



**Environmental and Social Impact Assessment  
Yarakta Oil and Gas Field Development  
Irkutsk Oil Company**

**Executive Summary**

November - December

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Yarakta Oil and Gas Field Development  
Irkutsk Oil Company**

*Irkutsk, Russian Federation*

**Executive Summary**

**November – December 2008**

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

This document has been prepared in connection with the intention of the holding company OOO "Irkutsk Oil Company" (hereinafter referred to as "the Company" or "IOC") to carry out development of the Yarakta oil and gas condensate field (hereinafter "the Project") located in the north of Irkutsk Oblast, Russian Federation, within the Districts of Ust-Kut and Katanga.

An essential aspect of the Project is the fact that during planning and implementation of the Project, the Company's objective is to comply not only with the relevant requirements of Russian legislation, but also with international environmental standards.

One of the specific features of this Project is the intention to reduce the volume of flared associated gas by gas re-injection into the reservoir. The proportion of utilization of associated gas will be as high as 96% for the total volume produced during the entire service life of the field. Currently all extracted associated and natural gas is being flared. At the same time, the emissions of harmful pollutants to the atmosphere, including greenhouse gases, will be substantially reduced.

Financing of the Project will be provided partially by the Company and it is expected that the European Bank for Reconstruction and Development (EBRD), which is a shareholder of the holding company, will also participate in the Project financing.

This Project is categorized as "Category A" Project in accordance with EBRD classification of investment projects.

## ***1 LEGAL AND POLICY FRAMEWORK***

### ***1.1 THE COMPANY'S ENVIRONMENTAL POLICY***

The Company makes all required efforts to ensure the environmental safety of its operations, and conducts an open dialogue in this respect with all stakeholders. The Company currently does not have a formal written environmental policy but standard procedures are drafted cognisant of the potential for environmental impact. Further, it should be pointed out that the Company is in the process of developing an integrated environmental management system for the corporation and all subsidiaries.

## **1.2 APPLICABLE NATIONAL AND INTERNATIONAL ENVIRONMENTAL STANDARDS**

In the process of the detailed project design development, the Company takes into account all legal and regulatory documents applicable in the Russian Federation including those regulating health, safety and industrial aspects associated with the planned activities; as well as the Federal Laws guaranteeing the rights and territories of traditional use of natural resources by indigenous ethnic minorities.

The Project will also comply with the provisions of the EBRD's Environmental Policy (2003) as the EBRD may provide funding for the Project. In accordance with the EBRD requirements, the Project has been designed to be consistent with pertinent EU environmental standards, and where such standards do not exist, other relevant international standards.

In order to comply with applicable national and international environmental requirements, it will be necessary to take measures aimed at mitigating environmental and social risks associated with the Project.

ERM Eurasia Limited has conducted an environmental and social impact assessment (ESIA) of the Project in conformity with the EBRD Environmental Policy (2003). Based on the ESIA findings, an Environmental and Social Action Plan (ESAP) has also been developed, and its implementation will permit the Company to prevent, minimize, mitigate and/or compensate potential negative consequences associated with drilling operations, construction of infield facilities and exploitation of the field. In addition, a Stakeholder Engagement Plan has been prepared which outlines how the company will engage with stakeholders, not only on the development of this project, but outlines the principles of how they will communicate their activities on all fields and licenses.

## **1.3 APPROVALS AND PERMITS ISSUED BY GOVERNMENTAL AGENCIES IN CHARGE OF SUPERVISION OVER USE OF NATURAL RESOURCES FOR PROJECT IMPLEMENTATION**

The main legal document entitling the Company to implement the given Project is License IRK No.01162 of 23.09.1996) with amendments No.1193 of 29.03.2006 and No.1753 of 29.05.2007) for production of hydrocarbon products in the Yarkta oil and gas condensate field and for geological exploration of the subsoil resources in the Yarkta field. The License is valid for a term of 20 years. As indicated in the ERM report entitled 'Environmental Audit of Facilities of the Irkutsk Oil Company' dated November 2007 - February 2008 the Company complies with the basic provisions of the above License.

In addition, the Company obtained a supplement of 28.03.2006 to License IRK No.01162, according to which the Company has the right to carry out exploration within the license area for underground water resources and abstract water for potable and industrial water supply; it also entitles the

Company to search for a formation suitable for future injection of produced water.

The Company supports and carries out all required work associated with the construction of surface infield facilities and exploitation of the field (including geological exploration, construction design development, approval procedures for design documentation, legalization of land take for construction with the respective governmental bodies).

The Company obtains and updates in due time the following permitting documents in the process of the Project implementation:

- Permitted limits for disposal of waste generated in the process of oil and gas condensate production, storage, transportation and transfer;
- Permits for release of pollutants to the atmosphere from stationary emission sources at the Company's operational facilities in the Yarakta field;
- Required permits for crossing of surface water bodies with linear facilities (pipelines and roads);
- Permits for release of potentially contaminated storm water runoff to the ground (if required).

Furthermore, the Company ensures strict supervision over the availability of the required permitting documents with its contractors and subsidiaries.

#### **1.4 PUBLIC RELATIONS AND INFORMATION DISCLOSURE**

During 2005-2008 the Company fulfilled the procedure for public discussion of the Project required in the Russian Federation. Among other methods of disclosure, public hearings were conducted, access to pre-design materials for the Project was provided, and discussions were held with representatives of local communities regarding the main design solutions and environmental protection measures.

The population and the general public were informed on a regular basis about the planned Project through mass media (in conformity with the corporate standards adopted by the Company in March 2007). Furthermore, in July 2008 the Company adopted a corporate standard specifying the feedback mechanism for consideration of complaints and public comments.

The Company pays special attention to its relations with indigenous ethnic minorities. In November 2008 an agreement was signed on cooperation with the Katanga District non-governmental organisation "Evenk Native Cultural Centre". An agreement is being currently prepared with the Irkutsk Regional NGO "Union for Support of Indigenous Ethnic Minorities of the North". These agreements state the general conditions of the Company's sponsorship of certain cultural events involving indigenous peoples.

- At the same time, the Company recognizes that some additional measures are required to bring its public relations and information disclosure procedures into compliance with the EBRD requirements (Annex 2 “Public Consultations” to the EBRD Policy of 2003) for a Category A Project

The Stakeholder Engagement Plan includes discussion of the Project materials and the ESIA before the commencement of construction of the Company’s facilities, as well as consultations at different stages of the field development. The Company will establish a grievance mechanism (a draft of Company’s standard with respect to grievance collection and consideration was issued in July 2008).

## **2 BASELINE ENVIRONMENTAL CONDITIONS**

### **2.1 LOCATION OF THE PROJECT AREA AND CURRENT LAND USE**

The Yarakta field is located in the northern part of Ust-Kut District and southern part of Katanga District, both in Irkutsk Oblast, at a distance of approximately 250 km to the north-east of the city of Ust-Kut.

From a geographical perspective, the Yarakta field is located on the Central Siberian upland in the boreal forest zone of the Yenisei River basin, along the left-hand tributaries of the Lower Tunguska River, i.e. the Yarakta, Gulmok and other rivers, as well as along tributaries of the Nepa River.

The license plot of the Yarakta field has an area of approximately 950 km<sup>2</sup>.

The nearest inhabited settlement is the village of Verkhnemarkovo (100 km to the south).

In addition to the existing Company oil field activities, local land use includes the following :

- The land belongs to the state forest fund (logging operations are carried out by the Trans-Siberian Forestry Company).
- Hunting plots allocated to the “Tokminskaya Community” (an indigenous ethnic community) in the northern part of the Yarakta field overlap with the IOC license plot.

### **2.2 ENVIRONMENTAL CONSERVATION CHARACTERISTICS**

The ESIA process considered the local environmental characteristics when assessing the project, and the highlights of the local environmental features are presented below.

#### ***Limitations Associated with Habitats of Rare Plant and Animal Species***

There are 9 species, which are currently included in the Red Book of the Russian Federation, have a rarity and can nest in this region, which requires special attention. In addition to this the planned edition of the Red Data Book of Irkutsk Oblast will include 26 regionally rare species in total: 23 bird and 3 mammal species, the habitats of which cover the field territory. Given that the habitats of these species exist in the field area, special attention must be given to ensure that development of the project does not adversely affect these species.

#### ***Limitations Associated with Biodiversity Conservation***

Based on the number of species known to use each habitat, the most valuable habitat from the viewpoint of biodiversity conservation within the license area are animal communities associated with river valley ecosystems within their middle and upper reaches, as well as dark coniferous forests with domination of Siberian pine in water divide areas. Provided that those ecosystems will be preserved to a maximum possible degree, they can serve as a source for the later propagation of boreal forest fauna into areas disturbed as a result of the field development. As a consequence, this should be taken into account when planning the new activities (to avoid or minimise the landtake within these areas).

#### ***Limitations Associated with Water Protection Zones***

Water protection zones and coastal protective strips along surface watercourses within the field area will not be affected by the Project's activities including drilling, construction and operations, with an exception of river crossings by linear facilities (pipelines and roads), and in this connection special measures are envisaged to ensure environmental safety during their construction and operation (minimization of construction timeframe and use of special protective means in the course of construction, systems for prevention of and response to accidents in the course of the operation phase).

#### ***Other Environmental Limitations***

There are limitations to the Project associated with the requirement to comply with the status of sanitary protection zones of the existing and planned water abstraction wells to be used for water supply. It is also possible that some limitations will be applicable in relation to sanitary protection zones toward the direction of residential camps located in the vicinity of operational facilities.

### **2.3 MAIN NATURAL ENVIRONMENT FEATURES**

#### ***Atmospheric Air Quality***

The concentrations of all investigated gaseous substances in atmospheric air in the area of the Yarkta field are below the regulatory MPC levels and correspond to the baseline values in unaffected areas. Elevated concentrations of certain pollutants (including polycyclic aromatic hydrocarbons) form zones directly adjacent to the currently existing operational facilities.

### ***Geology and Topography***

The surface relief constitutes hilly plains and plateaux with a significant number of valleys of medium-size and minor watercourses. The geological structure of the area of the Yarakta field is composed of Proterozoic, Paleozoic and Quaternary rocks. The total thickness of sedimentary rocks from the crystalline base up to the Quaternary deposits varies from 2570 m to 2740 m.

### ***Surface Water Bodies***

The river network within the Yarakta field area drains to the Yenisei River basin and consists of left-hand tributaries of the Lower Tunguska River. The chemical composition of river water in the Lower Tunguska basin is predominantly that of the calcium hydrocarbonate facies. Analysis of river water quality within the Yarakta oil and gas condensate field has indicated that it complies in general with the norms for drinking water supply sources.

### ***Hydrogeology and Underground Waters***

Groundwater within the field area occurs as irregular shallow temporary water, and various deeper ground water horizons (some usable for general purpose) throughout the stratigraphic column. A key unit is the Litvintsevskaya series (with the depth of 640 – 805 m) which is planned to be used for water extraction for formation pressure maintenance during field operations.

### ***Soils***

Visual observations have shown that in general, soil conditions (forest soils) in the subject area appear good. Areas of impact from human activity are present; however, most frequently the topsoil horizon is absent because it has been destroyed in the process of construction of surface infield facilities. Additionally, in certain locations fill or made ground has been introduced.

### ***Ecosystems and Biological Resources***

The conditions of the ecological forest communities within the Yarakta field do not cause any concern with respect to forestry management activities undertaken in this area. The boreal forests do not contain any unique plant associations or individual plant species requiring special measures and forms of protection.

Over 25 animal and bird species of commercial hunting value are reported within the subject area and in the surrounding landscapes. The overall species composition significantly increases in spring and autumn because of transit migrating bird species.

As it was mentioned above, there are potential habitats of 32 rare bird and 3 mammal species. There are no major flyways and migration routes of birds and land animals.

## 2.4 SOCIOECONOMIC CONDITIONS

As in many other areas of Eastern Siberia, the harsh climate, difficult access and remoteness are not conducive to economic development. Rural areas are sparsely populated, with most villages accessible by vehicle only in winter. The population is steadily aging, reflecting the lack of local economic opportunity, and life expectancy and health status are poor. Occupations are related to logging and hunting/fishing, but there is also high unemployment, and incomes are low.

Ust-Kut District has a relatively large population for a northern region, i.e. 57,000 individuals or 2.5% of the population of Irkutsk Oblast, the majority of whom (about 45,000 people) live in the town of Ust-Kut.

Katanga District has only a small population, i.e. 4,400 residents or 0.2% of the population of Irkutsk Oblast; they live in 15 small settlements.

Evenks, a designated “Small-Numbered Indigenous People of the North, Siberia and Far East” per Russian law, live in both districts. In Ust-Kut District their community is very small, i.e. only 15 persons. Approximately 550 Evenks live in Katanga District. Most Evenks are involved in traditional occupations, i.e. hunting for fur animals (mainly sable, squirrel, muskrat and ungulates) and fishing.

The Project implementation will stimulate the socioeconomic development of the area and will have the following positive effects:

Taxes will strengthen the Oblast’s budget;

Infrastructure needed for the Project, in particular roads, will benefit the broader community;

Local residents will be hired both for construction and operation phases, especially for unskilled and semi-skilled positions (electricians, installation workers, carpenters, construction workers, etc.).

## 3 HISTORY OF YARAKTA OIL AND GAS CONDENSATE FIELD AND THE COMPANY CURRENT OPERATIONS

The Yarakta field was discovered in 1969 and its exploration completed in 1978. Until 1992 the field was abandoned and not exploited. Currently, there are still signs of the historical exploration activities within the field area, i.e. disturbed land along geophysical survey lines, drilling sites, quarries, etc.

### *Existing Operational Facilities*

Currently, the Yarakta field includes the following categories of wells:

- Oil producing wells (in total 11);
- Gas condensate producing wells (in total 3);
- Abandoned exploratory wells, some of which have been reactivated for field development (in total 13).

Currently there is ongoing drilling at well pad #15.

The cumulative production to the end of 2007 was approximately 224,000 tons of oil and approximately 16,000 tons of condensate.

Natural and associated gas flaring (in 2008) totals 88.391 million m<sup>3</sup>. Currently gas is not used for any industrial or domestic needs.

The following existing surface infield facilities are available:

- Oil gathering station;
- Temporary booster pump station;
- Gas treatment plant (UPG-15).

An intrafield pipeline network is used for transportation of various fluids: oil and gas mixture, crude oil, natural gas and gas condensate.

There is an interfield oil pipeline from Yarakta to Markovo field with the capacity of 350,000 tons/year (current production is approximately 60,000 – 70,000 tons/year). This oil pipeline extends from the Markovo field to Ust-Kut for product export.

The Company generates electricity using turbines fed with condensate and diesel (currently imported).

The existing road network consists of forest roads, which can be used without limitations only during the winter season. During this time, trucks deliver oil from the Danilovo field to Yarakta for shipment through the pipeline.

There are two power transmission lines: one operating line and one under construction.

Several quarries are owned and operated by the Company within the field area produce mudstone used as fill material for site preparation and road-base construction.

## 4 DESCRIPTION OF PLANNED OPERATIONS

### 4.1 PLANNED PRODUCTION

It is planned to produce the following volumes of products until 2025:

Table 5.1-1: *Planned Oil and Gas Production*

Crude oil production, 10 <sup>3</sup> t/year								
2009	2011	2013	2015	2017	2019	2021	2023	2025
397.88	1,220.56	1,811	2,129.91	1,908.6	1,096.01	726.76	588.67	476.82
Gas condensate production, 10 <sup>3</sup> t/year								
23.5	125.24	125.24	309.38	293.28	267.97	243.89	223.48	203.97
Natural gas production, 10 <sup>3</sup> m <sup>3</sup> /year								
133,180	676,990	676,990	1819860	1,894,620	1,862,010	1,819,970	1,788,640	1,765,900
Associated gas production, 10 <sup>3</sup> m <sup>3</sup> /year								
60,080	184,300	273,460	321,620	288,200	165,500	109,740	88,890	72,000

## **4.2 FIELD DEVELOPMENT STRATEGY**

The Project design envisages an enclosed system for oil and gas collection and transportation with utilization of free natural gas (starting from 2009) and associated petroleum gas (starting from 2010) by injecting it into the formation (cycling process). In order to maintain the reservoir pressure it is planned to use water injection into productive formations (starting from 2009).

The oil-bearing part of the field will be developed mainly by using well pad approach (16 new well pad sites). The directional drilling utilizing multi-well pads will minimize the land take. Also, closed loop mud systems will be used with only cuttings being discarded to lined pits.

The produced oil and gas mixture (oil and associated gas) will be separated at a booster pump station (BPS) and an oil treatment plant with subsequent transportation of oil via an interfiled export oil pipeline to the central gathering station in the Markovo oil and gas condensate field. From the Markovo field, this pipeline goes to Ust-Kut for export. In the future the nearby Transneft interregional pipeline may have a pump station installed that could allow export to this line.

Gas separated at the oil treatment plant will be utilized partially as fuel gas for the Company's own needs and the bulk of associated gas will be transported to the planned integrated gas treatment plant to be constructed for the gas portion of the field.

The gas portion of the field will be developed by drilling new single wells (one gas producing well and two gas injection wells) and by reactivation of six prospecting and exploratory wells (five producing wells and one injection well).

Produced gas condensate will be sent to the gas treatment plant for separation of condensate and for drying and compression of separated gas (including associated gas delivered from the oil portion of the field).

The dried gas from the integrated gas treatment plant will be distributed after compression in the following way:

- Gas to the gas injection system for reservoir pressure maintenance;
- Gas to the electric power plant;
- Unutilized gas will be sent to a high-pressure flare facility.

The planned dried gas injection system (including associated gas) into the reservoir is designed to meet the requirements for consistent utilization of natural resources and for improvement of condensate recovery.

## **4.3 FIELD AND AUXILIARY FACILITIES**

It is planned to construct the following main and auxiliary infield facilities:

1. New well pad and single well sites, including:
  - Oil producing, water injection and reserve wells (95 wells at 16 well pad sites);

- Gas condensate wells (1 producing and 2 injection wells);
  - Water wells (for abstraction of water for injection to maintain the reservoir pressure), 5 wells.
2. Reactivated wells, including:
    - Oil wells and water injection wells (6 wells);
    - Gas condensate wells and gas injection wells (6 wells);
  3. Operational surface infield facilities, including:
    - Oil treatment plant,
    - Booster pump station,
    - Integrated gas treatment plant.
  4. Auxiliary surface infield facilities, including 2 residential camps (a new one for 40 people and a refurbished one for about 175 people), quarries for production of industrial minerals);
  5. Linear facilities (roads, pipelines and power transmission lines) with the total length of about 280 km of common routes;
  6. Landfill with incinerator

#### **4.4 LAND TAKE**

The total area of the license plot is approximately 950 km<sup>2</sup>. The existing and proposed facilities will together require 12 km<sup>2</sup>, or approximately 1.3% of the license area.

It is planned to use to a maximum possible degree the existing infrastructure (including roads, well pads, gathering lines, processing stations and export pipelines) of the sites to minimize clearing of forests. Areas used in the past will be cleared of vegetation (where the vegetation has re-established) and the existing facilities refurbished with subsequent reclamation of the previously disturbed land.

The estimated area of forest clearing required for this project is approximately 9 km<sup>2</sup>; some of the planned linear facilities will be constructed on the land cleared of vegetation earlier, i.e. in the right-of-ways of the existing roads and pipelines, where the original vegetation had been disturbed or modified and is currently represented by secondary, mainly grass and herb associations, which recover after impact within a short period of time.

Minimisation of land take will be key to the approach to and planning of drilling and well pad siting. The use of directional drilling from multi-well pads will be a key tool in this regard.

## 5 ENVIRONMENTAL IMPACT ASSESSMENT

### *Introduction*

The Project includes the following three phases:

- Drilling;
- Construction; and
- Operations.

These three phases entail different processes, and different risks, opportunities and impacts accordingly.

### *Impact Assessment Process*

The assessment of impacts was carried out in consideration of the following:

- Scale – impact occurs at the site only, in the locale of the site (up to 100 m); and regionally (greater than 100 m from the site);
- Duration – temporary (less than 6 months); medium term (6 months to 2 years); long term (greater than 2 years);
- Intensity – Low, Medium and High.

Impacts were assessed against typical sources of environmental impact and receptors present in the field area. Those categories were:

• Air emissions	• Flora and fauna
• Geology and relief	• Noise and vibration
• Surface water	• Water supply and waste water
• Groundwater	• Waste management
• Soils	• Accidents and emergencies

### *Mitigation measures*

Following the assessment and classification of potential impacts, each impact was considered in terms of potential avoidance, minimisation and mitigation measures. These measures have the following objectives:

- Avoid adverse impacts through the design of the Project,
- Minimise the direct impacts from each source in terms of scale, duration and intensity; and
- Minimise the potential for residual, irreversible impact.

The measures, which are outlined in the Environmental and Social Action Plan, are designed to either avoid impacts, break/ minimise or reduce the linkages between sources of impact and the receptors; or to outline remedial works which can rehabilitate impacts back to a state as close as practically possible to the original state.

Prior to presenting a summary of the main impacts and mitigation measures, it is important to briefly consider the project in the round and identify the key issues related to the lifetime of the works.

### *Overall Key Issues*

The project involves the expansion of an existing oil production field. The works, as described above, involve the drilling of new wells; the overworking of some existing wells; the renovation or rebuild of certain production facilities; the construction of a new pipeline infrastructure for the new wells; and the commissioning and operation of the new infrastructure.

The works will involve only a relatively small increase in the footprint of the current infrastructure, and do not represent a major new land take in virgin forest.

The introduction of new processing plant should result in environmental benefit as newer equipment, if appropriately installed and maintained, is more efficient and less likely to result in leaks or spills.

The key environmental benefit from the Project is related to the approach to produced gas. The Project design documentation indicates the following planned options for addressing produced gases:

<b>Year</b>	<b>Flared</b>	<b>Used</b>	<b>Injected</b>
2009	165,000 (82.5%)	29,000	0
2010	35,000 (4%)	185,000	640,000

All volumes are quoted in ,000 m<sup>3</sup>.

The reduction in flaring both in terms of percentages and in real terms is significant. These actions will result in a significant local environmental improvement in air impacts and reduce the overall CO<sub>2</sub> emissions related to site operations.

### *Impact assessment – drilling works*

The drilling works are temporary and entail no impact of high intensity or long term.

The works both use and generate a limited volume of hazardous materials. Effective containment structures and adequate treatment prior to re-use or disposal of generated materials or wastes shall be provided.

While land take will be required for the drilling works to provide drilling pads and access ways for vehicles and utilities, the area required is not significant compared to the total field area. Project design will aim at minimizing land take and utilize existing access and utility corridors.

Drilling works have the potential to impact local fauna, particularly in relation to bird nesting and reproduction. Surveys shall be undertaken prior to drilling works to identify sensitive locations and works shall be scheduled to avoid disturbance leading to avoidance behaviour, which would be an unacceptable impact. In detail, these measures include the following:

- Site specific ornithological surveys shall be carried out where additional land will be taken, and in the vicinity of currently used land. These surveys will be completed in spring and early summer of 2009.

- The results of these site surveys will be used to ensure that development of the Project does not utilize land currently used by rare and endangered species. If it is found that these species use land in the vicinity of future site operations, then any associated land clearing activities will be completed during the winter months when the majority of species are not present. It is recognized that returning birds would then avoid disturbed areas and would nest in areas away from project activities.
- It is recognized that noise and vibration created from drilling operations could cause stress on local wildlife which would likely result in avoidance behaviour. To avoid such impacts, detailed ornithological surveys will be completed in the spring of 2009. These surveys will be conducted to look for any of the rare and endangered species at or in the vicinity of the existing or planned future facilities. If it is found that such species use the area around any planned future site operations, the presence of such will be added to the existing database and new operations or land take will not be initiated during spring or early summer months (i.e. will not be initiated between May 1<sup>st</sup> and July 15<sup>th</sup>). Such activities will require to be carried out prior to, or post, this period.

In terms of residual impact, only drilling mud impacts to subsurface geological formations can be classed as long term and having no practical mitigation measures. Given that these impacts are localized, they are not deemed as unacceptable.

*Impact assessment – construction works*

Many of the impacts of the construction phase are similar in nature to those of the drilling phase. The use and generation of hazardous materials; land take; and impacts to flora and fauna will all occur, varying only in their scale. The mitigation measures will be similar to those utilized for the drilling phase.

The main additional impacts during the construction phase are those resulting from the construction of river crossings for access and pipelines. Such crossings have the potential to result in the generation of significant volumes of fine materials suspended in the river water which can impact the ecological communities both at the crossing locations and for a distance downstream. Additionally, the river crossings may also result in erosion impacts to river bank environments which can be a source of long term supply of increased sediment to the rivers.

Mitigation measures designed to limit the potential impacts from river crossings and reduce the potential for residual impacts include:

In terms of timing:

- River crossings can not be installed during the spawning season, which is from late May through to the end of July. They will be installed during winter, when the banks of the river are frozen and flow is minimal;
- Each river crossing should be carefully planned in advance, and the contractor should be required to demonstrate to IOC that all equipment is available onsite, ready for installation prior to excavation; and

- The amount of time the trench is open will be minimised. Once the trenching starts, the pipe will be buried in the ground and the plugs at the river banks will be installed as soon as possible.

In terms of technical issues during the installation:

- No chemicals or hazardous materials shall be stored within 100m or within the sanitary protection zone (SPZ) of the rivers, whichever is greater. This includes fuel for vehicles and equipment;
- Proper buoyancy control shall be applied to the pipes before excavation is started. It is not acceptable to adjust buoyancy control when the trench is open as this will cause significant delays and will extend the duration of the sedimentation impact;
- Once the pipe is installed, earth plugs will be immediately installed in the trench at the river banks. This will isolate the large open trench from the river and prevent discharge of the highly turbid water in the trench from discharging to the river. Once the plugs are installed, pumps will be used to dewater the trench. The pumped water will be discharged in such a way that it does not migrate back into the river, and does not cause soil erosion; and
- Banks will be reinstated to mimic surrounding topography and the material used will be sufficient to prevent subsequent erosion of the banks (such as gravel).

Implementation of these mitigation measures will ensure that any impacts caused by the installation of the pipelines at the river crossings are limited in scale and time, and therefore are acceptable.

#### *Impact assessment – operational phase*

The operational phase of works is significantly longer but contains fewer types of processes than the drilling and construction phases. The main mitigation effort will focus on monitoring and maintenance as a key prevention tool against spills and leaks of hazardous materials. Appropriate containment, spill prevention and response, and corrosion protection will also aid in the mitigation of potential impacts during this phase.

The key feature of the operational phase in terms of environmental impact is, as described above, the injection of produced gases significantly reducing air emissions from the current situation.

#### *Summary*

In summary, the key features of the proposed development are:

- Re-injection and use of produced gas will increase gas utilization from 0% currently to approximately 96%.
- The development is an extension of an existing field in operation and additional land take is insignificant;
- Potential disturbance to local avian fauna will be minimized and avoided following surveys to identify key locations and scheduling of works to avoid nesting and rearing periods; and

- Impacts to river water quality and fish communities will be minimized following surveys to identify key locations and utilizing construction methods which minimize the time required to complete the crossing.

Other environmental impacts will be mitigated by containing and/or treating hazardous materials to reduce potential impacts from releases; utilizing re-use and recycling of materials to reduce the resources required to complete the works; and restoration of longer term impacts back, as much as practical, to the original condition.

After consideration of all impacts and mitigation measures outlined in the Impact Assessment, it can be concluded that the risks and impacts associated with the project are acceptable.

## 6 SOCIOECONOMIC EFFECTS OF THE PROJECT

### *Impact assessment – drilling phase*

The main impacts to the socioeconomic environment during the drilling phase will be:

- Withdrawal of part of hunting grounds;
- Potential cultural conflicts between the local communities and the personnel of the Company and contractor organisations;
- Inadequate degree of awareness of the local communities.

To minimise such impacts it is required to take appropriate corrective measures, such as:

- Identify exact outlines of the hunting grounds, develop and implement a set of compensation measures for hunters;
- Issue and implement the Code of Conduct;
- Carry out additional investigations to identify ritual sites located within the Yarakta license plot and define the rules of behaviour for the personnel within such sties;
- Develop a set of compensation measures for the local communities.

### *Impact assessment – construction phase*

In the course of construction of the surface facilities in the Yarakta field the above impacts will be aggravated with an increase in the personnel number at the construction sites. In addition of the above issues, the potential for contamination of surface water bodies will also increase (higher water turbidity, contamination of water with fuel and lubricants, etc.), which might affect the fish resources, and as a consequence, incomes of the local residents. It is required to ensure proper supervision over the construction procedures and ensure compliance with the relevant norms and rules.

### *Impact assessment – operations phase*

Assuming that the designed measures will be implemented during the drilling and construction phases, all major issues during the operation phase will be resolved.

### *Positive impacts*

Implementation of the Project will have positive effects on the economic situation:

- Local taxes will be paid to the Oblast' budget;
- The Company will provide support for various cultural events with participation of local residents in general and the indigenous ethnic communities in particular;
- Creation of additional jobs for local residents;
- Development of the infrastructure (roads, retail shops, etc.).

## **7 EMERGENCY PREPAREDNESS AND RESPONSE**

Given the remote location of the field, there is no local infrastructure that can be relied upon in an emergency. Therefore, the Company will need to provide all such services. The scope of services to be provided is based on a risk assessment considering the likelihood and resulting consequences of a given occurrence. The following emergency services have to be provided:

- Fire
- Medical
- Well Control
- Chemical/oil spill or release.

The Company shall provide the Emergency Response Plan regarding well control, which will include prevention measures on site and a contract with paramilitary unit for controlling/managing blow outs.

The Company will develop and implement the Oil/Oil Products Spill Response Action Plans addressing the following:

- oil- and gas condensate transport pipelines in the Yarakta (in-field and inter-field),
- Oil and Gas Treatment Plants and Pumping Station,
- hydrocarbon transportation by tank trucks from the Yarakta oil field to Markovo and Ust-Kut. It should be noted that this truck option is a reserve option which will only be utilised in cases where pipeline transport is not available.

These plans shall detail the following issues:

- Roles and responsibilities associated with managing incidents;
- Lines of communication and appropriate information cascades;
- Details of required responses;

- Details on the decision making process on incident end-point; and
- Recovery plan.

The Company will implement all planned fire-fighting facilities and units, including:

- Cooling and fire foaming systems at the Oil and Gas Treatment Plants;
- Fire depot (2 fire-fighting vehicles) at the Oil Treatment Plant; and
- Initial fire-fighting equipment.

During the construction period the mitigation measures will concentrate on contractor management. The Company will develop and introduce Regulations on environmental protection requirements for contractor organizations. This Regulation will be part of all contracts for work to be completed on the Yarakta field and will require compliance with the ESAP developed as part of this impact assessment. IOC will also implement a procedure for monitoring performance of the various contractors and will introduce a method for corrective actions in the case of contractor non-compliance.

## **8 ENVIRONMENTAL MONITORING**

### *Summary Baseline Environmental Conditions*

The findings of the baseline environmental investigations conducted prior to the commencement of the Project implementation have indicated that:

- Concentrations of pollutants in atmospheric air, surface and underground waters and soils comply in general with the regulatory permissible levels for chemical substances, ions and compounds studied;
- There are no major flyways and migration routes of birds and land animals within the Yarakta field.

### *Required Additional Baseline Studies in Connection with Project Implementation*

In connection with the Company's plans related to construction and operation of the landfill for industrial waste disposal, it is required to carry out environmental site screening assessment, and baseline environmental monitoring (as detailed in the ESAP) in the area of at the selected site for landfill construction.

In addition, investigations of wildlife and in particular ichthyofauna and hydrobionts shall be continued within the license area.

### *Atmospheric Air Monitoring*

Atmospheric air monitoring will include:

- Monitoring of the main air emission sources;
- Monitoring of ambient air quality at selected points at the boundary of the sanitary protection zone in the vicinity of two residential camps.

### *Surface Water Monitoring*

Surface water condition monitoring shall be conducted at 19 points with systematic water sampling and chemical analysis.

In case of any accidental release of pollutants to water bodies it will be necessary to carry out water and bottom sediments sampling on a more frequent basis.

### *Underground Water Monitoring*

Monitoring of underground water will be carried out with the aid of observation wells. A hydrochemical monitoring system will function during the entire Project life.

In case of spills entailing actual or potential contamination of underground water, continuous monitoring will be conducted in addition to scheduled observations immediately after an accident.

### *Soil Quality Monitoring*

Monitoring will be conducted at representative sampling points to be selected on the basis of the results of drilling work, construction activities and operation of the Yarkta field.

In case of spills, sampling and analysis of soil samples will be carried out immediately to ensure early diagnostics.

### *Wildlife monitoring*

Wildlife monitoring will be based on the characteristics of the existing ecological and faunal associations characteristic of various specific landscape and geographical zones. The following researches will be done:

- Winter routing accounting of game animals
- Regular monitoring at index plots of vertebrates' density, including rare and endangered species
- Annual researches of aquatic organisms in surface water bodies

### *Vegetation Monitoring*

Vegetation monitoring will include a combination of aerial reconnaissance photography and field (land-based) surveys. Field surveys will be carried out to verify the interpretation of aerial photographs and to monitor the vegetation directly at stationary sites.

Given the existing and planned field development activities, and the baseline conditions, along with the extensive mitigation measures proposed here, this project can be implemented with only acceptable impacts to the environment.