturbed by excavating channels for main water pipelines.<br><br>Stockpiled top soil and stones from excavation of the channels create indirect impact on the soil and vegetation of the site. | Batch Plants that supplied quarry to the construction of roads and electric power lines should be rehabilitated once the construction work is completed. | Not possible to estimate in advance<br><br>Not possible to estimate in advance | Department<br><br>Environmental Department |
| No | Environment | Potential and apparent impacts | Actions to protect the environment and to minimize impacts of the project | Budget (Tugrug) | Responsible organizations |
| 3. | Surface water bodies and groundwater | Construction materials can be washed out by the flood water and any forms of precipitation. Thereafter substances in the construction materials can penetrate to the soil contaminating aquifers near the surface.<br><br>There might be negative impacts on herders' wells and vegetation layer, which are supplied by natural surface water, if the flow of the surface water is blocked.<br><br>Due to the damages in water collection tanks, water leaks to the surrounding areas wasting groundwater inefficiently.<br><br>Sites where transformers placed along the electric power transmission lines can be flooded. | During the storage and transportation of construction materials, any forms of contaminations should be avoided by creating safe and healthy conditions. Restrict activities such as fuel distribution and technical service for machines and equipment.<br><br>Trenches and slopes of the land surface should be preserved without any change in their natural formations by constructing channels in appropriate places. It should be specified in the planning and designing process of construction activities.<br><br>Repairing and maintenance actions should be taken without any delay in case of failures and damages.<br><br>Channels and dams should be built around the sites of main pipelines, road for maintenance and services, water reservoirs and emergency water tanks in order to prevent from flood water. | Allocate in the budget of construction works<br><br>Not possible to estimate in advance<br><br>Not possible to estimate in advance | Environmental Department of OT LLC and a contracted supplier of the construction work<br><br>Maintenance Department<br><br>Environmental Department of OT LLC and a contracted supplier of the construction work |
| No | Environment | Potential and apparent impacts | Actions to protect the environment and to minimize impacts of the project | Budget (Tugrug) | Responsible organizations |
| 4. | Soil | In total 60.7 hectare area (water reservoirs, pumping | There is no way to preserve land surface in order to launch construction works and | Not possible to estimate | Environmental Department of |

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|---|---|---|---|---|---|
| | | stations, emergency water tanks and deep wells) shall be disturbed by construction works.<br><br>142.7 km long and 0.2 m deep road to use for maintenances and services shall be built covering 71.2 hectare area. 142400 $m^3$ area is stripped off top soil for the road construction.<br><br>21.78 hectare area shall be directly disturbed by excavation of channels for main water pipelines. Depths of excavated soil are various depending on the soil structure. When the excavated soil is temporarily stockpiled, surface and plants under the dumped top soil shall be pressed down.<br><br>Land degradation caused by the movement of heavy machineries and the removal of top soil.<br><br>Leak of flammable and lubrication materials, toxic chemical substances contaminating soil.<br><br>Because of the flood water and precipitation, construction materials can be washed out. Thereafter substances in the construction materials can | hence, the top soil has to be removed (destroying plants). However top soil should be removed according to the proper planning and designing. After completion of the construction, the disturbed land should be rehabilitated and re-vegetated.<br><br>After installing water supply pipelines to the channel, the disturbed land should be rehabilitated and flattened with high quality topsoil which is stockpiled for future rehabilitation. During the construction work, dust monitoring and reducing activities should be undertaken regularly.<br><br>The light brown soil of Gobi is vulnerable to heavy rain and flood water and therefore it is recommended to always avoid from any activities that might disturb the land. For example, vehicles should travel through an only designated road.<br><br>Flammable and lubrication materials, toxic chemical substances should be stored in a secure place complying with requirements and conditions of standard. Regularly check completeness of the materials.<br><br>Construction materials also should be stored in a suitable place far from temporary water flow and trenches.<br><br>Take all necessary actions to prevent from leakage of flammable and lubrication materials and chemical substances. Make the leakage absorbent materials available at the sites. Provide relevant trainings and instructions to employees.<br><br>Record every case of contaminations and | in advance<br><br>Allocate in the operational expenses<br><br>10,000.00<br><br>Allocate in the operational expenses<br><br>Allocate in the operational expenses<br><br>Allocate in the operational expenses | OT LLC and a contracted supplier of the construction work<br><br>-<br><br>-<br><br>Environmental Department<br><br>Environmental Department of OT LLC and a contracted supplier of the construction work |

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| | | penetrate to the soil contaminating aquifers near the surface.<br><br>Groundwater contamination due to waste disposal in an open area. | minimize and clean their impact. Contaminated soil should be transported to the designated area at Oyu Tolgoi mine. All classified waste materials are transported to Oyu Tolgoi mine site for recycling and ultimate disposal by using the environmentally sound manner. | | |
| No | Environment | Potential and apparent impacts | Actions to protect the environment and to minimize impacts of the project | Budget (Tugrug) | Responsible organizations |
| 5. | Flora | Vegetation covering 154.8 hectare area will be destroyed by the construction work for water supply pipeline.<br><br>Construction machines and equipment creates dust and degradation of soil. Therefore amount of the dust in environment will increase.<br><br>Dust from soft soil settles on the vegetation causing indirect impact. | Rehabilitation and re-vegetation activities should be carried out on the disturbed area after the completion of construction works to prevent dust formation from soft soil.<br><br>Only main roads should be used for the traffics of maintenance and services. If there is any indication of forming branch roads, it should be observed and prevented since new roads are harmful to vegetation cover.<br><br>Dust monitoring and reduction activities are required to stop, prevent and minimize negative impacts to air quality. | Specify in the Dust Reduction Program<br><br>Specify in the Dust Reduction Program | Environmental Department and Maintenance Department of OT LLC<br><br>Environmental Department of the OT |
| 6. | Fauna | Animals in the project area will escape associated with the noises of vehicles and equipment during the construction of water supply pipeline and dust from earth works.<br><br>Animals will leave their territory during the transportation through the road for services and maintenances and also utilization of the equipment in water supply pipeline.<br><br>Increase illegal hunting for rare and endangered species of | Cooperate and provide support if necessary to local administration, environment unit and experts in order to preserve regional biodiversity.<br><br>Keep the noises related to the utilization of project facilities as low as possible. For instance, use equipment and machines with good technical specifications. Moreover the equipment and vehicles should not produce loud sounds.<br><br>When designing and planning certain facilities, paths for animal migration should be taken into consideration. There must be room for animals to pass through fences, roads and other facilities along the possible | Not possible to estimate in advance<br><br>Allocate in the operational expenses<br><br>Allocate in the operational expenses | Project Administrative Unit and Environmental Department of OT LLC<br><br>Project Administrative Unit<br><br>Project Administrative Unit |

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| | | animals. | migration paths. | | |
| 7. | Archeology | Historical and cultural heritages have been discovered at the sites 1.8-6.4 km distant from impact area of water supply pipelines. Therefore the sites of historical and cultural findings will not be affected by the project. | Project activities shall be temporarily stopped at the certain sites of new archeological discoveries while constructing water supply pipeline. Subsequently discovery of cultural and historical heritages shall be informed to the local administration and professional organizations. The project shall cooperate with those local organizations. | Not possible to directly allocate | Environmental Department of OT LLC and a contracted supplier of the construction work |
| **Total expenditures of the Environmental Protection Plan -2011 for construction and utilization of water supply pipelines** | | | | **Tugrug:** | |

**4.3 Environmental Monitoring Program 2011**

| No | Environmental impacts | Descriptions of monitoring | Sites for the monitoring | Duration and frequency of the monitoring | Budget (Tugrug) |
|---|---|---|---|---|---|
| 1. | Air quality and dust monitoring | Total amount of the dust with a size of <10µm (PM10). | In the 4 sites along the water supply pipelines. Each one of the monitoring sites is located out of project impact. (The site area has very little anthropogenic influence. It is along the pipeline within 2 km.) | Once in April and October during the construction period. Once in a year during the operational period. | 70,000 *8 sites (during the operational period, twice per a year.) |
| 2. | Soil | Study for land disturbance through weather forecast stations and HC1-5<br>Changes for overall situation of land surface. | Along the water supply pipeline for 5 days (daily salary of expert) * 40 years<br>Total area of underground aquifer<br>3 days (daily salary of an expert). | Once in a year.<br><br>Once in 3 years. | |
| 3. | Surface and groundwater | pH, TDS (total salination (by weigh)), total hardness ($CaCO_3$), dissolved oxygen, taste, odor, color and content of БХХ, ХХХ, Ca, Mg, Na, K, $SO_4$, $NO_2$, $NO_3$, $NH_4$, As, Cd, Cu, Hg, Pb, Zn, Cr, Fe and Ni. | Four wells including Khevtee bor, Suhain us, Shavagiin khudag and Ergiin us.<br><br>In the 12 sites inclusive of streams and ponds in the project site and its surrounding area. | Once in April and August starting from the date of the groundwater supply. (Twice per a year * 4 wells)<br>Once a year during the project implementation period. 3 days * 50,000 (daily salary of an expert). | |

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| 4. | Soil structure and dryness | Natural moisture of soil, fungus, thickness of fungus layer, pH, mechanic structure, nitrogen, phosphorus, heavy metal, bacteria in 1 $cm^3$. | In the 10 sites. (Anthropogenic influence less. Located along the water supply pipeline within 2 km.)<br>Sampling and laboratory examination are required. | Once a year during the project implementation period. | |
| 5. | Vegetation | Density of vegetation, number of species in $25m^2$ area and biomass. | In 10 sites. (Anthropogenic influence less. Located along the water supply pipeline within 2 km.) | Once a year (in July) throughout the whole period of utilization<br>3 persons/day * 50,000 tugrug | |
| 6. | Fauna | Count and register wild animals, migration, research of species (Involve Mongolian professional organizations.) | Along the water supply pipeline and project site and its surrounding areas. | July of each year during the utilization period | |
| **Total expenditures of the Environmental Monitoring Program - 2011 of the water supply pipelines** | | | | **Tugrug:** | |

# 5. OYU TOLGOI – GASHUUN SUKHAIT ROAD AND INFRASTRUCTURE PROJECT

## 5.1 Location and description of project

The critical part of Oyu Tolgoi Project integrated development is the road network and connection to the electric powerline grid since the Oyu Tolgoi is located remote area where no infrastructures networks exist. The option to develop OT-GS infrastructure development is chosen and feasibility study, detailed engineering designs and EIA reports been developed to build paved road between OT and GS border and also build 220kv transmission powerline from Inner Mongolian power grid.
Project is located Javkhlant and Nomgon bag of Khanbogd soum, Southgobi aimag. The instrastructure corridor starts from OT mine site and ends at GS border check point.

*Paved road*
The 96.8km long paved road will be state owned, III level road with two lanes 10m roadway with 2m sideways which makes total width of road 14m, average height of 0.45m, average cuts are 0.3-6.4m deep. As per preliminary estimate from 40 000 to 50 000 cubic meter water and 820 000 cubic meters of borrow materials are required for construction work. The engineering geotechnical survey conducted in area along road alignment in order to explore potential borrow material source location and expected to utilize 17 borrow pits for the interim. Water resource is currently under determination, and water exploration will take place within 10 km wide areas following the road route. Borrow pits and water boring have not been included in the Specially Protected area due to non-approval of permit, consequently extensive haulage of fill material and water will be required in this area. The contractor will provide concrete and asphalt batch plants and possibly rock crushing plants. Road construction contract will be awarded to a single Mongolian contractor. The construction worker's temporary camp will be build in approximately 60km SE from OT site.

*Transmission line*
The 220Kv transmission lines are 95km long from OT site to the China border directly. According the the engineering design the number of power circuits is two, average distance between towers are 300m and minimum height of energized conductor at the tower is 25m, suggested rogth-of-way widthe for double circuit 220Kv lines are 60m. There is no track adjacent to transmission lines in the final design, so that the construction impact route will be re-instated. The lines will be erected by three separate Mongolian contractors each having approximately equal scope of work.

*DTR tower*
Within the frame of OT-GS infrastructure corridor development a DTR tower will be erected at the distance of 32 km SE from OT site. other two DTR tower locations are planned in OT site and GH area respectively.

## 5.2 Implementation time

- Road construction: from March 2011 to September 2012
- Transmission lines: February 2011 to September 2011
- DTR tower #2: December 2010 to March 2011.

Location map of OT-GS infrastructure corridor is attached.

### 5.3 Environmental Protection Plan – 2011

| # | Environmental Component | Potential impacts | Mitigation measures | Cost (thou.tug) | Responsibility |
|---|---|---|---|---|---|
| 1 | **Ambient air** | The potential dust sources from the construction and operation of the proposed infrastructure corridor include:<br>• Land clearing during road, power line and radio communication tower construction<br>• Traffic on unsealed roads<br>• Spillage from haulage trucks<br>• Borrow pit excavation and stockpiling of road building materials<br><br>Ambient air pollution by the toxic substances emitted from the haulage trucks | • The use of water trucks during road, power line and radio communication tower construction to suppress dust from earthmoving equipment and vehicles by using dust suppressing compound which should be environmentally friendly,<br>• Limit vehicle speed on unsealed roads (before or during construction activities),<br>• Rehabilitate borrow pits and old unused tracks along the access route to encourage plants grow naturally,<br>• Limit land disturbance from road, power line and radio communication tower construction as low as practicable,<br>• Ensure a minimum separation distance from nomadic winter camp sites,<br>• Comply with Mongolian emission standards or appropriate international standards for all vehicles used on the project including: emissions from petrol engines (MNS 5031:2003) and emissions from diesel engines (MNS 5014:2003), | | |
| 2 | **Noise** | Disturbing the locals | • Construct at a distance which won't affect wintering quarters and settlements of households | | |
| 3 | **Surface and groundwater** | Water diversion structures and pipes to be installed during the road construction activity might affect the dry riverbed structure and alter flow pattern of spring and ephemeral flows and may affect vegetation in the vicinity of riverbed | • Plan water passing structure in accordance with flow regime<br>• Plan water diversion structure so that it won't impact surface water flow | | |
| | | Disturbance and erosion in banks of dry | • Keep the disturbance of river bed banks | | |

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| | | riverbed might increase during construction activity of road and bridge | at minimum during road construction<br>• Restore disturbed banks of ephemeral flow bed and to reduce further disturbance risk | | |
| | | Natural surface water beds might get affected by temporary impacts like fuel, lubricant and construction material waste during the construction of the water diversion and passing structures, pipes and bridge | • Not to bunker petrol near the dry riverbed<br>• Place fuel and lubricant storages at a minimum distance of 100 m from the dry river bed<br>• Identify precautionary measures for emergency cases of fuel and lubricant leakages, to take preventive measures | | |
| | | Due to consumption of pre-estimated amount of 60622.19 $m^3$ of water for ambient dust suppression and road construction, shallow groundwater level might drop for a certain period and resource might get exhausted and it might affect the water wells of some herder families and springs | • Register the groundwater boreholes and water wells in the vicinity of those<br>• Regularly monitor the groundwater boreholes at a distance of up to 1 km on a certain frequency during water extraction period<br>• When extracting water from boreholes for road construction activity, discuss with and hear opinion from herder families who owns the wells nearby those boreholes,<br>• Carry out monitoring program on water wells of local community along the road alignment during the construction and to define amount and quality of water<br>• If drastic decrease in the water level is observed in wells used by the herder families, identify other available water resource on basis of the discussion with local herders and to provide possibility for them to access that water resource | | |
| **4** | **Soil** | The soil will be disturbed by road and power transmission line construction | • Focus on making sure to keep the soil disturbance from the road construction activity, installation of electricity transmission line and radio communication towers and their | | |

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| | | | maintenance work as little as possible on the area of road and overhead electricity transmission line; to take measures in maintaining vehicle traffic on the designated strip of operational area<br>• Strip and stockpile the topsoil of the borrow pits along the road alignment and areas of installation for overhead electricity transmission line and radio communication towers and to use it for rehabilitation afterwards<br>• Place horizontal trench along the old road after the commission of paved road and to restrict further vehicle traffic, provide condition for re-vegetation and open-up the possibility for reclamation of soil and re-vegetation of those uncontrolled numerous auxiliary roads along the new road | | |
| | | Water flow might get altered and soil might get disturbed around the dry river bed and in areas where water diversion pipes and culverts are installed | • Keep the soil disturbance as little as possible during construction of the water diversion and water-passing structures | | |
| | | Soil might get polluted due to the potential accidents during hazardous and harmful substance transportation | • Carry out transportation of hazardous materials in accordance with the national and international standards and requirements, fully implement precautionary measures against soil pollution resulting from incidents like accidents by transporters and leakages during the transportation | | |
| **5** | **Flora** | Construction of 100 m wide and 96.8 km long paved road and power transmission lines, maintenance and service road, and radio towers will affect vegetation grown in total of 1110.65 hectares of area, major impacts specially for flat desert | • Soil stripping and flora removing is necessary and impacts are unavoidable. Thus, damaged area shall be shaped according to relevant standards and rehabilitation conducted in order to prevent loose soil to fly in air | | |

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| | | steppe<br><br>Unavoidable disappearance of flora in 211.52 hectares of area due to construction of paved road, maintenance and service road for power transmission lines, water drainage trenches, and fundaments for power lines<br><br>Disappearance of 4 rare species registered in red book of Mongolia, 4 endangered, 9 endemics, and 2 ancient desert relicts due to project impacts<br><br>Vegetation degradation and dust rise due to equipment used for construction. This will affect increase of dustiness which will cause loose soil fly in air which will indirectly affect flora<br><br>Soil sphere will be prone to erosion due to destruction of flora<br><br>Useful pasture vegetations will degrade due to project, and pastures will be deficient eventually | and produce dustiness<br>• Pay high attention and conduct measures for reduction of negative construction impacts on flora, and keep impacts of traffic and equipment and automobiles within infrastructure corridor<br>• Method of natural seed scatter is to be used during rehabilitation<br>• Involve botanists in case of existence of rare vegetations prior to construction, carry out detailed survey on vegetation and follow their recommendations<br>• Rare and very rare plants that could be affected by the construction should be fenced and protected temporarily during construction<br>• Rare and endangered species of vegetation of Mongolia shall be replanted in association with botanists in case the construction inevitably affects them<br>• Use of paved road will positively affect recovery of soil and flora grown on numerous pattern less roads and relieving of compacted soils on roads that area out of use. Traffic of trucks will be restricted which will create suitable conditions for seeds to scatter by wind and grow | | |
| **6** | **Fauna** | Wildlife inhabiting in the vicinity might flee and lose habitat during the construction of power line, bridges and road due to noise generated from the traffic of machineries and vehicles, and due to dust generated from the | • Organize activities for the protection of regional biological diversity and population number in cooperation with the local authority, environmental office and specialists, provide assistance if necessary<br>• Implement certain measures to keep the noise generated during construction | | |

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| | | earthmoving activities<br><br>Habitat of rodents and reptiles recorded in the project area will be destroyed during soil stripping and earthmoving activities<br><br>Some rare and endangered species and Mongolian red book enlisted species like Asiatic wild ass and black tailed gazelle's distribution area might get affected significantly during the construction of the power line, road and bridge<br><br>Insect habitat might get affected due to earthmoving activities in the construction stage of project implementation<br><br>Temporary deficiency of pasture for livestock and wildlife during road and power line construction<br><br>Indirect impact of ecological food chain balance loss may appear due to loss and flee of certain species<br><br>Increased poaching of rare, endangered and red book enlisted game animals species along the paved road | of road in the infrastructure corridor at low level. In particular, to use equipments with great technical parameters and those that produce less noise<br>• When panning the design of the road, pay close attention on not to interfere with the migration route of regional fauna, in particular to ensure possibility for wildlife to pass freely in sections where migration could occur and to build road crossing when constructing dam, security fences for road and other structures<br>• Install bird repellent on power transmission lines in order to prevent birds from sitting on power transmission lines and erect special lines and build artificial nests for predator birds in places where small rodents are plenty<br>• Conduct trainings, educate and arrange protection activities among employees engaged in project construction and operators on red book enlisted and endangered regional animals and ones enlisted in Appendix II of CITES<br>• To not build any bridges and crossings nearby surface water resource during road and construction work where wildlife drink water<br>• Place road signs and warnings properly and clearly in potential animal crossing sites and in places densely populated by local herdsmen and pastured by livestock<br>• Provide support for survey program on fauna inhabiting in SGSPA and its buffer zone and along the infrastructure | | |

| | | | | | |
|---|---|---|---|---|---|
| | | | corridor | | |
| 7 | **Preliminary estimate of the cost on environmental protection plan for infrastructure corridor environment to be implemented during construction of road, power line and radio communication towers and transportation** | | | | ОТ ХХК |

**5.4 Environmental Monitoring Program 2011**

| № | Environmental component | Monitoring parameter | Location | Frequency | Preliminary cost |
|---|---|---|---|---|---|
| 1 | Air quality | Dust , Total suspended particulate (TSP), $PM_{10}$ | DMP-1, DMP-2, DMP-3, DMP-4<br>DMP-5, DMP-JaBa, DMP-KhO, DMP-TsKh, DMP-GaSu | Monthly | |
| | | Gas emission, CO, CO2, SO2, NO2, O2, CH4, NH3, Pb | GEMP-1, GEMP-2 GEMP-3, GEMP-4 GEMP-5, GEMP-JaBa<br>GEMP-KhO, GEMP-TsKh, GEMP-GaSu | Annually | |
| 2 | Soil | Физик үзүүлэлтүүд, органик бодисууд, нийт азот, карбонат, Ca, Mg, $P_2O_5$, K2O, хөрсний pH, Pb, Cd, As, Zn, Се-ийн агууламж | - Bor Khushuu<br>- Khongor Ovoo<br>- Tsagaan khad<br>- Gashuun Sukhait | Quarterly | |
| 3 | Surface and groundwater | pH, -TDS, total hardness (CaCO3), Ca, Mg, Na, K, SO4, NO2, NO3, NH4, As, Cd, Cu, Hg, Pb, Zn, Cr, Fe, Ni, | Bogotr khuuvur spring & HDW, Ikh Gunii HDW; Tsagaan khand HDW | Quarterly | |
| 4 | Flora | Plant densiy, 25$м^2$ biodiversity , biomass | - Bor Khushuu<br>- Khongor Ovoo<br>- Tsagaan khad<br>- Gashuun Sukhait | Quarterly | |

| № | Environmental component | Monitoring parameter | Location | Frequency | Preliminary cost |
|---|---|---|---|---|---|
| **5** | **Fauna** | Population and movement of migratory species, reptiles, birds, rodents | Along road route | Annually | |

## 6. CONSTRUCTION OF PERMANENT AIRPORT

### a. Loaction and description of the project

As Oyu Tolgoi LLC is located at the distance of 10 kilometers north of the mine site of the Oyu Tolgoi project in Umnugobi province, the permanent airport shall be built in the north of the currently used local temporary airstrip (Figure 1). The proposed permanent local airport will facilitate swift and straightway travelling between OT mine site and Ulaanbaatar city for the project employees and local people.

An airstrip for takeoff and landing for the type of aircraft such as the Boeing-737 to 800 paved with concrete will be constructed with the related facilities. These include a 3250 meters long runway for takeoff and landing, pavement, runway end safety area, platform, an area for placing aircrafts and a facility for service and maintenance of the aircrafts, control tower, passenger terminal, departure lounge, car parking lot, signboard for the airstrip, lighting for the airstrip as well as power supply facility, building a fence and a trench to divert the surface water.
The airstrip, building for terminal, control tower and the car parking lot shall be fenced around with a 1.8 meters tall chainlike formed protective iron net.
5.2 kilometers of gravel road stretching from the south to the south east of the permanent airport will be constructed up to the OT-KB improved dirt road.

*Sand and gravel mine*
A geotechnical survey was conducted to study the selected area’s soil, quality and mechanical properties of infill materials and to identify the local construction materials that can be used for the construction of the basement layer, embankment, and the surface of the airstrip.
The detailed engineering design of the airstrip is prepared and the general design and the drawings for the construction of the basement layer and the embankment are prepared, and their thickness is determined based on the survey results. Analysis of the local construction materials which can be used for the construction of the airstrip are conducted and the composition of the fragmental textures of 5-10 mm, 10-20 mm, 20-40 mm, and 40-800 mm dimensions were identified.

Settling the location of the carrier to be used for the construction infill is underway and the extraction shall be carried out with the use of the grinding/screening and grading equipments that are capable of producing infill materials to the required quality and amount.
[The resistance of the material to bear the pressure shall be not less than 600kg/$m^2$].

*Fuel storage*
Aircraft from Ulaanbaatar to Oyu Tolgoi is expected to fill up fuel; hence the construction of fuel storage facility is unnecessary. Only low volume fuel tanks to keep fuel for the power generators which will supply power during the airport construction and operation will be placed.

*Water supply*
Water to be consumed during the construction and the operation of the airport will be supplied by transporting from the OT mine site.

*Sewage and waste*
A sewage collection tank will be placed around the airport and the collected sewage will be pumped and transported to the mine site’s sewage treatment facility. Garbage bins for classifying solid wastes shall be placed in work places and at the site and the wastes shall be transported to the Oyu Tolgoi mine site and disposed to the designated dumping sites.

*Employees’ temporary accommodation*
Construction workers will be accommodated in the camp at the mine site.

*Duration to implement the project*
The construction will start in March /April 2011 and will be completed by January 2012.

*Annexed map* – Location of the airport

### 6.1 Environmental Protection Plan - 2011

| № | Components of the environment | Potential impact | Mitigation measures | Budget (thous.MNT) | Responsibility |
|---|---|---|---|---|---|
| **1. DURING THE CONSTRUCTION OF THE AIRPORT** | | | | | |
| **1.** | **AIR** | Air pollution | • Irrigate dust producing sources such as construction site, dirt dumps, and covering fine grain construction materials such as cement and sands | | Construction Contractor company |
| | | | • Monitor air dust level | | OT LLC, Env.Dept. |
| | | Noise, vibration | • Measure noise level, rationally plan use of equipments with noises, and reduce ineffective usage | | OT LLC, Env.Dept., Construction Contractor company |
| **2.** | **SOIL** | Soil pollution, erosion, degradation | Take measures to rehabilitate soil erosion, soil destruction emerged as a result of the construction activity:<br>Rehabilitate and re-vegetate **42.65 ha** of eroded land which consists of:<br>• 16.25 ha of area with the length of 50 meters along the 2 sides of the 3250 meters airstrip,<br>• 0.2 ha of area near the pavement and the end safety area (100m x 10m), platform and aircraft placing area (50 m x 20 m),<br>• 1.6 ha of area that are eroded as a result of the iron fence (8000 x2) around the airstrip, terminal building, control tower and the car parking lot<br>• 1.0 ha of area emerged due to the construction of the terminal building and the car parking lot and,<br>• 26 ha of area or 50 m of eroded land alongside the 5.2 m of gravel road.<br>• Stripping soil of … ha of disturbed total area and make a pile for future rehabilitation use after the construction work finishes<br>• Plant at least 20 gobi trees and shrubs in front of the terminal building<br>• Take all possible measures to prevent from leakage and outage of oils, lubricants and chemicals, place absorption materials at the all necessary points, regularly provide training for employees on measures to take during the | | OT LLC, Env.Dept. |

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| | | | leakage<br>• Record every cases of leakage and outage of oils and lubricants, transport polluted soils in the designated field and neutralize, and prevent from spreading of pollution in the environment each time. | | |
| | | | • Conduct soil pH, sulfate, nitrate analysis (in the production site). | | OT LLC, Env.Dept. |
| **2. DURING THE OPERATION OF THE AIRPORT** | | | | | |
| **1.** | **AIR** | Air pollution | Take measures on reducing the road dust:<br>• In order to reduce the dust, use 5 tons of water for moisturizing 3 kms of road once in 2 weeks, hence 26 times per year and 130 tons of water shall be used in total. Recycled water from the OT water treatment facility can be used for this purpose.<br>• Carry out experiment on using substances and materials to stiffen the road surface to reduce dust | | Construction Contractor company<br><br>OT LLC, Env.Dept. |
| | | | Conduct air dust analysis ($PM_{10}$, $PM_{2.5}$) (shall be performed near the airstrip with 1 minute interval for 1 hour.) | | OT LLC, Env.Dept. |
| | | | Air pollution analysis ($NO_2$, $SO_2$, CO) (near the airport and the road) | | OT LLC, Env.Dept. |
| | | Noise | Conduct noise measurement with own equipments (at the airport), rationally plan use of equipments with noises, and reduce ineffective usage | | OT LLC, Env.Dept. |
| **2.** | **SOIL** | Soil pollution | Plant 100-150 pieces of deciduous trees such as gobi elms and asps at 50x50 m area near the departure lounge building of the airport (using seedlings prepared by the OT LLC) | | OT LLC, Env.Dept. |
| | | | Remove wastes of the departure lounge of the airport and other domestic wastes every time. Collect garbage and transport to the designated point and bury | | |
| | | | Conduct soil pH, sulfate, and nitrate analysis (in the construction site. | | OT LLC, Env.Dept. |
| **3.** | **MANAGEMENT AND ORGANIZATION MEASURES** | | Reduce air pollution by replacing land equipments that run on fuel with equipments that run on electricity; replace some motor vehicles with other type of vehicles (such as replacing some vehicles with modern buses, thus one bus equals to several cars) | | |
| | | | Keep flatland that is stretches north east of the OT mine site in its natural form as a pasture for livestock and wildlife, no construction | | |

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| | | of buildings and factories will be carried out; as much as possibly restrain conditions for gathering of bird around the airport area and the outside | | |
| | | Mitigate impact on the environment by making necessary changes to the Environmental management plan in case negative impacts are identified as a result of the environmental monitoring research and analysis | | |
| | | Fuel provider shall manage delivering of fuel to the site and location of fuel related equipments by taking into account that as much as possibly minimal fuel should be stored near the airport. | | |
| | | Avoid danger/risk of plane clash with birds, remove carcasses of dead animals immediately from the vicinity of the airport, and prevent from gathering of birds | | |
| | | Stick to the labour protection procedures, rules, to get employees undergo medical check, to organize healthcare activities annually | | |
| | | Potential flight accidents and risks assessment shall be conducted by professional organization, issue, approve and follow internal rules to work during such conditions, and regularly organize training for employees. | | |
| | | | | |
| | | Include budget for environmental protection activities in the annual production-financial budget and adhere to it | | |
| | | **Total sum** | | |

### 6.3 Environmental Monitoring Program - 2011

| Components of the environment | Indicators to be monitored | Location | Phases | Occurrence | Budget (thous.MNT) |
|---|---|---|---|---|---|
| **AIR QUALITY**<br>• **Dust** | • PM2.5<br>• PM10 | • At 0.1 km north and at 1km south east from the airstrip (at 2 points)<br>• Near the work place of the airport | • During the construction phase<br>• During the operation phase | Weekly<br>Weekly | |
| • **Gas pollution** | • $NO_2$<br>• $SO_2$ | • Near the airstrip and the road (at 2 points) | • During the operation phase | Monthly | |

| | | | | | |
|---|---|---|---|---|---|
| | • CO | | | | |
| • **Noise** | • Noise level, dB | • Near the construction site and in the outside area where heavy equipment traffic is situated | • During the construction phase | Monthly | |
| | | • At the airport | • During the operation phase | Monthly | |
| **SOIL (0-10 cm)** | • pH<br>• Sulfate<br>• Nitrate | • At 0.5 km east of the airport | • During the construction phase | 1 time | |
| | | | • During the operation phase | Annually | |
| **Total** | | | | | |