EXECUTIVE SUMMARY

ENVIRONMENTAL IMPACT ASSESSMENT

MunaiTas NWPC CJSC

(Republic of Kazakhstan)

Prepared for

EUROPEAN BANK
FOR RECONSTRUCTION AND DEVELOPMENT

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1 INTRODUCTION

GENERAL

Construction of this pipeline was completed in 2003 and the pipeline is currently transporting oil. This project has been proposed for EBRD financing retroactively, that is after construction has been completed. Clearly, if such a project was brought to EBRD for funding prior to or during construction, this would be screened as a category A project, requiring an Environmental Impact Assessment (EIA) consistent with EBRD policy. However, as the project is completed, the project has been assigned a Category C/1, requiring an environmental audit of the existing operations. This audit has been completed and has not identified any significant environmental issues. The relatively minor issues that were identified have been addressed in the Environmental Action Plan that will be required to be implemented as part of the loan agreement. While the EBRD categorization of C/1 for this project does not require an EIA, it should be noted that an EIA was completed for this project as part of the project design and permitting process. This EIA is in the Russian language, and has been reviewed by IT Russia Services as part of the environmental due diligence. This document presents an executive summary of the EIA for this project, and it is the intention of the EBRD to make this Executive Summary available for public information along with the Project Summary Documentation (PSD) in order to enhance the requirements of the C/1 level project.

1.1 BRIEF DESCRIPTION OF THE PROJECT

The oil pipeline Kenkiyak-Atyrau 448.85km long will be with respect to its throughput capacity the main link in the united oil pipeline network connecting the oilfields Kenkiyak, Zhanazhol, Kumkol, etc. being developed in the Aktyubinsk Oblast (Republic of Kazakhstan) to:

- the oil pipeline system of the Caspian Pipeline Consortium (CPC) transporting oil to the sea terminal in Novorossiysk (Black Sea coast) and further for export; and
- the united pipeline system of the Russian Federation.

The construction of the Kenkiyak-Atyrau oil pipeline will expand the export capacities of the Republic of Kazakhstan.

In the future, this pipeline will also serve as one of the links in the pipeline system for oil transportation in the eastward direction up to China. Such intentions are currently considered by investment companies and the government of the Republic of Kazakhstan.

The location of the territory for the given project with the delineated oil pipeline route is shown in Figure 1.

1.2 HISTORY OF THE PROJECT AND CONSIDERED ALTERNATIVES

Development of the rich oil fields discovered in the 1970-1980s in the Aktyubinsk Oblast (Alibekmola, Zhanazhol, Kumkol) was hindered by the limited capacity for transportation of large volumes of oil.

In the late 1990s, oil transportation from those oilfields was accomplished primarily by the oil pump station of Kenkiyak via a pipeline of a small diameter northward to the city of Orsk (Russian Federation). Part of the oil was transported by railroad.

To improve the export capabilities it was necessary to ensure transportation of large volumes of oil from the above oilfields in the western direction via the powerful pipeline system of the Caspian Pipeline Consortium (CPC) to the Black Sea coast. At the same time, such solution could also effectively involve also other oil pipelines and associated infrastructure facilities already available in the Atyrau Oblast.

For this reason the government of the Republic of Kazakhstan has supported the intention of an investment consortium to construct a Kenkiyak-Atyrau oil pipeline with its connection to the CPC oil pipeline system and to the Atyrau-Samara oil pipeline.

The following alternatives for oil transportation for the conditions of West Kazakhstan have been considered:

- transportation by railroad;
- transportation via pipelines.

Transportation of large volumes of oil via pipelines has been generally accepted as the most environmentally safe way as compared with other means of land and water transport, provided that the required monitoring and measures for abating the impact level and preventing accidents have been ensured.

Substantiation of the required investments conducted in 2000 preceded the preparation of the design documentation for construction of the oil pipeline. At this stage an oil pipeline route was selected on the basis of an analysis of different alternatives with due regard for environmental protection requirements.

To the large extent pipeline route runs in parallel to the right-of-way of existing corridors of pipelines and roads. This design solution allows to significantly reduce the extent of environmental disturbance.

The final route was agreed upon in 2000 with the relevant supervisory agencies at the level of the Aktyubinsk and Atyrau Oblasts and the Republic of Kazakhstan.

1.3 EARLIER ENVIRONMENTAL IMPACT ASSESSMENT STUDIES

After selection of the oil pipeline route, design development work was carried out for expansion and modernization of the oil pump station at Kenkiyak (for feeding oil into the pipeline) and the oil pump station at Atyrau (reception of oil from the pipeline and feeding to the CPC pipeline system or to the Atyrau-Samara pipeline), as well as for construction of the linear portion of the pipeline.

The present Summary has been prepared on the basis of the document “Environmental Impact Assessment” (EIA) for construction and operation of the Kenkiyak-Atyrau oil pipeline developed by TOO “Center of Industrial Ecology” in 2001 as an integral part of the package of the design documentation.

The complete text of the EIA report for the Kenkiyak-Atyrau pipeline construction within the design documentation of the KazTransOil Company for the given project has received a positive statement by the State Environmental Review Department of the Republic of Kazakhstan. The statement approved the design as an

environmentally safe under the condition of compliance with the technical solutions incorporated in the design.

2 LEGAL AND INSTITUTIONAL FRAMEWORK

An environmental impact assessment of Kenkiyak-Atyrau oil pipeline construction operations has been carried out on the basis of the national legislation and regulatory documents of the Republic of Kazakhstan specifying the requirements to general environmental protection activity and sound use of natural recourses as well as protection of individual environmental components such as air, surface waters and groundwater, soils, wildlife, and vegetation from a man-made impact (in all, over 50 legislative and regulatory acts.

The provisions of the following national regulatory documents have received much consideration:

- Provisional Instruction on the Environmental Impact Assessment (EIA) Procedure Related to Planned Economic Activity" dated December 30, 1993.
- Recommendations on an Assessment of Impact of Planned Economic Activity on Bioresources (soils, vegetation, wildlife)" dated August 26, 1996.

The following international Conventions and Agreements ratified and signed by the Republic of Kazakhstan have been taken into consideration in the process of this EIA, in spite of the fact that the oil pipeline route does not disturb territories regulated by international conventions:

- Convention on Biological Diversity (ratified in 1994);
- Framework Convention on Climate Change)ratified in 1995);
- Convention to Combat Desertification, 1997;
- Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Ozone-depleting Substances, 1997;
- Convention on Long-Range Transboundary Air Pollution, 2000;
- Convention on Transboundary Effect of Industrial Accidents, 2000;
- Convention on the Environmental Impact Assessment in a Transboundary Context, 2000;
- Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters, 2000.

3 DESCRIPTION OF PROJECT INTENTIONS OF THE COMPANY

Actions and planned facilities	Indicators
Planned volumes of oil transportation	
Design capacity of the oil pipeline	6.0 million t/year [1) 2)]
Year, when the design capacity should be reached	2004
Description of oil pipeline facilities	
Oil pipeline length	448.85 km
Land-take for planned facilities	Linear part of the pipeline – 2380 ha for temporary short-term use, including 241 ha on the basis of long-term lease agreements (from 5 up to 49 years) OPS Kenkiyak – 18.5 ha OPS Atyrau – 111.9 ha Connection unit to OPS Atyrau – 2 ha
General characteristics of the linear part of the pipeline to be constructed	A single-line pipeline with external diameter of 61mm (24 inches), at a depth of 1.9-2.2 m below the ground level on trench bottom, made of steel tubes of grade X65 from 7.1 to 12 mm thick (depending on the category of pipeline sections)
Planned facilities for the OPS Kenkiyak	• Operator's room with communications facilities • Scraper launcher • Pressure control unit • Commercial oil measuring unit • Two electric board rooms • 4 tanks of 10,000 m^3 each • Firewater pump station • Two firewater tanks • Diesel electric power plant • Building for general facilities • Satellite communications antenna • On-site pipelines • Cable trestle • Parking garage

Actions and planned facilities	Indicators
Connection unit at the existing OPS Atyrau	• Scraper receiver unit and diagnostic devices • Safety valve site • Filter and strainer site • Oil measuring station • Tank for oil discharge
Facilities of the linear part of the pipeline system, including:	
Valve sites	23 sites at a maximum distance of 37km from each other (10,500 m^3 of oil in a section)
Crossings of roads, railroad lines and watercourses	Installation of a protective casing by open and enclosed method (by pressing or horizontal drilling)
River crossings	Crossings of minor watercourses by construction of underground trenches (at a depth of 0.8-1 m from the pipe top), across a major watercourse (Ural River) – by directional drilling (at a dept of over 9 m from the bottom to pipe top); a total of nine crossings.
Site for scraper launcher and receiver and diagnostic devices (at the 226-km pipeline section)	Scraper launcher and receiver, underground drainage tank of 25 m^3 with a submersible pump.
Scraper receiver site at OPS Atyrau	Including a scraper receiver with piping and underground drainage tank of V=8 m^3
Cathodic protection station	The entire pipeline has cathodic protection
Accommodation camps for construction and operating personnel	Accommodation camps for construction and operating personnel located inside the existing residential areas
Electric power and heat supply systems	
Electric power supply	Linear part of the pipeline: • Solar power supply systems in combination with batteries for SCADA systems

Actions and planned facilities	Indicators
	• Overhead power transmission line of 6kV and from the diesel power plant (30 kVA) to the scraper launcher/receiver station at the 226-km section) OPS Kenkiyak: Centralized electric power supply system and standby power sources (two diesel power plants of DES-6-S-150V type, 250kVA) OPS Atyrau: Centralized electric power supply system and an emergency diesel power plant of DES-500 type
Heat supply	OPS Kenkiyak: boiler station comprising five boiler units of E-1-9 type; OPS Atyrau: gas-fired boiler station
Additional information	
Work implementation	Construction will be accomplished by 7 integrated crews (up to 2,500 workers in number) within 2 years. Operations will be performed by 300 – 350 workers.
Sequence of pipeline construction	0 km – LDPS Kenkiyak; 76 km – crossing of Baiganin-Zharkamys road; 104 km – Sagyz River; 105-116 km – zone of sands of Akkumsagyz; 150 km – town of Ebeity; 153 km – Sagyz River; 253 km – town of Kenbai; 256 km – Sagyz River; 298 km – crossing of the pipeline system “Central Asia - Center”; 299 km – crossing of Makat-Uzen railroad line, town of Makat; 304 and 309 km – crossing of Makat-Sagyz road and Makat-Oktyabrsk railroad line; after 331 km – town of Dossor, Corridor of existing oil pipelines and water pipeline, Dossor-Kulsary road and Atyrau-Oktyabrsk railroad line; 338 km – Dossor-Baichunas road; 381 km – Atyrau-Oktyabrsk railroad line; 409 km – Novy

Actions and planned facilities	Indicators
	Sokol River, 413 km – crossing of Atyrau-Dossor road; 421.5 km – crossing of Atyrau-Indeborsky road, town of Leningradskoye; 423.5 km – Ural River; 428.85 km – OPS Atyrau.

Note:

1) The project design provides for a possibility to connect the new oil pipeline to the existing OPS-3 oil pump station located at the 214-km section of the pipeline to supply annually up to 1.2 million tonnes of oil along the existing pipeline to the town of Kulsary.

2) The diameter and technical parameters of the pipeline will permit, with an increase in the Kenkiyak pump station capacity, transportation of up to 12 million tonnes of oil per year.

4 BASELINE ENVIRONMENTAL AND SOCIO-ECONOMIC CONDITIONS

4.1 CLIMATIC CONDITIONS AND ATMOSPHERIC AIR QUALITY

Extreme continental climate of the oil pipeline construction area is dictated, first of all, by location of this area in interior parts of the continent. Main climatic features are as follows:

- prevailing of anticyclonic conditions within a year;
- drastic daily and yearly air temperature variations;
- severe wind regime; and
- precipitation deficiency.

In general, climate is characterized by cold winters and long dry and hot summers,

The absolute minimum temperature of -48ºC was recorded in January.

The average temperature of the hottest month (July) varies from +23.9ºC to 25.2ºC in different parts of the oil pipeline route; the absolute maximum temperature recorded was +45ºC. An average daily temperature amplitude in June and July is 10ºC to 17ºC.

Average yearly amount of atmospheric precipitation does not exceed 130 mm to 220 mm. Maximum precipitation fall in winter months. The oil pipeline route area is characterized by a minimal frequency of abundant precipitation. Maximum daily precipitation amount recorded in Atyrau was 87 mm.

The evaporation rate is several times higher than the atmospheric precipitation rate. The number of days with a relative air humidity less than 30% is 95 to 100.

A stable snow cover of 16 cm in depth in average keeps from 90 to 120 days. The maximum frost penetration depth recorded in the Aktyubinsk Oblast is 205 cm.

Maximum wind velocities in winter vary from 20 m/sec to 24 m/sec. Strong winds (over 8 – 10 m/sec) in the summer season provoke dust storms.

The meteorological conditions of the oil pipeline route territory have a profound impact on air pollution because of low precipitation amount, a high level of the natural dust content in the air and frequent temperature inversions.

No data is available in design documents on surface air pollution at OPS Kenkiyak and OPS Atyrau before construction operations.

4.2 GEOLOGICAL AND HYDROGEOLOGICAL SEETING

Geological Setting

The oil pipeline route crosses the southeastern part of the Caspian Coastal Lowland, which constitutes from the geological viewpoint an extensive and deep tectonic depression. The mantle of weathering in this depression is composed of deposits of different ages (from Permian to recent) and significant thickness with an extensive development of salt domes.

The geological cross-section comprises a subsalt complex (Lower Permian age, located at a depth of 2km to 3km), salt complex (Lower Permian rock salt domes) and supra-salt complex (from Permian to Quaternary age).

The salt domes along the oil pipeline route are relatively small and insulated. The most ancient supra-salt deposits are sharply dislocated and complicated by discontinuities caused by ruptures of salt domes.

Quaternary deposits are horizontal and composed of:

- Marine clayey sediments (a consequence of Caspian transgressions) a few tens of meters thick;
- Recent continental sand and sandy-clay deposits up to 10-15m deep with extensive occurrence of salinization.

Hydrogeological Conditions

In hydrogeological respect, the given territory comprises a complex structure divided into:

- Eastern Caspian coastal basin (within the confines of the Ural-Emba plateau stretching from Kenkiyak to the 245-km section of the oil pollution route); and
- Western Caspian coastal basin (Caspian coastal lowland).

Within the ***Eastern Caspian coastal basin*** the following water-bearing complexes have been identified:

- Quaternary alluvial, lacustrine-sor (saline) and eolian deposits;
- Upper Oligocene deposits;
- Cretaceous (Upper Cretaceous and Aptian-Neocomian deposits; and
- Upper Jurassic deposits.

The most prominent feature of this basin is discontinuity of the regional aquifuge strata. The most significant aquifers as a potential water supply source are the Quaternary alluvial aquifers (associated with valley deposits of the Sagyz River) and Upper Cretaceous aquifers of fresh and brackish water with a salinity of up to 1.0-3.0 g/l.

In the areas of outcrops of the Upper Cretaceous water-bearing complexes along the pipeline route (40-50km, 80-100km, 140-180km and 200km) water occurs at shallow depths and has a salinity of up to 1.0 g/l.

Within the ***Western Caspian coastal basin*** the following water-bearing complexes have been identified:

- Recent sor and alluvial deposits;
- Quaternary marine deposits;
- Upper Pliocene deposits.

The regional aquifuge stratum of Paleocene and partially Cretaceous clays divides the supra-salt level into two water-bearing layers. The water-bearing complexes in the lower layer contain highly-pressurized thermal water with high salinity levels.

The yield of water-bearing rocks of the upper layer is insignificant and the underground water in the Western Caspian coastal basin has typically an extremely high salinity (on the average varying from 10 to 140 g/l).

Slightly brackish water with a salinity of up to 3.0 g/l accumulates only in the form of lenses in eolian sand massifs and in alluvial deposits in river valleys (Ural River).

Geomorphology Coastal Lowland

The oil pipeline route crosses the Ural-Emba plateau (up to the 246-km section) and aggradation plains of the Caspian (246-448km).

The Ural-Emba plateau constitutes a hilly-ridgy surface intersected by the valleys of the Sagyz, Emba and Uil rivers and slightly sloping south-westward with absolute elevations from 300-350m to 50-100m. The pipeline route crosses repeatedly areas with cuesta-like structural denudation benches (40-80km, 150-155km, 180-184km and 210-250km) and ridgy table outliers (85-90km) with elevation differences of 20m to 25m.

Virtually flat plain surface armored with diluvium accounts for about 60% of the plateau area. Intense sheet and linear erosion is typical only along the initial section of the oil pipeline route (0-30km).

The 104km to 116km pipeline section crosses massifs of semi-fixed and fixed hummocky sands with crescent-shaped dunes up to 10m high (Akkumsagyz massif).

The Caspian Coastal Lowland begins with Late Nekhvalynian hilly surface with elevations from 100m to 150m and stretches from the 246-km section to the 370-km section of the pipeline route.

The absolutely flat Novocaspian marine plain has absolute elevations of as low as minus 15m to minus 27m. The pipeline route is located beyond the zone affected by wind-induced surges common for the Caspian Sea.

Baer knolls about 6m to 10m high of narrow sub-latitudinally elongated configuration occur starting from the 300-km section of the pipeline route.

Seismic Conditions

The given area is relatively stable in seismic respect and is rated as region with potential seismicity of below 6 Richter scale according to the seismic zoning map of

the Republic of Kazakhstan (SNiP RK V.1.2-4-98). At the same time, it should be kept in mind that in some areas the pipeline crosses oil and gas fields, where extraction of hydrocarbons and produced water might result in induced seismicity.

4.3 HYDROLOGICAL CHARACTERISTICS

The formation of hydrological regimes within the given territory takes place under conditions of arid climate. A major part of surface runoff is associated with snow melting. Permanently or seasonally waterlogged areas (Ural and Sagyz rivers, minor watercourses and their floodplains) account for only 10.3% of the total length of the pipeline route. The density of the river network does not exceed 0.2km per 1km^2.

The surface water bodies along the pipeline route belong to the Caspian Sea basin. Out of the rivers crossed by the oil pipeline route only the Ural River (438km) has a perennial flow; its riverbed width in the lower reaches is 500m.

The annual average (for many years) discharge of the Ural river is 9.2 km^3; the flow rate is 1300 m^3/s; the highest water level rise during the snow-melting period reaches 3.7m in the vicinity of Atyrau.

A specific feature of the local drainage network is prevalence of drainless saline watercourses and water bodies drying out in summer and freezing to the ground in winter.

The oil pipeline route crosses the brackish river Sagyz (with a flow only during freshet periods) and a number of dry riverbeds. About 95% to 99% of the annual river discharge is in April-May averaging 0.095km^3. The maximum rise of water level in the Sagyz River during freshets is 2m to 5m with a maximum recorded water flow rate of 385 m^3/s. In summer the river dries out on the rapids and in winter water in the river freezes to the ground.

The discharge of temporary watercourses, dry riverbeds and gullies crossed by the oil pipeline is formed during the snow-melting season and lasts for 3 to 5 days; the annual discharge layer does not exceed 10mm to 30mm (the annual discharge coefficient does not exceed 0.05 to 0.10).

Hydrochemical Regime

In the lower reaches of the Ural River the salinity of the water is low, i.e. up to 0.64 g/l as compared with the regulatory salinity limit for fishery watercourses of 1.0 g/l. The man-made pollution of water in the Ural River at the crossing with the pipeline is rated as insignificant.

Water in most river pools of drying-out rivers crossed by the pipeline route has a salinity of as high as 4.0 to 10 g/l (in some individual cases even up to 20 g/l) during low-water season and becomes unsuitable for domestic and drinking needs.

The main sources of surface water pollution in the areas along the oil pipelines route are minor town and villages having no sanitation facilities, as well as livestock farms often located in the water protection zones of minor watercourses.

The current pollution level in temporary watercourses is also related to the oil production processes (oil and gas fields of Zhanazhol, Kenkiyak, Oryskazgan, Anako, etc. are located within the catchment area of the Emba, Temir and Sagyz rivers).

4.4 WATER SUPPLY AND WASTEWATER REMOVAL

Water Requirement

The oil pipeline route will involve the sites and facilities of the existing oil pump stations (OPS) of Kenkiyak and Atyrau. Water for these facilities is supplied from surface and underground water sources.

Water for industrial and drinking needs at the OPS Atyrau is supplied via a drinking pipeline from a water intake station on the Ural River. The OPS Kenkiyak is provided with water from artesian wells.

The water requirement of these facilities before the beginning of construction of the pipeline and its facilities was as follows:

- Kenkiyak 15,150 m^3/year
- Atyrau 188,682 m^3/year

According to design documentation, no additional water supply required for OPS at the operational stage. Data on water requirement during the construction stage is presented in Section 5.3.

Wastewater Removal

OPS Kenkiyak

Before the commencement of the pipeline construction this facility had an industrial effluents removal system and a stormwater drainage system with wastewater settling in a buffer tank (for separation of petroleum hydrocarbons), as well as domestic sewerage system with settling of wastewater in shallow wells.

All wastewater generated at the OPS Kenkiyak was removed after settling to evaporation ponds with subsequent disposal of sludge in a special landfill.

The limits for wastewater discharge by OPS Kenkiyak in 1999 amounted to 4,792 m^3.

OPS Atyrau

Two sewerage systems were available at the OPS Atyrau:

- one for industrial effluents and stormwater;
- one for industrial and domestic wastewater;

with subsequent wastewater removal to evaporation fields.

The limits for wastewater discharge by OPS Aturau in 1999 amounted to 93,000 m^3.

4.5 CHARACTERISTICS AND CURRENT CONDITION OF SOIL COVER

In accordance with the natural and agricultural zoning of the land resources of Kazakhstan, the territory crossed by the oil pipeline belongs to the following zones:

- semi-desert (desert/steppe) natural and commercial zone with light-chestnut soils (primarily in the eastern portion of the pipeline);
- desert zone (sub-zone of northern deserts) with zonal brown soils (mainly in the western portion of the pipeline route).

This territory is suitable for limited pastoral livestock breeding.

Along with zonal soils, saline soils (solonets and solonchak soils of different types) are common over salinized rocks in relief depressions.

In the areas crossed by the pipeline route, the land has already degraded both as a result of natural factors (water erosion and deflation processes) and man-made impacts.

Among the factors of current man-made impacts affecting the soils prevailing are the use of pastures, transportation, livestock breeding and general domestic impacts.

The degree of disturbance of pasture land in this region is in general not high, but it is extremely severe in the vicinity of commercial livestock farms.

In areas, where the oil pipeline route runs along the right-of-way corridors of existing pipelines and associated infrastructure facilities (over 40% of the total pipeline length) , the land has been disturbed primarily by temporary soil roads and the soil is affected by local mechanical impacts, contamination and pollution with oil.

According to the findings of an investigations carried out in 2000, the degree of soil disturbance in the eastern and central portions of the oil pipeline route is mainly low (with some localized areas of medium and severe disturbance).

In the western portion of the pipeline route the degree of soils disturbance is severe or extremely severe, which is attributed first of all to the domestic impacts of residential areas of the city of Atyrau and its surroundings.

4.6 CHARACTERISTICS AND CURRENT CONDITION OF VEGETATIVE COVER

According to the botanical geographical zoning, the oil pipeline route crosses the territory of the North Turansky Province of the Asian desert region.

A specific feature of the vegetative cover here is monotony of baseline vegetation communities and relatively poor plant species composition. Predominant are herbaceous xerophyte and halophyte plant species, primarily sagebrushes, perennial saltworts, etc.

The flora of the region includes 230 species. Three species (*Rubia cretacea, Medicago komarovii, Jurinea fedtschenkoana*) are included in the Red Data Book of Kazakhstan, and three more plant species (*Tulipa schrenkii, Medicago rjvfrovii, Linaria cretacea*) are rated as rare species. No rare species were revealed at the construction site in the course of field surveys. No potential habitats of rare species were recorded there either.

Before the commencement of the pipeline construction, significant disturbance of the vegetative cover had been reported; it had been caused by mechanical impacts and pollution. These disturbances are mainly of local character, i.e. confined by the sites of existing facilities and right-of-way corridors of pipelines, railroad lines and roads, especially temporary and unauthorized roads, as well as in the vicinity of residential areas.

4.7 CHARACTERISTICS AND CURRENT CONDITION OF WILDLIFE

The fauna of the region includes 268 species of mammals and birds, both migrating and resident. Twenty-seven species are listed in the Red Data Book of the Republic of Kazakhstan.

The most part of the pipeline territory (right-of-way corridors of existing pipelines, roads, surroundings of settlements and OPS) has been noticeably changed as a consequence of recent industrial activities. As a result of these activities, habitats of rare species are located in sparsely populated areas, far from areas of planned construction operations.

The pipeline route is crossed by transit flyways of migrating bird species and natural ways of migration of Saiga antelope (*Saiga tatarica*)

There are 17 species of reptiles and amphibians common in this region, of which one species (*Elaphe quatuorlineata*) is in the Red Data Book of the Republic of Kazakhstan.

The ichthyofauna in the lower reaches of the Ural River includes 38 fish species, of which 5 species (*Stenodus teucichthys leucichthys, Alosa kessleri volgensis, Caspiomyzon wagneri, Salrno trutta caspius, Rutilus frisii kutum*) are in the Red Data Book of the Republic of Kazakhstan. The Ural River has a special significance as one of the main spawning grounds for sturgeons (along with the Volga River).

4.8 CURRENT LEVEL OF INDUSTRIAL AND DOMESTIC WASTE GENERATION

Before the commencement of the oil pipeline construction there had been some operating facilities along the pipeline route (OPS Kenkiyak with a tank farm and OPS Atyrau with a tank farm). At its 116-km section, the pipeline route runs close to the right-of-way corridor of an abandoned pipeline and pump station “Perekachka-4”.

Solid wastes were generated at all these facilities (as a result of oil transportation, reception and storage, as well as at a scraper receiver).

In the process of maintenance of the linear part of the old oil pipeline, metal scrap and construction debris were generated. Domestic waste was generated in the accommodation camps.

The bulk of waste was generated at oil terminals (tank farms at the OPS Atyrau and Kenkiyak).

The approximate amounts of waste generation at the above facilities operated before the commencement of the Kenkiyak-Atyrau pipeline were as follows (t/year):

Oil sludge	182.0
Oil-polluted soil	27.0
Domestic solid waste	6.3
Metal scrap and metal-containing waste	90.85
Spent oils	4.4
Wooden waste	0.8
Spent tires	0.4
Total	**311.75**

The design documentation does not contain any description of ways for removal and disposal of these wastes.

4.9 SOCIO-ECONOMIC ASPECTS AND ECONOMICS OF THE REGION

The Kenkiyak-Atyrau oil pipeline route crosses the territory of the Aktyubinsk Oblast (0-166km) and Atyrau Oblast (166-428km) of the Republic of Kazakhstan.

Within the Aktyubinsk Oblast the pipeline route crosses the Temirsky, Mugalzharsky and Baiganinsky administrative districts. The population of these districts is 139,400. The density of population in the areas crossed by the pipeline is less than 1 person per 1 km^2 as compared with an average population density of 2.3 persons per 1 km^2 for the Aktyubinsk Oblast as a whole.

Within the Atyrau Oblast the pipeline route runs in the Kzylkoginsky and Makatsky administrative districts and the Atyrau urban area. The population of this territory is approximately 108,000; the population of the city of Atyrau is 142,100. The average density of population in the Atyrau Oblast is 3.7 persons per 1 km^2. In the areas crossed by the pipeline route the average density of population is as low as in the Aktyubinsk Oblast, i.e. less than 1 person per 1 km^2.

The pipeline route bypasses a number of towns (Kenkiyak, Ebeity, Kenbai, Makat, Dossor, Leningradskoye). The distance from the pipeline route to the nearest residential areas is more than 200m.

During the pipeline construction period, temporary accommodation camps will be constructed for the engineers and technical personnel (for a total of up to 2,500 persons).

Socio-Economic Conditions

About half of the national recoverable oil reserves and a considerable portion of gas and condensate reserves of Kazakhstan are concentrated in this area.

In the Aktyubinsk Oblast a number of oil fields has been explored (Zhanazhol, Kenkiyak, Alibekmola, Kozhasai, etc.) with recoverable reserves of about 194 million tonnes. The annual oil production reached in 2003 a level of 4.5 million tonnes.

The unit investments into the oil and gas industry accounted in 1999 in the Atyrau and Aktyubinsk Oblasts for 96% and 79% of the gross investments. A certain contribution to the development of this region is made also by the utilities, consumer

goods and food industry. According to the statistical data of 1999, the enterprises of this region produced products of a total value of 262.2 billion Tenge or 1.94 billion US Dollars.

In the structure of the industry, private ownership is prevailing accounting for 99% of the overall output.

In the Atyrau Oblast the per-capita income level is higher than the average level in Kazakhstan as a whole due to the high proportion of those employed in the oil and gas industry and banking business, but it is still rather low, i.e. 10,836 Tenge or about US $80 per month. In the Aktyubinsk Oblast the level of wages is lower by about 58% to 79% as compared with the Atyrau Oblast.

The official unemployment level in the Aktyubinsk Oblast has been slightly decreasing over the recent years, but it is still approximately 3.6%. In the Atyrau Oblast the unemployment level has increased and reached 7.3%.

Cultural and Historic Aspects

There are numerous pieces of evidence of cultural heritage of ancient and more recent historic epochs in Western Kazakhstan; they are represented along the pipeline route by a number of archeological sites (mounds and settlements) and architectural monuments (mausoleums, buildings, burial places, etc.).

Over 30 ancient burial places have been identified outside of the pipeline right-of-way, but in its direct vicinity. There are also a number of ancient buildings and sculptured stone figures located close to the planned pipeline route. Archeological sites are in general associated with river valleys.

All these monuments of cultural and historic heritage are of interest both for historians and researchers, on one hand, and have high value for the religious feelings of the indigenous residents.

5 ENVIRONMENTAL IMPACT ASSESSMENT

5.1 GENERAL DESCRIPTION OF SOURCES OF ADVERSE ENVIRONMENTAL IMPACTS

The present assessment refers to impacts caused by the applied technology and other potential environmental impacts during the pipeline construction and operation periods.

The main e***nvironmental impact factors associated with the technology*** applied in the course of pipeline construction and operation include the following:

- Air emissions;
- Use of water resources;
- Impacts on underground and surface waters;
- Impacts on soil and vegetative cover;
- Disturbance and risk factors for the wildlife.

Impacts not associated directly with the applied technology may be potentially caused due to various unpredicted and emergency situations. Emergency situations are associated first of all with failure of equipment ensuring oil transportation via the pipeline and external damage inflicted to the pipeline and valves. They might result in oil spills and pollution of different environment media.

5.2 ASSESSMENT OF IMPACTS ON AMBIENT AIR

Construction period

The oil pipeline construction implies certain impacts on the atmospheric air in the process of:

- construction of accommodation camps;
- construction of roads
- operation of construction machinery and vehicles;
- pipeline construction.

Maximum air pollution with chemical substances is expected in the process of operation of earthmoving and pipe-laying machinery, welding operations and vehicles transporting materials, equipment and construction personnel.

Release of dust into the atmosphere will be caused by excavation and earthmoving operations (excavation and backfilling of trenches). The design provides for moistening of the ground in the process of construction of soil and gravel roads, which will prevent dusting.

Gross dust emissions during the construction period will amount, according to the design data, to approximately 33 tonnes per year, which may be rated as a low level of pollution.

The main stationary sources of emissions will be the filling stations located in accommodation camps with their tank farms for fuel storage. The design gross emissions from stationary sources will be as follows:

- gasoline storage facilities 0.234 t/year;
- diesel fuel storage facilities 0.013 t/year.

Emissions from welding operations are expected to be negligible.

Operation period

Emissions from mobile sources (vehicles) will account for 49.5% of the total gross emissions of pollutants from the pipeline facilities, and will be as follows:

- carbon monoxide approx. 2,136 t/year
- hydrocarbons 1,013 t/year
- nitrogen dioxide 1,129 t/year

According to the design, the gross air emissions from the linear portion of the oil pipeline will be about 6 t/year (including about 5 t/year of petroleum hydrocarbons emitted from the valves installed on the linear portion of the pipeline).

The main stationary source of release of chemical substances into the atmosphere will be storage tanks, boiler stations and fuel depots at the OPS sites.

The gross emissions from both OPS after their expansion and modernization will be 1,353 t/year.

The main pollutants emitted will be:

- Petroleum hydrocarbons (C12-C19)
- Hydrogen sulfide
- Carbon monoxide
- Nitrogen dioxide

The computed width of the regulatory sanitary protection zone will be 1,000m for the OPS Kenkiyak and 1,365m for the OPS Atyrau in the direction toward the residential area.

Based on the results of computations of pollutants dispersion in the atmosphere for the OPS Atyrau and Kenkiyak it has been determined that the regulatory permissible ground-level concentrations will not be exceeded both at the SPZ boundary and in the nearest residential area (located at a distance of over 3km) with respect to any of released pollutants and groups of pollutants summation.

It is also expected that even with a further increase in the volume of oil transportation the regulatory sanitary norms will be also complied with both at the OPS sites and in the nearest residential areas.

5.3 WATER REQUIREMENT AND WASTEWATER REMOVAL

Water Requirement

According to the design, additional water supply sources for the OPS Kenkiyak will be the Company's own water wells and the main water pipeline operated by the NGDU "KenkiyakNeft" company.

Water for the OPS Atyrau will be supplied from the existing water pipeline Astrakhan-Mangyshlak via a connection pipeline to be constructed for the given project.

Construction period

The design specifies that the total industrial and drinking water requirement will be 103,676 m^3.

The industrial water requirement includes:

- Water for preparation of cement mortar 188 m^3
- Water for washing of vehicles and machinery 4,207 m^3
- Water required for construction of water wells 122 m^3

The total water required for industrial and construction needs has been estimated in the design at 4,517 m^3.

Water for fire suppression will be used from the existing firewater reservoirs and temporary firewater tanks.

Water for general domestic and drinking needs will be supplied for the construction personnel at construction sites and accommodation camps along the linear portion of the pipeline system and at the OPS sites during their expansion and modernization.

The total water requirement of the accommodation camps during the entire construction period has been estimated at 98,476 m^3 (for 2,500 persons in one construction crew working on a rotation basis).

Operation period

Water for pipeline testing prior to its commissioning will be abstracted from artesian wells and surface water bodies (Ural and Sagyz rivers). The volume of water required for testing has not been specified in the design.

The drinking water requirement for the personnel during the pipeline testing period has been estimated at 218.7 m^3. The industrial water requirement (vehicle washing) is assumed to be 137.2 m^3.

In connection with the construction of additional oil storage facilities at the OPS Keniyak and Atyrau, the firewater requirement will increase:

- At OPS Keniyak the total volume of water required for fire suppression by foam during 1 hour and cooling during 4 hours will be 1,322 m^3.
- At OPS Atyrau, the required firewater volume will be kept in two tanks with a total capacity of 4,000 m^3 and supplied by a pump station at a rate of 600 m^3/hour.

The design water requirement for general and drinking needs during the operation period at the OPS Keniyak and Atyrau is 305.38 m^3/day.

Wastewater Removal

Construction period

In the process of construction work no industrial effluents will be generated.

Wastewater might be generated during this period as a result of water use for domestic needs and vehicle washing. According to the design data, the amount of wastewater to be removed from the accommodation camps will be 900 to 1500 m^3 per month; it will be discharged to the existing municipal sewerage system (construction of connection sewer line is required).

Operation period

During the pipeline operation period, the industrial water requirement will increase in connection with construction of additional oil storage facilities at the OPS Kenkiyak and OPS Atyrau.

At the OPS Kenkiyak the gross wastewater volume is expected to be 19,327 m^3/year and the amount of pollutants contained in wastewater will be approximately 10 t/year.

Treatment of stormwater and industrial effluents will be accomplished during the initial stage of operation in the existing buffer tank for static settling. Then this wastewater stream will be sent to sludge accumulating pond and clarified wastewater will be then pumped to evaporation ponds.

General and domestic wastewater will be collected in a system of shallow wells located near the buffer tank and pumped after settling to evaporation ponds.

About 819 t/year of pollutants will be released to the evaporation fields at the OPS Atyrau (primarily chlorides and sulfates) with removal of a total expected wastewater volume of 158,804 m^3/year.

Out of this amount, the proportion of effluents generated at the connection unit to the OPS Atyrau will be only 0.166 m^3/day (maximum 42 m^3/year), which is negligible.

Industrial effluents and stormwater will be treated in a buffer tank and filter units, after which treated wastewater will be sent to evaporation fields.

The wastewater from the industrial and domestic sewerage system will be sent to evaporation fields after treatment and decontamination at biological treatment facilities.

5.4 ASSESSMENT OF IMPACT ON SURFACE WATERS

A specific feature of the selected oil pipeline route is the fact that it crosses a number of minor watercourses, dry riverbeds and a network of gullies, as well the intermittent Sagyz River and the Ural River in its lower reaches (in total the design foresees 25 crossings of permanent and intermittent rivers).

The required *permitting documents* for construction of river crossings have been already obtained:

- Approval by the regional utilities enterprises “AtyrauVodkhoz” and “AktyubVodkhoz”;
- Approval by the North-Caspian regional agency for bioresources conservation.

According to the design all river crossings of the oil pipeline (except for the Ural River) will be constructed using underground method with pipeline laying at a depth of 0.8m to 1.0m to the pipe top using a heavy-duty protective coating and with installation of shut-off valves at both river banks. In case of construction of river crossings during dry season, the use of open methods for laying the pipeline across minor watercourses and gullies will not have any negative impacts.

The construction of a river crossing across the Ural River might have an especially significant potential impact. The use of directional drilling method will minimize the impact on surface waters as a result of an increase in the volume and rate of sediments transfer from the disturbed areas of the river floodplain into the riverbed.

Pressure testing of the pipeline prior to its commissioning implies the use of large volumes of water. This water after the completion of the tests will have an elevated content of suspended matter, which permits its release onto the ground.

During the construction period, pollution of surface waters is potentially possible in areas used for parking of vehicles and construction machinery, as well as at temporary general and accommodation infrastructure.

In general, any negative impacts on surface waters ***during both the construction and operation periods*** will be of short-term and local character.

During the pipeline operation period there will be a potential threat of surface water pollution in case of accidents and in the course of preventive pipeline repairs. The following sections are most vulnerable:

- Area at the Kokbulak Lake (55-km pipeline section);
- Takyrs and sors filled with water during snow-melting periods;
- Floodplains and riverbeds of watercourses.

Underground river crossings are potentially most hazardous facilities due to potential damage, that might be inflicted to the pipeline in case of its exposure, river bottom deformation and ice loads; this might cause an emergency situation.

5.5 ASSESSMENT OF IMPACT ON NATURAL GEOLOGICAL ENVIRONMENT AND UNDERGROUND WATER

The main factors that might have potential negative impact on the geological environment and underground waters ***during the pipeline construction period*** include the following:

- Mechanical destruction of soils;
- Disturbance of natural landforms;
- Changes in drainage conditions of a given territory and in the groundwater regime;
- Stimulation of adverse exogenous geological processes.

Construction of the oil pipeline requires significant volumes of earthmoving operations (2.1 million m^3) in the process of trench excavation for the pipeline. This will cause **local** impacts on the geological environment.

Substantial impacts that might be caused during the pipeline construction are possible in case of intensification of exogenous geological processes, which in turn might determine the technological stability of pipeline systems. Prevalence of areas along the pipeline route resistant to effects of exogenous processes permits us to assess the potential degree of impacts on the geological environment as **low**.

Unstable areas sensitive to exogenous processes are observed only at some individual sections of the pipeline (on valley slopes and benches, unfixed sands, etc.), where it is necessary to apply anti-deflation and anti-erosion measures.

With the adopted structure of water requirement no significant loads on underground waters are expected during the pipeline construction and operation.

In the course of construction, some local pollution of underground waters is potentially possible in the areas used for parking of vehicles and construction machinery, as well as at temporary auxiliary infrastructure facilities.

In the course of operation of the linear portion of the pipeline system and associated facilities the main source of impacts on the condition of underwater will be tank farms, sludge pits and settling ponds at the oil pumping station, potential leaks and emergency discharge along the pipeline route. Pollution of underground water is also potentially possible in the process of maintenance and preventive repair work.

The degree of natural protection of underground water horizons along the pipeline route has been rated as poor (Quaternary deposits) or there is no protection at all (limestones and coquina).

Accidental oil spills might be a most dangerous source of pollution at the following pipeline sections:

- The OPS Kenkiyak is located in the zone of poorly protected underground waters in the Quaternary alluvial deposits with a groundwater stream directed north-westward toward the Temir River (3km to 4km away from the pipeline route);
- Crossing of areas of Oligocene deposits (45-km to 67-km pipeline section) and the probability of pollution of numerous deep and shallow water wells downstream of the underground water stream;
- Area of artesian wells (86-km and 89-km sections);
- Crossing of Quaternary deposits in the sand massif of Akkumsagyz (110-km to 120-km section of the pipeline route) with potential pollution of the Sagyz River;
- Crossing of areas of highly permeable Upper Cretaceous deposits (170-km to 243-km section of the pipeline route).

According to the design documentation, the pipeline route runs beyond the boundaries of sanitary protection zones (SPZ) around water wells (the SPZ width is estimated for each particular well; as a rule, it does not exceed 1,000 m).

Measures aimed at groundwater protection against pollution and prevention of emergencies are described in detail in Sections 6.1 and 6.2.

5.6 ASSESSMENT OF IMPACT ON SOIL COVER

The main factors of potential adverse effects on the soil cover ***during the pipeline construction period*** are:

- Withdrawal of land for construction purposes;
- Mechanical impact on soils in the process of trench excavation;
- Road digression;
- Stimulation of water and wind erosion development;
- Contamination of soils with construction and household wastes.

The oil pipeline route crosses natural pasture land of low fertility. Within the right-of-way allocated for the pipeline construction, the land temporary withdrawn for the construction period must be returned after reclamation to its permanent users.

A substantial impact factor affecting the soil cover is irregular movements of vehicles causing road digression. In addition to the direct impact on the soil cover within the road network, potential soil erosion will result in entrainment of dust particles and pollution of the adjacent areas.

After the completion of construction, the temporary road network will be liquidated.

The impact of the oil pipeline and pump stations on the condition of the soil cover ***during the pipeline operation period*** under normal operating conditions has been assessed as **insignificant**.

In emergency situations, in case of equipment failure (cracks and rupture of the pipeline, defective linear valves, oil spills at the OPS, etc.) and in the process of maintenance and repair operations it is possible that soils would be polluted with petroleum hydrocarbons and associated toxic chemicals within some localized areas.

5.7 ASSESSMENT OF IMPACT ON VEGETATIVE COVER

Mechanical impact on the vegetative cover will be maximum during the pipeline construction period in the process of pipeline laying, expansion and modernization of the OPS, construction of access roads and accommodation camps. As a result, partial or complete destruction of vegetation within localized areas will take place, resulting in development of negative exogenous processes.

The vegetative cover and underlying soil are especially sensitive within the sand massif of Akkumsagyz, were sand movement processes can become more intensive. Furthermore, valuable herbaceous plant communities might be affected in river floodplains at the river crossings of the pipeline.

In general, the construction operations occupy a minor area of vast steppe and semi-desert territory; moreover, over 40% of pipeline route runs within right-of-way corridors of the existing pipelines and roads. Therefore the impact of the pipeline on the natural environment is considered as negligible.

The impact of the oil pipeline and associated facilities on the condition of vegetation ***during the period of pipeline operation*** under normal operating conditions has been assessed as **insignificant**.

During the operation period it is expected that the man-made pressure onto the vegetative cover along the linear pipeline part will decrease. Successions of vegetation communities will take place in areas used previously for temporary operations and the vegetation condition will in general stabilize. After the completion of the construction work, the areas, which might be potentially exposed to man-made impacts on the vegetative cover will significantly decrease.

In potential emergency situations, in case of equipment failure (defective linear valves, oil spills at the OPS, etc.), as well as during maintenance and repair work, it is possible that the vegetation would be exposed to pollution and stunting by petroleum hydrocarbons and associated toxic chemicals within limited areas.

5.8 ASSESSMENT OF IMPACT ON WILDLIFE

Among the factors of impact on the wildlife, the following are most substantial:

- Habitat destruction and disturbance of areas of seasonal concentrations of animals;
- Direct destruction of animals;
- Disturbance of migrations of animals;
- Disturbance factor;
- Habitat pollution.

Disturbance of habitats of animals during the pipeline construction period will take place within a narrow limited strip of land. Most of animal species will leave the

disturbed zones. Rare species might be substantially affected, if breeding, feeding or resting grounds would be disturbed.

The most part of the pipeline runs within right-of-way corridors of existing pipelines and close to residential areas and industrial facilities. Rare animal species avoid populated and developed areas. In this connection, construction operations are not expected to impact rare or Red Book species.

Habitat destruction is especially important for animals living in the soil.

The oil pipeline route crosses migration routes of the Ustyurt population of Saiga antelope, and in this connection, open trenches might cause death of animals, and especially young animals.

In case of accident-free ***operation*** of the oil pipeline and associated facilities the populations of invertebrates will recover within 4 to 5 years. Obstacles for migration of large mammals across the linear portion of the pipeline will be removed. A decrease in the wildlife population is potentially possible only as a consequence of illegal hunting.

In general, the impact on the wildlife may be rated as **local and insignificant** under condition of accident-free operation.

In emergency situations it is possible that some sources of pollution with petroleum hydrocarbons and associated toxic chemicals might appear and pose threat not only to the fauna in the soil, but also to birds.

5.9 INDUSTRIAL AND DOMESTIC WASTE GENERATION

Construction period

The main sources of waste generation during the pipeline construction period are:

- Used construction materials;
- Operation of construction machinery and vehicles;
- Accommodation camps.

The following amounts of waste generation are expected during the construction period (t/year):

Oil polluted soil	11.0
Domestic solid waste	98.9
Metal scrap	118.65
Spent oils	42.4
Wooden waste	0.36
Packing materials	78.0
Construction debris	63.2
Total	**412.51**

Operation period

Under normal operating conditions, the amounts of generated wastes resulting from operation of pump stations, linear portion of the pipeline, maintenance and repair work will be insignificant. It will be mainly metal scrap, wastes generated by vehicle operation and solid domestic waste. The total amount of waste generation has been estimated in the design at approximately 2.0 tonnes per year.

The maximum amount of wastes will be generated in the form of oil sludge as a result of pipeline cleaning and removal of scale from the internal pipe walls. The design documentation does not contain any data referring to the total amount of generation of this waste at all oil pipeline facilities.

Potential oil leaks from technological equipment might result in pollution of soils with oil. The design documentation does not refer to expected amounts of generation of oil-polluted soils.

Waste recycling

Industrial and domestic solid wastes will be stored on a short-term basis in containers and in specially designated and prepared areas (for metal scrap) at the OPS sites.

Oil sludge will be disposed of in special landfills and domestic solid waste will be removed by contractors for disposal in municipal landfills.

The design documentation does not contain any information on the availability in the given region of adequate landfills for oil sludge and domestic waste disposal.

6 MEASURES FOR MINIMIZATION OR ELIMINATION OF NEGATIVE ENVIRONMENTAL IMPACTS OF OIL PIPELINE CONSTRUCTION AND OPERATION

6.1 MEASURES ABATING THE ENVIRONMENTAL IMPACT LEVEL DURING OIL PIPELINE CONSTRUCTION AND OPERATION

The main organizational, technical and technological solutions aimed at preventing environmental pollution are associated with safe implementation of construction work in conformity with the applicable technical norms and rules, as well as compliance with the technological specifications for oil pipeline operation and the general environmental regulations.

Technological measures ensuring environmental protection during the construction period

Measures incorporated in construction technology

- Earthmoving work and vehicle traffic strictly within the boundaries of the right-of-way area allocated for the oil pipeline construction;
- Compliance with the prescribed anti-deflation measures in the process of work accomplished on unconsolidated ground (barkhan and ridge sands): grading of ground surface along the pipeline route up to the level of depressions between

ridges; keeping trenches open not longer than during one shift to prevent their filling with drift sand by wind.

- Implementation of work on irrigated land during periods when irrigation is not in progress and prevention of ingress of irrigation water to the right-of-way area during the construction work;
- Construction of embankments in sor depressions (saline areas) in two stages: first up to the level of the design elevation of pipe bottom (simultaneously ensuring passage of vehicles), and then after laying the pipe, filling to the design elevations;
- Use of best available environmentally sound technologies for construction of river crossings, including:
    - Inclined directional drilling for construction of river crossings on major watercourses (Ural River);
    - Construction of bank reinforcement structures of passive type to protect the Ural River banks against scouring;
    - When using open-trench method for river crossing construction (on watercourses up to 30m wide), underwater trenches should be excavated during the low-water season;
    - Compliance with the design technology for pipeline laying across minor watercourses (from barriers along the trench and dams in case of stable ground and by pulling in unstable ground);
    - Laying of the pipeline at a depth of at least 1m from the natural bottom elevation to the pipe top and at least 0.5m below the riverbed deformation line predicted for a 25-year period;
    - Stockpiling of excavated soil in dumps and prevention of its washing-out; prohibition of soil and construction debris dumping into riverbeds;
    - Bank reinforcement (filling with a gravel layer 0.2m thick) at crossings and on the river bottom for the width of the trench opening; reinforcement of banks exposed to scouring at both ends of river crossings up to the areas not exposed to scouring;
    - Restoration of the natural water flow after the construction completion (removal of temporary earth bulkheads, dams, wooden barriers, pipes, etc.);
    - Cleaning of riverbeds starting from the upstream areas with gradual advancing downstream along a watercourse.
- Integrated technical and biological reclamation of disturbed land along the oil pipeline route and return of the temporarily withdrawn land areas to their previous owners for original use.

Engineering protection of the territory in case of adverse weather conditions

- Use of a range of anti-erosion and anti-landslide measures, including measures to ensure adequate stormwater and snow-melt water drainage and reinforcement

of slopes (spraying, polymeric impregnation, brushwood laying, boards and mats, grass seeding, bush planting, etc., depending on specific conditions);

- Prohibition of traffic over unauthorized roads and off the temporary road network;
- Laying of pipes at a depth of 1.9m to 2.2m (over trench bottom, depending on the seasonal ground freezing depth to prevent pipeline damage due to cryogenic impact);
- Construction of an adequate number of culverts under the roads running along the oil pipeline route;
- Provision of a barrier with a water draining structure under the pipe;
- Prevention of water drainage stream along the pipeline by construction of hillside water diversion trenches and bulkheads in drainage trenches to prevent water erosion.

Organizational and technological measures for pipeline operation

- The pipeline operation in compliance with the "Safety rules for operation of main pipelines" (RD 39-002-98) and other relevant regulatory and technical documents;
- Instruction and information of the operating personnel and local communities on issues relating to environmental protection in connection with the oil pipeline operation;
- Safe operation of the linear portion of the pipeline and the OPS sites, provision of fire-fighting and fire preventing means at industrial sites;
- Environmental monitoring;
- Installation of an adequate number of warning signs at the oil pipeline.

Main environmental protection measures for individual environment media

Air pollution abatement measures:

- Use of equipment with a high degree of operational reliability and keeping vehicles in proper technical condition to ensure compliance with the regulatory levels of NO_x and CO emissions with exhaust gas;
- Compliance with the technological specifications relating to the use of vehicles and machinery during the pipeline construction and operation;
- Minimization of the use of manual electric welding;
- Installation of equipment for efficient gas treatment, decontamination and recovery of harmful components prior to release into the atmosphere from stationary sources (boiler stations, diesel generators, oil heating ovens, workshops, etc.);
- Use of industrial processes based on close-circuit technology;
- Use of a sealed system for oil and gas collection, suppression of emissions from storage tanks, adequate sealing of valves, flanges and gaskets in utilities lines and equipment;

- Introduction of systems for gas utilization and recovery of light hydrocarbon fractions; repeated treatment of tail gas received from storage tanks;
- Use of physical and chemical means for reducing oil evaporation in storage tanks (solid foam films) and pontoons with shut-off valves and seals, as well as floating covers on storage tanks;
- Replacement of safety valves with more advanced systems; inspection and adjustment of breather valves during transitional seasons of a year;
- Installation of reflecting discs on storage tanks;
- Installation of gas-equalizing systems on storage tanks;
- Use of optimal conditions for filling and emptying of storage tanks;
- Installation of vertical gas dividers ahead of storage tanks;
- Regular renovation of the paint coating of storage tanks using light-reflecting paints;
- Elimination of the use of oil pits, oil traps and open treatment facilities;
- Storage of particulate materials, chemicals and industrial wastes in specially designated areas with water spraying of sites.

Measures for protection of surface and underground waters:

- Installation of shut-off valves at both banks at river crossings;
- Compliance with the relevant environmental measures in the process of pressure testing of the pipeline (use of settling tanks, if water pollution is expected after the hydraulic pressure testing);
- Prohibition of vehicle and machinery washing on river banks and discharge of wastewater and oil-containing effluents into water bodies; storage of industrial and domestic solid wastes within water protection zones; installation of containers for temporary storage of pollutants at industrial sites;
- Use of corrosion-resistant coating of a reinforced type (three-layer polyethylene coating) in combination with electrochemical protection;
- Use embankments made of sand or gravel at least 1m thick with appropriate bunding to prevent digression of vehicles and machinery from roads and sites along roads, at junction points, river crossings, permanent or temporary industrial sites, filling stations, etc.;
- Reduction of water requirement.

Measures for protection of the soil and vegetative cover:

- Prohibition of construction work in springtime in areas with unconsolidated ground and hydromorphic soils;
- Execution of construction work in areas with meadow and sor-solonchak soils during winter period;
- Permanent supervision over observance of the boundaries of allocated land areas;

- Obligatory collection and disposal of products of internal pipe cleaning in case of pipeline flushing.

Measures for mitigation of threats to wildlife:

- Mitigation of acoustic impact by using appropriate and improved mufflers on vehicles and machinery;
- Prompt identification of areas affected by potential oil spills to prevent any death of animals and penetration of animals into evaporation ponds;
- Creation of territories with low-impact conditions when accomplishing certain work during seasons of Saiga antelope migration, nesting of waterfowl along the Sagyz river valley (150-km section) and in the sand massifs of Akkumsagyz (110-km section);
- In order to ensure conservation of migration ways of Saiga antelope and other animals, passageways 5m wide will be provided during the pipeline construction period at the following pipeline sections:
    - 60-km section
    - 60-km section (natural topographic boundary of Tortkuduk)
    - 80-km section (natural topographic boundary of Shuburkuduk)
    - 110-km section (sand massif of Akkumsagyz)
    - 160-km section (natural topographic boundary of Akkora)
- Compliance with limitations and a time frame relating to prohibition of any work during spawning and fry fish migration in the Ural River, as well as adequate cleaning of riverbeds to remove construction waste;
- Prevention of spread of epizootic infections (malaria, Q-fever, bubonic plague, rabies).

6.2 MEASURES FOR ACCIDENT PREVENTION, LOCALIZATION AND RESPONSE

Major Risk Factors

The quantitative characteristics of the pipeline safety are determined based on an analysis of risk of accidents and emergency situations.

The main hazardous factors of the pipeline failure are:

- Inadequate quality of pipe manufacture, as well as defective implementation of construction and installation work;
- External and internal corrosion;
- Impact of man-made (mechanical) and natural factors.

Measures for accident prevention and response

The measures proposed in the engineering design for accident prevention and response are based on the regulatory requirements set forth in the relevant SNiP

norms of the Republic of Kazakhstan, as well as safety rules and western standards. They include the following:

- Minimization of the probability of accidents by taking comprehensive measures aimed at eliminating potential causes (risks) of accidents;
- Timely identification of leaks (ruptures) and prompt response to potential accidents;
- Ensuring of safety of the operating personnel and local residents, as well as minimization of damage that might be caused by environmental pollution.

For this reason the following measures have been incorporated in the design:

- The pipeline route has been selected to ensure adequate regulatory distances from residential areas in accordance with SNiP Norm 2.05.06-85;
- High-strength tubes will be used with efficient insulating coating and corrosion protection;
- Most hazardous sections of the pipeline have been identified (Ural and Sagyz rivers);
- Shut-off valves will be installed at a distance of not more than 37km between valves (along the pipeline) and at both banks of any river crossed by the pipeline;
- Devices have been provided for pipe cleaning and diagnostics;
- Hazard of scouring and pipe floating at river crossings has been eliminated;
- An advanced leak detection system (LDS) has been installed;
- Resources and complete sets of equipment have been provided for monitoring and response to emergency situations;
- Personal protection equipment has been provided for personnel protection;
- Safe zones for the operating personnel have been computed in accordance with the existing procedures for project risk assessment.

The main measures aimed at accident prevention and response include:

- Careful monitoring of leaks (emissions);
- Due maintenance of shut-off valves and local warning and alarm systems; timely diagnostics of the pipeline and shut-off valve condition;
- Maintaining of the preparedness of the human resources and equipment for emergency response;
- Constant patrolling of the pipeline right-of-way area;
- Training of the management and personnel in emergency response.

Actions to be taken in case of accident threat and emergency response

In case of receiving any information about a threat of an emergency situation caused by external sources or as a result of a major accident:

- The oil feeding to the damage pipeline section will be interrupted;

- Preparations will be made to hand out personal protection equipment to the personnel within 0.2 to 0.5 hour (in case of an accident at an OPS);
- Emergency response crews and required resources for emergency response will be mobilized within 0.2 to 2 hours;
- Fire brigades will be mobilized within 0.2 to 1 hour;
- The actions foreseen in the contingency plan will be implemented to ensure safety and evacuation of the personnel.

Cleanup of oil-polluted areas will be ensured by means of:

- Containment of oil spills (containment bunding, boom deployment, etc.);
- Collection and removal of spilled oil and wastes (in some cases by burning);
- Cleanup and reclamation of affected areas.

7 PROPOSALS FOR ENVIRONMENTAL MONITORING

During the oil pipeline construction and operation periods it is planned to carry out the following types of monitoring in coordination with the relevant land management and environmental protection agencies:

- Ambient air quality monitoring, including:
  - Reception of daily hydrometeorological information;
  - Monitoring of air emissions from point emission sources (stationary sources and vehicles);
  - Monitoring of atmospheric precipitation and snow cover around the OPS;
- Monitoring of the condition of surface and underground waters, including:
  - Monitoring of the drinking water quality;
  - Monitoring of water quality in rivers at the river crossings;
  - Monitoring of potentially polluted underground water with the aid of a network of observation wells;
- Lithological monitoring, including:
  - Assessment of soil pollution;
- Monitoring of harmful physical and chemical impact factors at workplaces;
- Monitoring of radiological factors.

8 CONCLUSIONS

Main environmental impacts of the project on the local ecosystems took place during the pipeline laying period. These impacts were associated with earthmoving operations necessary for pipeline construction and temporary withdrawal of agricultural land.

No rare or Red Book species as well as their habitats were revealed in the pipeline right-of-way area during field surveys.

The consequences of these impacts are mitigated after the pipeline construction completion, but due to local climatic conditions the recovery of vegetation and soil cover will proceed at a slow rate.

During the normal and accident-free operation of the pipeline and associated facilities (OPS), there will be no substantial impacts on the natural environment and ecosystems. The operating Company has foreseen the required technological solutions and technical means for prevention of accidents and obtains the required equipment and resources in place to ensure adequate response to emergency situations and mitigation of the consequences of potential accidents.

In general, the implementation of the Kenkiyak – Atyrau oil pipeline construction project will have a positive effect on the socio-economic conditions in the given region and on the living conditions of local communities due to contributions to be made by the operating company to the budget of the region.

Thus, the integrated assessment of the impacts of the project to be implemented by the KazTransOil Company has indicated that ***the expected impacts on the local ecosystems will be of primarily local scale. The level of the project impact on the environment and public is evaluated as moderate to low.***

Most of the negative environmental impacts connected with the construction work will be mitigated or terminated after the completion of these works.

On a long-term basis a special attention should be paid by the pipeline operator to ensure the accident-free operation of the oil pipeline, since negative environmental consequences of potential accidents might have a major environmental factor.