East West Highway Project (Almaty – Khorgos, Kazakhstan)

Draft Environmental and Social Impact Assessment (ESIA)

PREPARED FOR:

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EXECUTIVE SUMMARY

The Project

The Project involves the rehabilitation, upgrading and substantial new construction of a ca. 330 km long road Section which traverses a variety of environments and landscapes. The Project has all the physical characteristics of a large linear infrastructure project, with significant spatial extension, visible impact on landscape, biosphere and land use patterns, and significant impacts on topography, climate, natural conditions and human activity. The alignment crosses of a variety of land forms, land use types, and micro-climatic zones. The project is being structured and designed in three different Sections of roughly equal length. These Sections are described below, including features and information relevant for safeguards classification and the design of safeguards instruments.

Section 1 (024-126 km) starts north of Almaty city and ends at the Shelek River This Section begins at about 20 km NNE from the city centre of Almaty (the chainage refers to a reference point in Almaty). Much of the road (ca. 70-80%) will follow a new alignment. The first 10 km run through what can still be seen as suburban zone of Almaty, characterized by a dense network of infrastructure (roads, power lines, railroad) and numerous satellite settlements, with intense agricultural land use in non-built-up areas. The alignment then heads steadily in an east and east-north-easterly direction, about 2-5 km north and parallel to the existing main highway, the A351 ("KuldzhinskiyTrakt"). About 80% of the alignment runs through lands which are under intense agricultural use (with minor animal husbandry) and are mostly irrigated. The alignment crosses between 10-15 seasonal rivers, which run dry in summer, but can carry considerable water and sediment loads in spring. Many of them are use for gravel extraction About 15 km to the North, and thus downstream and at a lower elevation than the project alignment, lies the Kapchagai Reservoir, created by damming Ili River. Ili then continues to flow NW into Lake Balkash, which is the second largest lake in Kazakhstan and the receptacle for the entire surface water network in the project area. At the eastern end of Section 1 the alignment runs through more arid rangeland, which is mostly covered by brush and grass and used mainly as pastureland for animals. The boundary of the first Section is defined by river Shelek which lies just east of a major settlement of the same name. River Shelek is a perennial watercourse, albeit with large fluctuations in discharge rate. It is under intense use for gravel extraction in the project area (i.e. near the existing road). In this Section (about 100-126 km) the new alignment will use the existing right of way south of the small town of Shelek. The existing bridge over Shelek River will be reconstructed and a new bridge built to accommodate two additional traffic lanes.

Section 2 (126-268 km) starts from Shelek River and runs eastwards until almost reaching Ili river. This Section commences in NE direction from River Shelek, while the A351 highway turns off due east, running roughly parallel to the project alignment at a distance of about 20-30 km to the southeast. The project alignment follows a secondary road, which is a narrow asphalted road for the first 25-30 km and then turns into a gravel road for about 70-80 km which is in very poor condition. This part of the alignment was projected to be upgraded to a transit highway in the 1980s, but construction did not proceed beyond a gravel platform. Alignment adjustments and new Sections are planned in 3 segments of this Section: (i) about 5 km at the start of the Section (new alignment crossing agricultural lands), (ii) about 2-3 km at 18 km from the Section start, where the new alignment will cross an area of waterlogged land, and (iii) about 23 km stretch towards the end of the Section, where the new Section will be routed between an alluvial fan with irrigated agriculture, and a semi-desert type area. Over most of Section 2 the road alignment follows an existing infrastructure corridor with a newly constructed railway line, a gas pipeline, and electricity supply

lines between which the road will be located. The natural environment of the alignment is already disturbed by these various developments.

At about 63 km from the start of Section 2 the road alignment will pass at the closest point, about 2 km to the north of the Charyn National Park, the core zone of which is an ancient forest which has survived in a narrow, sheltered canyon along a 25 km stretch of Charyn River. Currently the National Park is bisected by the existing highway A351. This forest is one of the last remnants of a much larger forest which once stretched along the foothills of the Tian Shan Mountains after the last Ice Age. It is the last location in Central Asia and one of the few places in the world which still supports a large population of the endangered Sogdian Ash Tree. To the north of the alignment also in this area there lies the Altyn-Emel National Park which lies 6 km distant at the closest point. Famous for its ''singing'' sand dunes and various desert and mountain reptiles and mammals.

Following the alignment to NE directions there is a visible trend towards a more arid climate, thus much of the alignment of this Section would run through arid steppe or semi-desert type rangeland, with no perennial rivers, no wetlands (except the aforementioned) and few temporal rivers (located in the NE of the Section, at ca. 86 km from the start of Section 219-220). Agricultural lands and associated irrigation systems will be affected only along ca. 25% of the Section. Ca. 80% of Section 2 will run along existing, albeit much smaller and lower capacity roads. The Section ends about 5 km South of River Ili, where the project alignment rejoins the existing route A351.

Section 3 (268-360 km) runs through a variety of landscapes and land use types and ends at Khorgos near the Kazakhstan/China border. This Section starts ca. 5 km east of the existing, ca. 700 m long bridge over River Ili. Ili is the largest river of the entire project area and the main tributary to Lake Balkash. Several km before and after the crossing of Ili River the project alignment would follow the existing route A351, and a new bridge would be built immediately next to the existing one to accommodate 2 additional lanes. A few km after the river crossing the projected road would again turn off the existing route A351 to the West-North -West and run on a new alignment for the rest of the project. The bulk of the Section would traverse grazing land, some irrigated agricultural land and water courses, one of which the River Usek is a major tributary of the Ili. At about 62 km from the start of Section 3 there is a stretch of land used for irrigated agriculture which is close to a small settlement on the exiting main road which is bypassed at a distance of about 0.5 km. A section of the road approximately 70 km from the start of Section 3 runs through a large field of sand dunes with sparse vegetation. The district center, Zharkent City, lies at a distance of about 10 km north and west from the alignment.

The last 5 km cross the broad flood plain of Khorgos River to the Chinese border, where a new border-crossing is planned. This development has been started some years ago and has advanced considerably on the Chinese side of the border. The development will serve as dry port for both road and railroad and is in itself a project considerable size. The two projects are not functionally linked in Bank policy terms, as the crossing, which includes a dry port facility, was planned mainly in the context of the new railway line and is neither dependent upon the roads project nor required for the successful achievement of the objectives of the roads project. Nevertheless, a screening analysis of the environmental and social due diligence processes undertaken by the investor confirmed that the due diligence required under Kazakh legislation has been implemented, yielding environmental and social assessments carried out at various design stages (conceptual design, FS, detailed design).

Safeguards Policies

The project was classified as category "A". This classification is justified by the widening and extensive new ("greenfield") road Sections planned under the project. Also the alignment will run

through a variety of areas with safeguards implications that warrant careful investigation and analysis, including that of alternatives: (i) in zones of intense agricultural use existing irrigation systems will have to be preserved, (ii) where the road would cross rangeland under use for animal husbandry animal underpasses will have to be planned to guarantee the safety of drivers and animals, (iii) some Sections were routed to avoid fragile habitats and protected areas, (iv) routing and design was optimized to minimize disruptions and alterations of the surface water network.

Below those safeguards policies are listed and discussed that were either triggered, or, due to their thematic relevance given enhanced attention during safeguards discussion and the preparation of environmental due diligence documents.

Environmental Assessment OP/BP 4.01 (triggered): The main envisaged potential negative impacts during construction are the operation of borrow areas, generation of waste (construction materials, spent consumables, household waste and wastewater from camps), excessive land use, topsoil destruction and erosion. There is also a potential impact on groundwater and surface water from excessive turbidity and siltation, washing equipment in rivers (e.g. cement trucks) and accidental spills involving fuels and lubricants. During operation of the road storm drainage management, soils, ground and surface water contamination by heavy metals, soot and organic compounds (e.g. PAH), noise, dust, air pollution will be the main issues. Moreover, there is a potential risk of destruction or disruption of natural habitats and ecosystems by poor construction management.

The Borrower has already prepared one ESIA report for every alignment Section (i.e. a total of 3 reports). They were found to contain an adequate project description and collection of baseline data, all major elements of impact analysis and useful basis for the planning of mitigation measures. EMPs were elaborated to a level of detail commensurate with the design stage and integrated into bidding and contract documents to provide clear guidance and contractual obligations for environmental due diligence in further project design and implementation. However, due to some gaps identified during a review by the World Bank the Borrower financed an upgraded and improved ESIA which is the subject of this assignment.

Natural Habitats OP/BP 4.04 (not triggered, but addressed in ESIA): The road alignment will pass ca. 2 km to the North of the Charyn National Park, which is a 25 km stretch of protected forest along the Charyn River as well as an extensive swath in an adjacent small mountain range. The protected area will not be affected by the project, as the alignment would run at a distance of ca. 2km from the park boundary, North of Charyn town, which would "buffer" between road and national park. The current A351 highway bisects the park South of Charyn town, thus positive effects are expected by re-routing the main traffic flows away from the park. No other protected areas or national parks are sufficiently close to the project area to be at risk of negative impacts, nor were other untransformed natural areas of significant ecological value detected along the road alignment. No RAMSAR sites will be affected by the project. A "wetlands" area at the beginning of Section 2 was found to be a waterlogged area resulting from local irrigation practice and not of significant ecological value. To the north of the alignment and north of the Ili River lies the Altyn-Emel National Park which lies 6 km distant at the closest point. Potential impacts on a zone of fragile dune habitat in the very East of Section 3 will be avoided by routing the alignment around this area.

Forests OP/BP 4.36 (not triggered, but addressed in ESIA): Besides the national forest described under OP4.04 only small patches of mostly planted forest occur in the Western Section of the project area. No significant impacts on forests are expected and the policy thus not triggered. Trees from roadside and other cultured plantations, which need to be cut due to project activities,

will be replaced under the measures prescribed by the EMP (environmental management plan). This will be undertaken by a separate landscaping contract.

Physical Cultural Resources OP/BP 4.11 (not triggered, but treated in ESIA): Kazakhstan is a country rich in cultural heritage, especially along the historic silk road corridor. During project preparation a survey of PCR was carried out by a licensed Consultant and under the supervision of the Kazakh State Archaeological Survey, and an inventory of known PCR produced, which might be affected by the project. These PCR were mainly found in Section 1 in the form of numerous ancient burial mounds. One of these could not be circumvented by the alignment and will be physically affected, thus it is already earmarked for a salvage dig (excavation and documentation of the site and securing all detected objects of value in state archives and / or museums) before any works in this specific location may start. For the case of hitherto unanticipated discoveries of PCR a PCR management plan has been included into the EMP, as well as a chance find procedure for PCR encountered during construction, which have been agreed with Committee of Culture of the Ministry of Culture.

OP/BP 4.37 on the Safety of Dams was not triggered. No dam safety issues were found during the site appraisal. The only dams near the project area are low dykes for the containment of rivers and irrigation channels, as well as flood protection works on riverbanks, which pose no safety risk. The Kapchagai reservoir, which has a substantial dam structure, is located downstream and topographically below the road alignment.

OP/BP 7.50 on Projects on International Waters was not triggered. No international waterways will be affected by the project. The impact on the hydrological regime and flow pattern of rivers crossed by bridges will be insignificant, as their hydrological flow pattern will remain entirely unchanged. Moreover the project area lies in the basin of Lake Balkash, an endorheic (closed, without connection to the sea) river basin shared by Kazakhstan (as downstream recipient) and China (upstream), with a small (upstream) part in Kyrgyzstan. The basin drains into the lake via seven rivers, the major one being Ili River, which brings the majority of the riparian inflow. As both China and Kyrgyzstan lie upstream of the project area there are no transboundary hydrological impacts caused by the project.

<u>Environmental and Social Baseline Conditions</u>

The project corridor runs parallel to the Tien Shan mountain range over its entire length at a distance ranging from 10 to 30 km. It thus will be confined to the alluvial plains of the foreland, which have a gentle morphology, a geology characterized by thick accumulations of periglacial, aeolian and fluvial sediments, and a surface water network that drains to the North with all flows draining into Lake Balkash eventually. Groundwater is relatively abundant in the project area, ranging in depth from shallow aquifers in young sediments, to deep thermal waters.

The Climate varies from moderate in the West, to arid in the East, with clear continental character, cold winters and hot, dry summers, precipitation occurring in relatively short periods in spring and fall. Natural hazards do not pose a key risk in the project area. The main hazard results from rivers traversed by the road, many of which have their catchment areas in the mountains and thus show high seasonal variability with a significant potential for flash floods during storm events. Erosion or rock falls, landslides and mudflows are not seen as significant potential risk for the road.

Most of the alignment shows existing human activity. In the West, close to Almaty, population density is highest; Section 2 is the least populated. In the Western Section 1 the existing road

network therefore is the densest and there is significant economic activity, including manufacturing, construction, aggregate extraction and intense irrigated agriculture. Settlements close to the alignment, where noise protection may be an issue, are mainly Baiserke at the beginning, and Shelek at the very end of Section 1. Zones of irrigated agriculture are found throughout the corridor, most in Section 1, least in Section 2. The entire project corridor shows anthropogenic impact in forms of animal husbandry, agriculture, settlements or infrastructure and transport corridors. There will be no significant conversion of pristine, untouched habitats under the project.

An existing national park (Charyn Canyon) will be bypassed to the North, with a distance (> 2 km) between the road and the park boundary. The corridor, especially the Western part (Section 1), is rich in physical cultural resources, mostly ancient settlements and burial mounds. To the north of the alignment and north of the Ili River there lies the Altyn-Emel National Park which lies 6 km distant at the closest point. Based on currently available information, other untransformed natural areas of significant ecological value, hitherto without significant impact by human activity, do not exist along the road alignment.

Impacts and Their Mitigation and Management

The design of the road has taken measures for the minimization of environmental impacts into account. The routing as much as feasible avoids sensitive areas and habitats and protected areas, follows existing infrastructure corridors and thus limiting the conversion of land to non-critical land types and land use types. The design includes measures to protect the adjacent population from noise (routing, barriers), increase traffic safety by speed controls, pedestrian crossings and underpasses. The design also has taken into account requirements articulated from farmers along the alignment for safe crossings for animals and farm traffic through sufficiently dimensioned underpasses. Similar underpasses will facilitate wildlife crossings (mainly Deer and Wild Boar) especially in Section 2 in the vicinity of the National Parks. The design has included results from hydrographic and hydrological studies, installing sufficient culverts to avoid damming of permanent of seasonal watercourses and the creation of swamps or waterlogged areas, and the dimensioning of bridges is taking the seasonality of discharges, as well as the proneness to flash floods into account.

Most impacts during the construction period will be mitigated by good housekeeping measures. There will be standard procedures for the control and mitigation of emissions, such as dust, noise, exhaust fumes and liquid discharges from camps and the road platform. Surface watercourses will be protected by settling ponds and filters (e.g. straw bales). Wastewater from construction camps will be treated on site in settlement and aeration basins, where biological waste will be processed, before discharge into surface streams or rivers. Septic sludge from toilets will either be composted on site or trucked to existing water treatment plants along the alignment. Groundwater is not expected to be impacted by the project, as no deep excavations or major cuts are expected. Water for the construction activities as well as the camps will be extracted in relatively small quantities from existing wells or the public supply system. Generally water availability is unconstrained in the project area.

Noise and exhaust emissions will be minimized by the requirement for Contractors to use modern equipment and machinery complying with modern emission standards, and to maintain the equipment in good working order throughout the project. This will be prescribed in the equipment specifications in the tender documents. Nuisance to the public will moreover be minimized by limiting work hours and not allowing nighttime works. Where works are carried out in close vicinity to residential areas additional measures, such as noise

barriers or the installation of insulating windows will be implemented in accordance with good practice and in consultation with the community.

Borrow pits will be operated by the Contractors only at locations that have been pre-identified previous to project implementation and for which both operational and environmental permits have been obtained. No borrow pit will be operated without a site specific EMP that will contain a plan for its closure, remediation and recultivation that will be approved by the local environmental authorities (as required under Kazakh regulations) as well as the supervising engineer (who will ensure that international good practice is followed).

All environmental management measures to be carried out by the Contractors during the construction period will be integrated in the tender documents and become part of the works contracts. This will also include a manual on chance find procedures to be followed in case of unanticipated discovery of potential PCR. The salvage dig at the one site identified on the alignment will be carried out by the Kazakh State Archaeological Survey under the Ministry for Culture and will be completed before any works may start in the specific area. The Contractors will be required to have permanent staff on site with the specific responsibility of environmental and social management (including a grievance specialist), reporting to the supervision engineers and local authorities.

During operation the functionality of noise and traffic safety measures described above in the Section on design will be monitored and maintained. Any required modifications, upgrades or additions will be flagged and integrated into the road repair and maintenance plans for rectification.

Analysis of Alternatives

- In Section 1 there were a number of minor alignment changes from the original FS to minimize impacts on existing irrigation infrastructure and the natural gas pipeline which follows a similar corridor.
- Section 2: In the vicinity of Tashkarasu and Charyn the original alignment for this Section followed the existing route of A351 which passes through the Charyn National Park. The upgrading of this original alignment was discarded at an early stage precisely because it passes though the National Park and thus is not in accordance with Kazakh environmental policy. The current alignment was proposed by the Uigur Rayon Akimat and strongly supported by local environmental NGOs (represented mainly by Almaty-based "Green Salvation") as a means of (i) avoiding irrigated agricultural land to the south and east of the town of Tashkarasu and (ii) avoiding passing through the protected Charyn National Park south of Charyn. The selected alignment now passes through largely unused open land, in an infrastructure corridor already containing the railway line and a gas pipeline, which is neither used for agriculture or grazing, nor has significant environmental or ecological value.
- Section 3: In the area of Koktal and Zharkent the alternative alignment avoided irrigated agricultural land north and west of Zharkent. The original proposed alignment followed the present route through Kaktal and then bypassed Zharkent immediately to the south. This affected irrigated land immediately to the south of Zharkent. The selected alignment passes approximately 10 km south of Koktal and Zharkent and avoids all agricultural land and passes through unused land or low intensity grazing land, as well as a fragile sand dune habitat at the eastern end of Section 3.

Land Acquisition and Resettlement

The proposed project entails land acquisition and associated impacts, as is to be expected in a highway project with a 304-km alignment. What is unusual, however, is that most of the land acquisition has already occurred, in advance of World Bank involvement, because the Committee for Roads initially intended to finance the works through domestic resources. As preparation of a Resettlement Action Plan to guide land acquisition is no longer possible, the

Bank and CR have agreed on the following:

a) Principles and standards incorporated into the Resettlement Policy Framework agreed between the CR and multiple donor agencies, including the Bank, for use throughout the Western China- Western Europe Corridor program, apply to the proposed project;
b) An ex-post Resettlement Implementation Review would be conducted, to assess the land acquisition that has already occurred against RPF principles and standards, and to propose supplemental measures as necessary to fully meet RPF requirements.
c) Arrangements for continued monitoring and reporting on the individual cases of land acquisition that have been initiated but not yet completed by the time of project appraisal.

A draft Resettlement Implementation Review is nearing finalization. It indicates that a total of 1,044 hectares of privately owned or leased agricultural land will be required for the project, affecting an estimated 4,476 persons (on 713 affected plots). While no residential demolition is required, 14 commercial structures are affected. The Review indicates that land acquisition generally has been undertaken in a manner consistent with Kazakhstan regulations, and that compensation arrangements generally meet the World Bank's replacement cost criterion. It recommends supplemental measures to provide assistance to persons deemed significantly affected by land loss, to meet transitional expenses for commercial relocation, and to provide transitional support to vulnerable households (though none have been identified to date among the affected population).

At present, land acquisition involving 86 of the 675 privately leased or owned plots remains incomplete. These cases reflect a limited number of ongoing court disputes regarding compensation amounts, difficulties in resolving issues on plots subject to mortgage, or other issues. Some owners do not have full documentation of their ownership or leasehold rights and time is being allowed for these people to obtain all the necessary documents. As the validity period under Kazakhstan regulations for land valuation regarding these plots has expired, all of the 86 affected plots will be revalued and it is expected that this will be completed in a period of 6 months. Regular monitoring and reporting arrangements, as well as a project-specific grievance redress mechanism, will be in place to promote effective resolution of all outstanding cases.

CONCLUSION

THE PROJECT WILL HAVE A NUMBER OF IMPORTANT ENVIRONMENTAL IMPACTS DURING CONSTRUCTION AND OPERATION PERIODS. WITH APPROPRIATE MITIGATION, PARTICULARLY DURING THE CONSTRUCTION PHASE OF THE PROJECT, NONE OF THE IMPACTS REFERRED TO IN THIS REPORT WILL BE SIGNIFICANT.

IT SHOULD BE POINTED OUT THAT THE ROAD WILL BRING NUMEROUS SOCIAL AND ECONOMIC BENEFITS TO THE COMMUNITIES WITHIN THE AREA A FAST, SAFE AND ALL WEATHER ROAD WILL ALLOW THE EFFICIENT AND RAPID MOVEMENT OF GOODS BETWEEN CHINA, KAZAKHSTAN, RUSSIA AND BEYOND

IN EUROPE AND CENTRAL ASIA. AGRICULTURAL PRODUCE FROM THE AREA, WHICH IS A MAJOR EMPLOYMENT SECTOR AND A SIGNIFICANT PART OF THE LOCAL ECONOMY CAN BE TRANSPORTED RAPIDLY TO A WIDER MARKET, NOT JUST ALMATY. ON A REGIONAL BASIS THE LARGER COMMUNITIES ALONG THE ALIGNMENT, ZHARKENT, SHELEK AND ALMATY WILL BENEFIT FROM FASTER TRAVEL TIMES BETWEEN THE TOWNS AND TO OTHER URBAN CENTERS IN THE SOUTH AND SOUTH WEST OF KAZAKHSTAN.

CONTENTS

INTRODUCTION

The Khorgos – Almaty Road Project has a total length of 304 km, which will be partly reconstructed within the existing right of way (ca. 19%), partly newly constructed (ca. 81%). The project crosses a variety of land forms, land use types and (micro) climatic zones.

The project alignment lies entirely within Almaty Oblast and affects 5 Rayons: Iliskiy, Talgarskiy, Enbekshikazakhskiy, Uigurskiy and Panfilovskiy Rayons. The project consists of 3 design sections of roughly equal length which, are likely to translate into construction lots during implementation. This is a large and significant project with a range of Environmental and other impacts.

In accordance with the requirements of the Government of Kazakhstan an Environmental Impact Assessment (EIA) has been prepared. The preparation was conducted in accordance with the provisions of the Environmental Code of Republic of Kazakhstan (RK) and other applicable legal and regulatory guidance documents concerning environmental issues and environmental safety. The content and composition of the EIA meets the requirements of "Guidelines for the Assessment of Proposed Economic and Other Activities on the Environment in Developing planning, design and project documentation, as approved by the Order of the Minister of Environment of the Republic of Kazakhstan" 28 "June 2007 № 204-p".

In August 2011, the government has requested that the World Bank provides funding through a loan for the construction of the project. In accordance with World Bank requirements and operational procedures this has been defined as a Category A project and an EIA is necessary in accordance with World Bank Operational Policies (Environmental Assessment OP 4.01). The original EIA document has therefore been translated and various amendments and adjustments carried out to reflect the requirements of the World Bank which are seen to reflect good international practice. This has included rearranging the sections of the original document to be in accordance with the report structure suggested by World Bank operational policies and related guidelines. This work has been carried out by the Environmental Team of SNC Lavalin in accordance with an agreed Terms of Reference from the Committee of Roads.

This EIA includes all Sections of the alignment:

- Chapters 1, 2 and 3 are common to all three road sections of the alignment.
- There is a separate Chapter 4, Baseline Conditions, Chapter 5, Impacts and Chapter 6, Mitigation, for each road section.
- Chapter 7 again is common to all road sections.

The purpose of EIA is to identify the environmental and other impacts of the proposed road development and the report includes the following main sections:

- Policy and Administrative Framework
- Project Description
- Analysis of Alternatives
- Baseline Data
- Predicted Environmental Impacts

- Environmental Management Plan

1. POLICY AND ADMINISTRATIVE FRAMEWORK

1.1 OVERALL LEGAL FRAMEWORK

Environmental protection is administered in Kazakhstan by the Ministry of Environmental Protection (MEP). The Environmental Code was adopted in January 9, 2007 and is the basic legislative framework for environmental protection activity. Three main laws (the *Law on Environmental Protection*, the *Law on Ecological Expertise* and the *Law on Air Protection*) were abrogated subsequent to their integration into the Environmental Code. Moreover, some 80 normative legal acts were abrogated after the adoption of the Environmental Code.

1.2 ENVIRONMENTAL IMPACT ASSESSMENT

All EIA requirements are included in the Environmental Code. The basis of EIA development is "Instruction on conducting environmental impact assessment of planned economic activity when developing pre-planning, planning, initial project and project documentation, approved by the Order of the Minister of MEP, 28 June 2007, No.207-p". According to the instruction there are four stages:

1) Review of Environmental Conditions;
2) Preliminary EIA;
3) EIA;
4) Section "Environmental Protection"

The first stage of the EIA "Review of Environmental Conditions" includes general characteristics of natural and socio-economic environment of the area of planned activity, analysis of main trends of practical use of the territory and defining of principal positions of EIA. This stage of the EIA is based on the conceptual design, available materials, other special literature, project description etc. The purpose of this stage is to evaluate the environmental conditions, identify key environmental issues, choose the best option available for siting of the development, and to define scope of work for the second stage.

The Second stage of EIA "Preliminary EIA" – potential possible changes of components of natural and socio-economic environment and its impacts are defined. The purpose of this stage is to assess baseline environmental conditions, identify potential impacts, and design mitigation measures to offset such impacts, which is then included as a chapter into feasibility study of the project. All materials supporting decision-making on regulatory requirements (EIA study and statement, minutes of public hearings, permit applications and other supporting documents) must be reviewed by competent environmental authorities within a procedure known as "ecological expertise". Ecological expertise (EE) is conducted by The Department of Natural Resources and Environmental Management staff for category I enterprises, by TEPOs for categories II and III, and –since 2007- by local administration (Territorial Department of Environment) for category IV enterprises. Recourse to external experts can be made but they only have a consultative role. Services provided by these experts are paid by project developers; the so-called public expertise may be conducted by independent experts. However, the final documents (expert opinions

and permits) are not available to the general public and, sometimes, not even to field inspectors.

According to Article 36 of the Environmental Code "Development of Environmental Impact, assessment is obligatory for all types of activities that can have a direct or indirect impact on the environment or health of the people". The procedure on public hearings is regulated by the 2007 ministerial order on Rules for carrying out of public hearings. EIA and SEE are two interconnected procedures. The developer has to conduct an EIA, which is carried out by accredited private companies, and is in charge of preparing the EIA documentation. The EIA procedure is a two-phase process: the proper EIA and then the SEE. Once the EIA is approved, the developer should apply to the SEE. The competent authority checks the documents` quality prepares its own evaluation and returns both to the developer. The evaluation takes into account the opinions and views expressed by the public and other authorities which have participated in the process. The EIA procedure is performed before the permitting procedure and the developer has to attach the EIA report and the competent authority`s statement together with the permit application. EIA procedure lasts about two months and SEE up to three months. A post-project analysis by the authorities is mandatory and carried out after one year. Experience in other IFI-financed projects in the country shows that the authorities are proactive and compliant with regulations in their oversight of projects with potential significant environmental dimensions.

It is forbidden to implement projects for economic and activities or to finance it by banks and other financial institutions without a positive resolution of the state ecological examination. The positive conclusion of state ecological expertise that is given to the project is generally valid for five years from the date of its issuance.

In the case of green-field projects (i.e. new facilities), environmental authorities must be consulted on land allocation despite the fact that allocation as such is done by *akimats* (sub national administration). At this stage, project developers are obliged to assess baseline environmental conditions and to present this study, together with the Declaration of Intent, for ecological expertise. The Declaration should be discussed with the general public in hearings organized to this purpose. If environmental expert evaluation is positive, land may be allocated to the project developer.
A "preliminary" EIA is required at the feasibility study stage, when technological solutions are assessed. For a large-scale project, field prospecting should be conducted at this stage. Impacts should be estimated but precise emission calculations are not expected. The feasibility study, including all environmental related documentation, is then presented for EE. This EE is carried out by MEP staff at the national or local level, depending on the importance of the project.
An approved "preliminary" EIA is a prerequisite to receive a budget for implementing the project. and as such, it may trigger a "yes or no" decision on the project feasibility. The next stage implies a "full-fledged" EIA. At this stage, very detailed information is required, including calculations of emission limit values (ELVs), an emergency preparedness plan, monitoring programs for all media, etc. Again, this documentation must be presented for review by authorities. If design documentation undergoes any changes at a later stage (e.g. adjustment in the technology), the developer is required to adjust the EIA materials accordingly. Such adjustments require review by authorities as well.

Finally, a "post-construction" EIA must be carried out for large projects with capital investments of over $50 million one year after the activity starts. This is done to confirm the environmental safety of the economic activity and to correct the plan of environmental protection measures during operation.

Public hearings are required at all stages of EIA. In 2006, the total number of such hearings reached 95,073 cases (more than 50% of all EIA material) as compared to just 3,683 hearings in 2000. Minutes from these hearings are part of the EIA documentation. Although the public hearings` conduct and quality may not yet correspond to good international practice as promoted by international protocol (e.g. Aarhus convention) their wide application helps to advance the principle of public participation in Kazakhstan and to take root not only in procedural guidance but in real practice.

Table 1-1 Legislation and Regulations Governing the EIA Process

Name of Legislation	Date and number of registration
Methodology for Determining Emissions Standards to the Environment	Approved by the Order of the Minister of MEP, 21 May 2007, No. 158-p.
"Instruction on Conducting Environmental Impact Assessment of Planned Economic Activity when Developing Pre-planning, Planning, Initial project documentation,	Approved by the Order of the Minister MEP, 28 June 2007, No. 204-p"
The Amendments to the Order of the Minister of Environment Protection of Republic of Kazakhstan on Approval of "Instruction on Conducting Environmental Impact Assessment of Planned Economic Activity when Developing Pre-planning, Planning, Initial project and Project documentation"	Approved by the Order of the Minister of MEP, 20 March 2008, No.62-p".
Regulations on Conducting State Ecological Expertise.	Approved by the Order of the Minister of MEP, 28 June 2007, No.207-p".
The Amendments to the Order of the Minister of Environment Protection of Republic of Kazakhstan on Approval of Regulations on Conducting State Ecological Expertise	Approved by the Order of the Minister of MEP, 9 October 2007, No.296-p".
Rules for Conducting Public Hearings	Approved by the Order of the Minister of MEP, 7 May 2007, No.135-p".
Instructions for Qualifying Requirements to Licensed Activity on Environmental Design, Regulation and Development of Environmental Impact Assessment	Approved by the Order of the Minister of MEP, 21 October 2003, No.239-p".
Methodological Guidelines to the Licensed Activity on Environmental Design, Regulation and Development of Environmental Impact Assessment	Approved by the Order of the Minister of MEP, 10 February 2005, No.51-p".
Final Environmental Supervision Experts Opinion on Definite Types of Licensed Works and Services	Approved by the Order of the Minister of MEP, 1 July 2004, No.192-p".
The Rules for Licensing and Qualification Requirements to Work Implementation and Delivery of Services in the Field of Environmental Protection	Approved by the Order of the Government of Republic of Kazakhstan, 5 June 2007, No.457-p".
Environmental Code of the Republic of Kazakhstan	9 January 2007, No.212-p".
Law of the Republic of Kazakhstan "On Amendments and Additions to Some Legislative Acts of Kazakhstan on Environmental Issues"	9 January 2007, No.213-p".
Law of the Republic of Kazakhstan "On Ratification of the Stockholm Convention on Persistent Organic Pollutants"	7 June 2007, No. 259-p".
The Concept of Transition to Sustainable Development for 2007-2009 (Action Plan)	The Order of the President of RK, 14 November 2006, No. 216-p".
The Concept of Environmental Security of the Republic of Kazakhstan for 2004-2015	The Order of the President of RK, 3 December 2003, No. 1241

1.3 TRANSPORT LAW

The Law of Republic of Kazakhstan 'On the road' dated 17 July 2001 laid out the basic legal, economic and organizational principles of governance roads in the Republic of Kazakhstan. The Road Law covers all aspects of the development and use of roads including design, engineering, traffic requirements, dimensions and providing land.

The size of the right of way for projected roads for common use is set depending on the category under the rules of allotment of land for roads of public use, namely: for road of I technical categories – 35 meters from the roads axis, for roads of II technical categories – 20 meters, for roads of III technical categories – 15 meters, for roads of IV technical categories – 13 meters, for roads of V technical categories – 12 meters. Road right of way lands are in the possession and use of road authorities or concessionaries, and are intended only for the development, improvement of roads and location of road services.

1.4 AIR QUALITY STANDARDS

The standards for air quality establish the permissible limit of the content of harmful substances both in industrial areas and residential areas. The main terms and definitions related with the atmospheric air contamination, monitoring programs, behavior of pollutants in the atmospheric air determined by the GOST 17.2.1.03-84; Environmental Protection, Atmospheric Air' Terms and Definitions for Contamination Control.

The regulatory document containing information on harmful substances in the atmospheric air is the "Sanitary and Epidemiological requirements for the Atmospheric Air Quality" approved by the Order of the Ministry of Health of the RoK № 629 dd 18.08.2004.

The emission of hazardous substances (pollutants) in the atmospheric air by the stationary source is allowed only on the basis of the permit issued by the authorized state body in the field of atmospheric air protection or its territorial subdivisions in the manner established by the Government of the Republic of Kazakhstan. The permit is based on total emission amounts supplied by the applicant (the developer) and does not show emissions from individual vehicles. The procedure of issue of the atmospheric air pollution permits during operation of the motor vehicles or other transport facilities is defined by the Government of the Republic of Kazakhstan.

All motor vehicles of any type (including buses and trucks) are required to pass an annual roadworthy test which includes emission testing which must be in accordance with the regulations referred to below.

The various legislative, regulatory and procedural documents covering atmospheric air protection are listed below:

Table 1-2 Air Quality Legislation

Instruction on Agreement and Approval of the Design of the Maximum Permissible Emission (MPE) and Maximum Permissible Discharges (MPD).	The Order of the Ministry for Environmental Protection of the RoK № 61-n dd 24.02.2004.
Collected Book of Methods for Calculation of the Atmospheric Air Pollution by Different Types of Production.	The Order of the Ministry of Ecology and Bioresources 01.12.96. *Included in the list of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection № 324-n dd October 27, 2006.*
The inventory Rules for Emissions of the Hazardous Substances (Pollutants), harmful Physical Effects on the Atmospheric Air and Their Sources.	The Order of the Ministry for Environmental Protection of the RoK № 217-n dd August 4, 2005.
The procedure of Calculation of the Hazardous Substances Concentrations Containing in the Atmospheric Discharges of the Enterprises. Guiding normative document 211. 2. 01.01-97	The Order of the Ministry of Ecology and Bioresources dd 01.08.1997. *Included the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection № 324-n dd October 27, 2006.*

The procedure of Calculation of the Hazardous Substances Concentrations Containing in the Atmospheric Discharges of the Enterprises.	Approved by the Order of Minister of Environmental Protection № 100-n dd April 18, 2008 (Attachment 18)
Recommendations on Execution and Content of the Design Standards of the Maximum Permissible Emissions (MPE) in the Atmospheric Air made by the Enterprises of the Republic of Kazakhstan. Guiding normative document 211. 02. 02-97	The Orders of the Minister of Ecology and Bioresources of the Rodd August 1, 1997 and Order of the Ministry of natural resources and environmental protection of the RoK № 156 dd 06.07.2001. *Included the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection № 324-n dd October 27, 2006.*
Instruction on the Normalization of the Emission of Contaminants in to the Atmosphere of the Republic of Kazakhstan	The Order of the Ministry of natural resources and environmental protection of the RoK № 516-n dd 21.12.00. *Included the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection № 324-n dd October 27, 2006.*
The Calculation Procedure of Motor Vehicles Emissions for Carrying Out of the Summary Calculations of Atmospheric Pollution Guiding normative document 211.2.02.11-2004	The Order of the Ministry for Environmental Protection of the RoK #328-n dd December 20, 2004 *Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006*
The Calculation Procedures of the Specific Emissions of the Atmospheric Pollutants and Damage Depending on the Type of Fuel Used in the Republic of Kazakhstan Guiding normative document 211.3.02.01-97	The Order of the Ministry of Ecological and Bioresources of the Rodd 09.07.97 *Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006*
The procedure of Calculation of Discharge (Emissions) of Contaminants into the Atmosphere Caused by the Motor Transport Enterprises	Approved by the Order of the Minister of Environmental Protection #100-n dd April 18, 2008 (Attachment 3)
The Rules of Governmental Accounting of the Sources of Greenhouse Gases Emission into Atmosphere and Consumption of Ozone-destroying Substances.	The Governmental Decree N 124 dd February 8, 2008
The Rules of Restriction, Stoppage or Decrease of the Greenhouse Gases Emissions into Atmosphere	The Governmental Decree N 128 dd February 11, 2008

1.5 WATER QUALITY LEGISLATION AND STANDARDS

The main legislative act in the area of water resources protection and use is the Water Code of the Republic of Kazakhstan #481 dated July 09, 2003. According to the definition provided in this document "protection of water bodies" is an activity aimed at preservation, rehabilitation and reproduction of water bodies as well as prevention of water from detrimental effect.

I. According to Article 112 the water bodies shall be protected from:

1) natural and industrial pollution by hazardous chemical and toxic substances and their compounds, as well as thermal, bacterial, radiation and other types of pollution;

2) infestation (blockage) with hard, non-soluble subjects, production and household and other wastes;

3) defecation .

II. Water bodies shall be protected to prevent:

1) disturbance of the environmental stability of the natural systems;

2) causing harm to the lives and health of population;

3) reduction of fishery resources and other water fauna;

4) deterioration of the water supply conditions;

5) weakening of the natural self-reproduction and cleansing functions of the water bodies;

6) other unfavorable conditions that negatively affect physical, chemical and biological qualities of water bodies.

III. Protection of water bodies is carried out through:

1) Taking into consideration competing or conflicting demands related to the protection of water bodies to all water users who use water for any purpose;

2) improving and applying water protective activities/ measures with the help of new equipment and environmentally and epidemiologically safe technologies;

3) establishment of water conservation zones and sanitary protection zones for protection of public (drinking) water supply sources;

4) execution of public (state) and other forms of control over the use and protection of the water bodies;

5) applying sanctions for non-observance of the water protection requirements.

IV. Central and local execution authorities of the Oblasts (cities of republican significance, capitals), in line with the legislation of Republic of Kazakhstan, take measures in compliance with the principles of sustainable development towards water resources conversation, prevention of pollution and blockage.

V. Physical and legal entities, activities of which affect the water bodies, are obliged to carry out managerial, technological, forestry, ameliorative, land treatment, hydro technical, sanitary-epidemiological and other activities, which ensure protection of water bodies from pollution, blockage and depletion.

Article 116 of the Law regulates issues related to the water protection zones: to maintain water bodies and water facilities in the condition required by the hygiene and sanitary and ecological norms; to prevent contamination, blockage and depletion of the surface water; to preserve flora and fauna water protection zones and belts are required.

While developing any project, which may have any impact on the water system/ resources, the project designs should be agreed with the local executive entity for water resources

protection. A Water Code, adopted on March 31, 1993, is in force in the Republic of Kazakhstan. The Government has approved the *Conception for the development of the water sector of the economy and water policy until 2010 and has approved the sectoral program for Drinking Water.*
In developing the Water Code, the Government of the Republic of Kazakhstan has adopted normative acts concerning the procedure for allowing water reservoirs for special use, a procedure for agreeing to end issuing permits for the special use of water, a procedure for using water for fire fighting needs, classifying water ways as navigable routes, and for using reservoirs for air transport needs. The Government has approved lists of reservoirs (underground waters) that have health significance of the Republic and reservoirs that have special state significance or special scientific value, the granting of which for use is restricted or entirely forbidden.

As for the atmospheric air so for the water such standards are the maximum allowable concentrations (MAC). The MACwrf (water reservoirs for fishing) are stricter than MACwrdw (water reservoirs for drinking water) as rule. It is necessary to emphasize that this refers primarily to the fish industry as such and protection of the human needs though some principles of water ecosystem protection, to all probability, were also taken into account during determination of the standards. As in the case of atmospheric air there are the various indices used for comparative assessment of the water contamination which enable the consideration of the presence of several pollutants. The most widely used index is the integrated hydro chemical water impurity index (WII). The basic document regulating the condition of the surface waters and content of the hazardous substances in them is the sanitary and epidemiological norms and regulations "Sanitary and Epidemiological Requirements for the Surface Waters Protection Against the Pollution" #3.dd 02.03.04 approved by the Order of the Ministry of Health of the RoK #506 dd 28.06.2004.

The legislative and regulatory and procedural documents in the field of the water environment protection are listed below:

Table 1-3 Water Quality Legislation

Recommendations on Execution and Content of the Design Standards of the Maximum Permissible Discharge (MPD) in the Water Bodies for the Enterprises of the Republic of Kazakhstan.	The Order of the Ministry of Ecology and Bioresources of the RoK 1992. Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006
Instruction on the Normalization of the Discharge of Contaminants into the Water Bodies of the Republic of Kazakhstan Guiding normative document 211.2.03.01-97	The Order of the Ministry of Natural Resources and Environmental Protection of the RoK#516-n dd 21.12.00. Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006
The Calculation Procedure for Standards of Discharged Waters with Pollutants (MPD) into the Water Bodies, Disposal Fields and Relief of Land	Approved by the Order of the Minister of Environmental Protection #100-n dd April 18, 2008 (Attachment 19)
The Procedure of Establishment of the Maximum Permissible Discharge (MPD) of the Pollutants onto the Disposal Fields and Natural Depressions of the Land. Guiding normative document 211.3.03.03-2000	The Ministry of Environmental Protection of the RoK #156-n dd 06.07.2001 Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006
The Recommendations on Control over the Operation of	The Order of the Ministry of Ecology and Bioresources of

the Treatment Facilities and Discharge of the Wastewaters.	the RoKdd 21.05.94. Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006
The Rules of Surface Waters Protection in the RoK Guiding normative document 01.01.03-94	The Order of the Ministry of Ecology and Bioresources of the RoKdd 27.06.94. Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006
The Guidelines on Application of the Rules of Surface Waters Protection in the RoK	The Order of the Ministry of Ecology and Bioresources of the RoKdd 12.02.97. Included in the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection #324-n dd October 27, 2006
The Procedural Definitions of Norms and Standards of Water Resources Use in the Various Natural Climatic Zones of the Republic of Kazakhstan During Carrying out of the Ecological Zoning.	Approved by the Order of the Minister of Ecology and Bioresources of the RoKdd 1997

1.6 SOIL STANDARDS

New sanitary rules introduced in Kazakhstan following the long-term scientific studies-SanPiN (Sanitary Rules and Norms) 2.1.7.1287-03 Sanitary and Epodemiological Requirements for Quality of Soil and Subsoil which establish the specifications for soils quality in the inhabited localities and agricultural lands and control the observance of the sanitary-hygienic standards during engineering, construction, renewal (technical upgrading) and operation of the facilities of different purposes, including those which may cause the adverse effect on the soils status.

The main terms related to the chemical contamination of soils are defined by the GOST 27593-88. Soils. Terms and Definitions. The basic regulatory documents for control of the soil pollution content is "Standards of the Maximum Allowable Concentrations of the Hazardous Substances, Harmful Microorganisms and Other Biological Materials Being the Soil Pollutants" approved by the Order of the Ministry of Health of the RoK #99 dd 30.01.2004 and Order of the Ministry for Environmental Protection of the RoK #21П dd 27.01.2004.

The maximum allowable concentrations (MAC) or allowable permissible concentrations (APC) of the chemical substances in soil are the principal criterion of the sanitary assessment of the soil contamination by the chemical agents. This requirement applies to all land uses, and differentiates for residential and agricultural uses of land.

1.7 NOISE STANDARDS

The level of the road traffic noise is determined according to the norms of the SNiP (construction norms and rules) 11-12-77 «Noise Protection». The limit of noise exposure generated by the motor vehicles in the distance of two meters from the buildings facing to the noise sources in compliance with the SNiP 11-12-77 (tab.1.2) is 70 dBA.

The maximum allowable noise level is assumed for areas neighboring on the residential houses, rest areas of the micro-districts and residential groupings, school areas, playgrounds of the preschool after adjustment as follows:

- for noise made by the motor vehicles - 10 dBA
- for existing residential construction - 5 dBA
- for daylight time from 7 hour till 23 hour - 10 dBA.

1.8 HEALTH AND SAFETY DURING CONSTRUCTION AND OPERATION

It is required to follow the requirements of the SNiP 3.06.04-91 «Construction Safety» during the execution of works. There are the «Safety Regulations for Construction, Repair and Maintenance of the Automobile Roads», «Regulations for Safety and Production Sanitary During the Building of the Bridges and Pipes» are applied in the road construction. At performance of the road construction works it is necessary to use the «Safety Instructions» for each construction machine.
The personal protective equipment shall comply with the applicable GOSTs (apron under the GOST 12.4.029, rubber gloves under the GOST 20010, respirator "The Petal" under the GOST 12.4.028, gloves under the GOST 12.4.010, goggles under the GOST 12.4.013 and breathing mask of B type or B with filter, helmets).The site shall be kept in a safe, clean and good sanitary state. The "Contractor" shall bear the responsibility for cleanup of the site from garbage, construction waste and household rubbish and their removal to the municipal solid waste landfill (MSW). The "Contractor" shall be guided by the SanPiN №3.01.016.97 in that regard.

In addition, it is necessary to carry out routine inspection of the machinery and equipment and observance of the repair, training and instruction of the workers engaged in maintenance of the machinery, tools and equipment on safe methods and techniques of work. The protective measures with respect to the equipment are also important for prevention of injuries and accidents. Such equipment includes the following:

- motor vehicles;
- pumps, compressors;
- generators, crushing equipment;
- lifting equipment (cranes, hoists, wire ropes, loaders);
- electrical equipment.

For provision of the sanitary and living conditions for the workers it is required to establish a field camp; changing rooms, drying premises, wash rooms, shower rooms, warming premise for workers, dining facility with three meals daily, toilet facility, field office, rest room, machinery parking facility and household waste storage area. There shall be the information on safety, occupational health, production and household sanitary in the rest room. There shall be medicine boxes, first-aid outfit, drinking water and service water kept in the separate containers provided on the construction sites and field camps. The drinking water shall be located at the distance of maximum 75 m from the working area. The water permit shall be obtained in the sanitary supervision and disease control authorities and comply with the requirements of the SanPiN of the RoK № 3.05.017.97.

It is required to perform works during the hours of darkness provided that artificial lighting in accordance with the standards of the electric lighting for the installation and construction works. Irrespective of the lighting of the sites and working areas the machinery shall be equipped with the independent (built-in) lighting of the working elements and control devices.

The storage of all types of fuel and chemicals shall be in the special location with the mandatory barbed wire fence. The storage area shall not be located near the water source and depressions. The filling and

unloading of materials shall be strictly controlled and performed in accordance with the established procedure. All valves and plugs shall be protected against the undesirable interference and vandalism and shall be turned off and opened easily when used. The inner surface of the tanks shall be clean. The measurement shall be carried out so that the impact of moisture and water was not taken into account.

1.9 ARCHAEOLOGY AND CULTURAL HERITAGE

The main legislation comprises:

- The Law of the Republic of Kazakhstan "About Culture", dated 15.12.2006
- The Law of the Republic of Kazakhstan "On Protection and Use of the Historical Cultural Heritage", dated 2.07.1992
- The Land Code of the RoK, dated 20.06.2003

For the purpose of recording and protection of the historical and cultural monuments they are divided into the following categories:

- historical and cultural monuments of international status representing the historical, scientific, architectural, artistic and memorial objects included in the UNESCO World Heritage List;
- historical and cultural monuments of national status representing the historical, scientific, architectural, artistic and memorial objects, having the special significance for the history and culture of the whole country;
- historical and cultural monuments of local significance representing the historical, scientific, architectural, artistic and memorial objects, having the special significance for the history and culture of the oblasts (city of republican status, capital), regions (cities of oblast sub ordinance).

According to Article 39 of The Law of the Republic of Kazakhstan "On Protection and Use of the Historical Cultural Heritage", development and use of any allocated lands shall be made only after archaeological research. Any works that may endanger the existence of monuments are prohibited. Businesses, organizations, institutions, public associations and citizens in case of detection of archaeological and other sites of historic, scientific, artistic, and other cultural value, are obliged to inform the authorized body for the protection and use of historical and cultural heritage, and to suspend continuing such works.

1.10 COMPARISON OF KAZAKH AND WORLD BANK ENVIRONMENTAL LAWS

An evaluation of the national environmental protection legislation and WB procedures and its bearing on the Project is presented in this section of the report. Much of the environmental legislation of Kazakhstan has been designed to provide for control of developments and control of adverse impacts on the environment and human health. The submission of EIAs for Ecological Expertise does not always accord with best international practice, which includes a significant component of ongoing evaluation in an iterative process. The submissions of EIA in Kazakhstan is a more static process, which focusses more on the calculation of emissions, for which charges are levied and there is less emphasis analysis and conclusions with a focus on understanding impacts and actions to avoid or mitigate them. The data collection process does not always relate well with the objectives of the EIA and the boundaries of the project.

Public consultation in Kazakhstan focuses more in local government officials and representatives rather than the general public. This aspect is being reconciled for the Almaty-Khorgos Project, for which consultation took place at each Rayon during the design period in 2008/9 and additional consultation commenced in October 2011 when consultation meeting were held at each Rayon (Ili, Talgar, Enbekshikazakh, Uigur and

Panfilov). These meetings were chaired by Akim or Deputy Akim for each Rayon with the Almaty Department of Roads supported by the Design Engineers and PMC Environmental and Resettlement Experts providing a presentation. Records of these meetings are found in Appendix 5. A further round of Consultations at each Rayon where the EIA conclusions will be presented is programmed for January 2012, 30 days after publication of the Draft (refined) EIA. Responses from these consultation meetings will be incorporated into the final EIA.

The practical procedures are not always adapted to monitoring during construction of a project, as for example the Oblast Environment Department has to apply to the Chief Prosecutor's Office for an application to conduct an audit and can do that only once per year, giving the contractor 2 weeks notice of the upcoming audit. The content of Kazakh EMPs includes only a description of generic mitigation and monitoring measures, minus location and responsibility details, focusing on listing norms and standards and is of little use to contractors.

Standards are used as thresholds above which pollution is permitted so long as payments are made

Overall, there are several public organizations involved to varying degrees in environmental protection. These include the Ministry of Environmental Protection, Ministry of Health, Ministry of Agriculture and Ministry of Energy and Mineral Resources. There are special institutions in Kazakhstan such as the State Expertise in Environment and several environmental think tanks also involved.

A comparison of the legislation is presented below in Table 1.1 00.

Table 1.1 0 Comparison of Kazakhstan EIA and environmental legislation and World Bank Standards

EA Step	Kazakhstan	WB
Sources	RK 2007. Ecological Code Ministry of Environmental Protection Order 204-п, 28 June 2007: "The Instruction of Conducting the Environmental Impact Assessment during the preliminary planning, planning, preliminary design and full design documentation"	World Bank Operational Policy 4.01
Basic Principles		
Most sensitive component rule	There does not appear to be a 'most sensitive' rule. The sensitivity of project is measured by the Sanitary Epidemiological (SE) classes of dangers. There are four categories and within each, one or more levels of danger, a category 1 project has two levels of severity, either trigger a full EIA. A Category 2 project is considered a 3rd level severity and as such a lesser assessment is undertaken, although still referred to as an Environmental Assessment. A category 3 and 4 project are considered 4th and 5th level severity and as such generally do not warrant an assessment.	Projects are categories according to the most sensitive component, e.g. if 6 of 7 components are not sensitive and one is the entire project becomes a Category A or B.
	The planning and conduct of an assessment is the duty if the proponent, in this case MOTC. MOTC often retains a licensed consultant to do this work; and frequently a member of the team undertaking the Feasibility Study. The assessment must be preceded with a scoping study which must be approved before the EIA can begin. The EIA process has 5 stages: 1) Overview of Environmental Condition; 2) Preliminary EIA 3) EIA; 4) Chapter of Project Documentation "Environmental Protection"; 5) Post-project Analysis.	Usually EAs are required to be prepared by the country, and donors will request this. Often the proponent's EA capacity is not there or funds are scarce, or the EA prepared is incomplete or non-compliant, in which case consultants help fill the gaps, undertake new studies on behalf of the proponent or assist national specialist to fill the gaps and improve the documentation. This is a proponent focused activity, with the requirement for close collaboration and ownership. In the case of this project the existing EIA prepared by the Design Consultants have been refined and strengthened by International Consultants to the Committee of Roads, Astana, to be in accordance with World Bank OP.
Document Preparation		When the donors prepare IEEs, SiEAs and EIAs <u>on behalf of</u> the country, these documents are always the country's documents, and as such must be presented as if the country were preparing them. Where consultant recommendations are included, this must be made clear. Summaries of the IEEs and EIAs often contain review and comments by the donors or the donor's consultants on behalf of the Banks
Document Ownership	Category 1 projects are assessed by the MOEP in Astana, Category 2 and 3 by the Oblast or Regional Environment Department, and 4 at the rayon level.	
The Environmental Management Plan	As specified in Ecological Code Article 41 an environmental assessment documentation should include "*10) Description of measures provided for preventing and mitigating impacts on environment, including proposal for ecologic monitoring"—more or less a partial EMP.* This description does not comply with donor requirements and construction monitoring is not always rigorous.	The EMP is required by WB for A and B category projects, It is considered to be an integral but distinct part of the assessment document. It is not a separate document, but the key summary of the mitigation and monitoring measures to be applied should be extractable as a stand-along section or set of Tables.

EA Step	Kazakhstan	WB
Public consultation	Kazakhstan has a consultation process but it involves the public sector and community members themselves are not always involved.	Public consultation is a requirement for WB. The World Bank has a mandatory 2 sessions for full EIAs and 1 session for category B projects. For full EIAs the sessions are scheduled to coincide with early EIA planning and the preparation of the draft EMP or record of likely impacts. For the B -level projects a session during the impact definition stage is most useful, although exact timing is a function of the environmental issues emerging and the proponent's wishes. Consultations must be announces and for full EIAs advance notices of consultations and contact details must be published in the media for several weeks in advance of the session(s). Latest consultation commenced in October 2011 when consultation meeting were held at each Rayon (Ili, Talgar, Enbekshikazakh, Uigur and Panfilov). These meetings were chaired by the Akimat or Deputy Akimat for each Rayon with the Almaty Department of Roads supported by the Design Engineers and PMC Environmental and Resettlement Experts providing a presentation. Records of these meetings are found in Appendix A2. A further round of Consultations at each Rayon where the EIA conclusions will be presented is programmed for January 2012, 30 days after publication of the Draft (refined) EIA. Responses from these consultation meetings will be incorporated into the final EIA.
Classification	Projects are classified by the 5 danger levels with 1 being the highest as defined by norms and standards developed by the Sanitary and Epidemiological Services, in relation to human health and safety. There is less reference to protection of the environment and e.g., forests and wildlife populations. As with the Banks, certain projects have been pre-classified, e.g. the road projects are mostly considered Category 1 of requiring a full EIA.	Using a Screening approach the Bank completes an Integrated Safeguard Data sheet, where it examines general project effects in relation to relevant bank guidelines, called Operational Directives or Policies (e.g. OP 4.01 on Environmental Assessment). The categorization is based on these results. The Bank also has a list of automatic-A category projects. This project is classified as Category A project.
Category C	A general equivalence for Category C would be KAZ Class 4 projects	These are projects where impacts are considered at a low enough level that neither a full EIA nor IEE or Abbreviated EIA is needed.
Document Form	Nothing specified other than a 'minor environmental statement'	No specific documentation required
Summary Doc	None defined	None required.
Consultation & Information Disclosure Timing	None specified	Not needed
Disclosure	None required	None required
Category B: Initial Environmental Examination (IEE); Initial Environmental Evaluation (IEA) or Simplified	A general equivalence for Category B would be KAZ Class 2 and 3 projects. Again there is no special name for this document other than the acknowledgment that it is at a lesser detail than for a Category 1 document and more detailed than a Category 4 document. The main difference is this document will be reviewed in the Oblast level of the Territorial Department of Environmental Protection. And this Category is not required (but recommended) to conduct the 5th stage of EIA process, namely the post-project analysis, 1 year after the end of project.	The Bank undertakes an Initial Environmental Analyses (IEA), or Simplified Environmental Assessment (SiEA) of projects classified during the ISDS activity as 'B'.

EA Step	Kazakhstan	WB
Environmental Assessment (SiEA) ,		
		EIA ands EMP disclosed prior to project appraisal both locally in the country and in the World Bank's InfoShop. SiEAs do not require an analysis of alternatives
Document Form	All environmental assessment documents are stand alone reports	A section of the Feasibility Study
Summary Document	Each assessment document as its final section "Main conclusions of the EIA". No other summary was referred to in the Code or related standards	An executive Summary—but with no special designation
Consultation and Information Disclosure Timing	No consultation required	At least once during IEA/SiEA preparation
Disclosure	None required	All environmental assessment documentation is available on World Bank Information Centre website and in the borrowing country office as well, but there is no formal public review.
Category A: EIA	EIA is required for projects of Sanitary and Epidemiological class 1, which will have significant impacts on the human safety. According to Section 26 of the EIA Instructions the third stage of EIA process – "Environmental Impact Assessment" requires detailed analysis in full volume on all aspects of environmental impact of the specified objects, and includes the following components: air, water, mineral resources, production wastes, physical impacts, soil, plants, animals, socio-economic condition, and ecological risks. The Category A is required to undertake the 5th stage of EIA process, Post-project Analysis, 1 year after the end of project. The 5th stage should be undertaken by different licensed organization than which conducted the EIA.	The World Banks Category A requirements include environmental and social assessments.regardless if human health and safety are concerned (i.e. the threat to habitats and biodiversity alone may count as reason for a Cat A categorization). EIAs must also include a detailed analysis of alternatives, especially the "no project" alternative. This report is in accordance with this requirement.
Document Form	Each stage of EIA process has its own stand alone document with prescribed format and the level of detail.	Stand Alone document with prescribed format and minimum level of detail
Summary Documentation	Each of 5 assessment stages has its own stand alone document; and each has a "Conclusions" section, which acts as a summary.	An executive summary is prepared and is attached to the EIA but often used separately. An Executive Summary is included in this report.
Consultation and Information Disclosure Timing	No information on specific consultations, except for public hearing as part of the EIA – the Instructions for Public Hearing are publish by the MOEP Order №135, 7th May 2007.	Minimum 2x mandatory, with timing specified. Once with the TOR for the EIA, once to present the draft EIA. For the disclosure of the draft EIA, Category A projects must be allowed a 120-day period for stakeholder evaluation and comments between disclosure of draft EIA/EMP and project appraisal. The 120 day rule will commence once this document has been completed in accordance with World Bank requirements.
Disclosure	From the time a full environmental assessment is submitted to the local /oblast-level environment agency to the time it is reviewed by the central government is 60 days. During the first 30 days there is time for the "public" to comment. The public is not always made aware of this time for comment. . There	The public must be informed about the availability of EIA documentation, which must be prepared in English and the local language (sometimes English, Russian and local language), and be accessible at convenient locations in country, at a published website and on the donors website (InfoShop) 120 days before project

EA Step	Kazakhstan	WB
	is then 'public debate/hearing' held as part of the final EIA approval. The public does not aways get involved in the process though 50% of EIAs do lead to a public hearing though the pulbic may not be actively involved. . There is no other disclosure. It has been agreed by the CR that this document when agreed by the Bank as suitable for public disclosure under the 120 rule will be put on the CR website in Russian. 30 days after this submission the next round of public consultation will take place.	appraisal. Loan processing cannot proceed during this period. This document will be disclosed in WB website and CR website once agreed by the WB as suitable for public disclosure.
CIA	Does not undertaken CIA (cumulative impact assessment)	The Bank applies one of a number of strategic assessment methods including CEA (country environmental assessment) and SEA (strategic / sector environmental assessment), and Regional EIA.
Land Acquisition and Resettlement Review	No internal review of land acquisition and resettlement.	World BankPolicy requires preparation of a Resettlement Action Plan prior to project Appraisal (and prior to any involuntary land acquisition taking place). In view of the advanced land acquisition process in the project the Bank requested a review of resettlement, land acquisition and compensation payment to ensure all activities were undertaken I accordance with World Bank Guidelines OP 4.12. A Resettlement Implementation Review (RIR) was undertaken by International consultants to CR. This is now being finalized.

Conclusions and Recommendations from Gap Analysis:

The following conclusions and recommendations address those issues were divergence of standards and subsequent practice between Kazakhstan and the World Bank may lead to shortcomings in environmental due diligence during implementation, because local practice may be rigid and well established and incorporating new elements or changing practices may need extra efforts during project supervision:

1. Kazakhstan has not yet put into practice an iterative process to ensure that project design and environmental analysis have an actively managed interface, and that data and findings from either are incorporated into the other. Usually the design approval process in KZ is quite advanced when ESIAs are conducted, which may prevent recommendations for design changes based on the environmental analysis being implemented, as they would require a repetition of the approval processes. Design changes may, however, be introduced during the construction design stage once a contract has been awarded with relatively minor review and approval requirements. This is the recommended approach to mainstream design changes based on environmental findings into the designs submitted by the Contractor to the Client for approval and construction. Such design changes are likely to mainly concern the number and location of under- and overpasses for animals, farm traffic and wildlife.
2. Environmental protection is often seen as compliance with emission or pollution standards, while an understanding of environmental values such as fauna and flora, soils, landscape, biodiversity, esthetics, and the priority in enforcement appears on compensation payments rather than preventive and remedial action to avoid, minimize, mitigate or repair damage. This will require enhanced capacity building and supervision efforts during project implementation, with practical, implementation-focused training's for Contractors, supervising engineers and environmental authorities (incl. those representing forestry, national parks, water). It is recommended to ensure the presence of a consultant with international best practice experience in environmental site supervision and management during the first 6 months of project implementation (starting with Contractor's mobilization) to establish knowledge and compliance practice from early implementation stages onwards.
3. Due to the absence of distinct and practical EMPs in the ESIA reports in Kazakhstan, it is difficult to incorporate proposals of the ESIA reports into contract documents, translating them into enforceable clauses. It is therefore recommended to place special emphasis on this issue during the preparation of the tender packages for the construction works and, if required, seek assistance from international Consultants with specific experience in both procurement and environmental management.
4. The competences and powers of Kazakh environmental authorities regarding site inspections are very limited, with visits legally limited in number and having to be announced several weeks in advance to the project owner. While this practice is unlikely to be changed within the project context, a strong supervision system needs to be contractually embedded, with effective enforcement mechanisms including penalties and arrangements for required remedies (e.g. by third parties with costs deducted from the contracts). It would be recommendable to entrust a project management consultant with the enforcing mandate that would in countries implementing best practice be with the authorities. In parallel the authorities should be kept well informed on all project activities and included in training and capacity building programs.

2. PROJECT DESCRIPTION

2.1 BACKGROUND

The Khorgos – Almaty Road Project has a total length of 304.4 km and will provide an essential link in the route between western China and Western Europe. The routes objective is to provide an all weather divided highway through western China, Kazakhstan and Russia. The route will have significant Economic benefits and will provide a greatly improved route for goods, for tourists and for improved social contact between China and Kazakhstan.

The proposed road will be partly reconstructed along the existing roads but with a widening of the present right of way (approximately 40% of the total alignment), and partly newly constructed alignment (approximately 60%). The project crosses a variety of land forms, land use types and (micro) climatic zones. The project alignment lies entirely within Almaty Oblast and affects 5 Rayons: Ili, Talgar, Enbekshikazakh, Uigur and Panfilov Rayons. Total road length is 304,4 km.

Length of the section in Ili Rayon is – 6.6 km.

Length of the section in Talgar Rayon is – 7.6 km.

Length of the section in Enbekshikazakh Rayon is – 97.7 km.

Length of the section in Uigur Rayon is – 118.4 km.

Length of the section in Panfilov Rayon is - 74.1 km.

The project consists of 3 design sections of roughly equal length. This is a large and significant project with a range of Environmental and other impacts and the acquisition of about 700 plots with almost 3,000 hectares.

2.2 PROJECT CHARACTERISTICS

Key indicators of the projected road are as follows:

- road category - 1b;
- length – 304.4 km;
- carriageway width - 27.5 m;
- number of traffic lanes - 4;
- width of the median - 5 m;
- maximum width of right of way–70 m;
- maximum rated speed - 120 km / h;
- estimated average speed - 80 km / h;
- multilevel interchanges – 13;
- bridges and overpasses - 77;
- culverts - 410;
- type of pavement and the type of coverage –cement / concrete.

Estimated construction period:

- Section 1 – 37 months
- Section 2 – 39 months
- Section 3 – 35 months
- Ili bridge construction – 33 months

The construction activities will include;

1. Site clearance and preparation;
2. Establishment and operation of borrow pits;
3. Construction and operation of camps, depots and workshops;
4. Construction of embankment;
5. Construction of road pavement;
6. Grading at junctions;
7. Construction of multi level interchanges and junctions;
8. Construction of bridges over rivers;
9. Installation of traffic signs and fences;
10. The application of road markings;
11. Construction of drainage channels for the roadway and the bridges;
12. Construction of training dikes near artificial structures.

2.3 SECTION 1

Section 1 (024-126 km) starts north of Almaty city and ends at the Shelek River This section begins at about 20 km NNE from the city centre of Almaty (the chainage refers to a reference point in Almaty). Much of the road (ca. 70-80%) will follow a new alignment. The first 10 km run through what can still be seen as suburban zone of Almaty, characterized by a dense network of infrastructure (roads, power lines, railroad) and numerous satellite settlements, with intense agricultural land use in non-built-up areas. The alignment then heads steadily in an east and east-north-easterly direction, about 2-5 km north and parallel to the existing main highway, the A351 ("KuldzhinskiyTrakt"). About 80% of the alignment runs through lands which are under intense agricultural use (with minor animal husbandry) and are mostly irrigated. The alignment crosses between 10-15 seasonal rivers, which run dry in summer, but can carry considerable water and sediment loads in spring. Many of them are use for gravel extraction About 15 km to the North, and thus downstream and at a lower elevation than the project alignment, lies the Kapchagai Reservoir, created by damming Ili River. Ili then continues to flow NW into Lake Balkash, which is the second largest lake in Kazakhstan and the receptacle for the entire surface water network in the project area. At the eastern end of section 1 the alignment runs through more arid rangeland, which is mostly covered by brush and grass and used mainly as pastureland for animals. The boundary of the first section is defined by river Shelek which lies just east of a major settlement of the same name. River Shelek is a perennial watercourse, albeit with large fluctuations in discharge rate. It is under intense use for gravel extraction in the project area (i.e. near the existing road). In this section (about 100-126 km) the new alignment will use the existing right of way south of the small town of Shelek. The existing bridge over Shelek River will be reconstructed and a new bridge built to accommodate two additional traffic lanes.

No natural areas, ecosystems or sensitive habitats were detected along the Section 1 alignment. The average elevation of the road is 600 meters above sea level; the minimum being 560 meters and the maximum being 640 meters.

Bridges and interchanges at Section 1 are shown in Table 2.1.

Table 2.1–Section 1: Bridges and Interchanges

№	Section	Length (meters)	Pavement	Notes
1	2	3	4	5
1	BAKAD-Novoalekseevka	11,00	Cement concrete	4 medium bridges: 2 pc. -new,2 pc. -reconstruction; 3 "clover" type interchanges; road lights 2,4 km, at interchanges
2	Novoalekseevka-109 км	78,00	Cement concrete	Construction of 16 new bridges, of which: 8 pc. – small, 7 pc. - medium, 1pc. - large, 2 interchanges "full clover", Lighting of interchanges and bridge over Talgar river
3	Section 109-126 km	17,00	Cement concrete	2 bridges, of which: 1 pc. – replace of small bridge, 1 pc. – reconstruction of medium bridge, 3 interchanges, "tube" type, lighting of interchanges, capital repair of REP-1 pc.

Needs in construction materials for Section 1 are shown in Table 2.2.

Table 2.2 – Section 1: Estimate use of Construction Materials

№	Name	Unit	Amount
1	2	3	4
1	Soil	T	6619437
2	Cement	T	110220
3	Water	$м^3$	650316
4	Crushed stone	T	876405
5	Sand gravel mixture	T	2019874
6	Asphalt concrete	T	66194
7	Bitumen	T	1242

Numbers of machinery and equipment needed for Section 1 are shown in Table 2.3 and 2.4.

Table 2.3 – Section 1: Characteristics of the machinery using diesel fuel

№ п/п	Name of machinery	Needs for project mach/h	Refuel consumption kg/hr	Fuel consumption t/yr	Fuel consumption g/s
1	2	3	4	5	6
1	Graders average type 99Kw	9856,1	4,50	44,3525	1,2500
2	asphalt distributor 7000l	141,86	20,00	2,8372	5,5556
3	Asphalt paver	3982,9	14,00	55,7606	3,8889
4	Bulldozers 108 and 165 hp	56071	8,00	448,5680	2,2222
5	Bulldozers 80 hp	76,825	6,40	0,4917	1,7778
6	Rollers t-propelled 8,13,16 t	31763	13,00	412,9190	3,6111
7	Cranes 6,3 t on cars	139,39	14,00	1,9515	3,8889
8	Cranes 25 t on crawlers	1702,4	14,00	23,8336	3,8889
9	Cranes 25 ton pneumatic movement during other works	13982	10,00	139,8200	2,7778
10	Marking machine T 40	110,3	11,00	1,2133	3,0556
11	Tractor 108 hp	14116,06	8,00	112,9285	2,2222

12	Tractor 80 hp	8,28	3,70	0,0306	1,0278
13	Excavators E-652 B 0,65 m3	6641,94	7,40	49,1504	2,0556
14	Excavators E-10011 1,0 m3	12992,17	8,20	106,5358	2,2778
15	Earth borer	81,14	6,40	0,5193	1,7778
16	Drilling machines with drilling capacity 3,5 tractor 85 kW 115 hp	44,48	8,40	0,3736	2,3333
17	Concrete paver	22421,04	15,4	345,28	4,3777
18	**Total:**		**194.4**	**1746.56**	**50.999**

Table 2.4 – Section 1: Characteristics of the machinery using benzene fuel

№ п/п	Name of machinery	Needs for project mach/h	Fuel consumption kg/hr	Fuel consumption t/yr	Fuel consumption g/s
1	2	3	4	5	6
1	Watering machine ,6000 l	57272,69	22,00	1259,9992	6,1111

2.4 SECTION 2

Section 2 (126-268 km) starts from Shelek river and runs eastwards until almost reaching Ili river. This section commences in NE direction from River Shelek, while the A351 highway turns off due east, running roughly parallel to the project alignment at a distance of about 20-30 km to the southeast. The project alignment follows a secondary road, which is a narrow asphalted road for the first 25-30 km and then turns into a gravel road for about 70-80 km which is in very poor condition. This part of the alignment was projected to be upgraded to a transit highway in the 1980s, but construction did not proceed beyond a gravel platform. Alignment adjustments and new sections are planned in 3 segments of this section: (i) about 5 km at the start of the section (new alignment crossing agricultural lands), (ii) about 2-3 km at 18 km from the section start, where the new alignment will cross an area of waterlogged land, and (iii) about 23 km stretch towards the end of the section, where the new section will be routed between an alluvial fan with irrigated agriculture, and a semi-desert type area. Over most of section 2 the road alignment follows an existing infrastructure corridor with a newly constructed railway line, a gas pipeline, and electricity supply lines between which the road will be located. The natural environment of the alignment is already disturbed by these various developments.

At about 63 km from the start of section 2 the road alignment will pass at the closest point, about 2 km to the north of the Charyn National Park, the core zone of which is an ancient forest which has survived in a narrow, sheltered canyon along a 25 km stretch of Charyn River. Currently the National Park is bisected by the existing highway A351. This forest is one of the last remnants of a much larger forest which once stretched along the foothills of the Tian Shan Mountains after the last Ice Age. It is the last location in Central Asia and one of the few places in the world which still supports a large population of the endangered Sogdian Ash Tree. To the north of the alignment also in this area there lies the Altyn-Emel National Park which lies 6 km distant at the closest point. Famous for its ''singing'' sand dunes and various desert and mountain reptiles and mammals.

Following the alignment to NE directions there is a visible trend towards a more arid climate, thus much of the alignment of this section would run through arid steppe or semi-desert type rangeland, with no perennial rivers, no wetlands (except the aforementioned) and few temporal rivers (located in the NE of the section, at ca. 86 km from the start of section 2190-220). Agricultural lands and associated irrigation systems will be affected only along ca. 25% of the section. Ca. 80% of section 2 will run along existing, albeit much smaller and lower capacity roads. The section ends about 5 km South of River Ili, where the project alignment rejoins the existing route A351.

Bridges and interchanges at Section 2 are shown in Table 2.5.

Table 2.5 – Section 2: Bridges and interchanges

№	Section	Length (meters)	Pavement	Location
1	2	3	4	5
1	Overpass on an interchange	77.11	Cement concrete	Km 126/ Interchange
2	Bridge over watercourse	61.2	Cement concrete	Km 189
3	Railway overpass	79.385	Cement concrete	Km 197+500/ Railway overpass
4	Bridge over Karakuldek river	54.35	Cement concrete	Km 207+500
5	Bridge over Charyn river (West)	97.05	Cement concrete	Km 211
6	Bridge over Charyn river (Tashkarasu)	55.15	Cement concrete	Km 227

Needs in construction materials for Section 2 are shown in Table 2.6.

Table 2.6 – Section 2: Need in construction materials

No.	Name	Unit	Quantity
1	2	3	4
1	Soil	$м^3$	6000000
2	Cement	Ton	264000
3	Water	$м^3$	825 245
4	Crushed stone	$м^3$	767000
5	Sand-gravel mix	$м^3$	1424000
6	Asphalt concrete	ton	40000

Numbers of machinery and equipment needed for Section 2 are shown in Table 2.7 and 2.8.

Table 2.7 – Section 2: Characteristics of the machinery with diesel fuel

№	Name of machinery	Fuel type	Fuel consumption kg/hr	Need for project mach/hr	Fuel consumption, Tons/year
1	Watering machine ZIL-130, 6000 l	Benzene	22	72678,48	1598,93
2	Grader 99 кВт	Diesel	4,5	12507,26	56,28
3	Paver 7000 л	Diesel	20	180,02	3,60
4	Asphalt paver	Diesel	14	5054,22	70,76
5	Bulldozers 108 hp, 165 hp	Diesel	8	71154,07	569,23
6	Bulldozers 80 hp	Diesel	6,4	97,49	0,62
7	Rollers 8 t, 13 t, 16 t	Diesel	13	40307,09	523,99
8	Crane on tires 6.3 t	Diesel	14	176,68	2,47

9	Crane on tracks 25 t	Diesel	14	2160,28	30,24
10	Crane on rubber-tires 25 t	Diesel	10	17743,09	177,43
11	Marking machine T-40	Diesel	11	139,97	1,54
12	Tractor 108 hp	Diesel	8	17913,14	143,30
13	Tractor 80 hp	Diesel	3,7	10,51	0,04
14	Excavator E-652B 0.65 m^3	Diesel	7,4	8428,55	62,37
15	Excavator E -10011 1.0 m^3	Diesel	8,2	16486,94	1351,93
16	Hole-borer	Diesel	6,4	102,97	0,66
17	Drilling machine with 3.5 m head on tractor 85 kWt 115 hp	Diesel	8,4	56,45	0,47
18	Concrete paver	Diesel	15.4	241.6888	4.277
	TOTAL			265438.89	4598.137

Table 2.8 – Section 2: Characteristics of the machinery using benzene fuel

№	Name of machinery	Needs for project mach/h	fuel consumption kg/hr	Fuel consumption t/yr	Fuel consumption g/s
1	2	3	4	5	6
1	Watering machine ,6000 l	72678,48	22,00	1598.93	6.374

2.5 SECTION 3

Section 3 (268-360 km) runs through a variety of landscapes and land use types and ends at Khorgos near the Kazakhstan/China border. This section starts ca. 5 km East of the existing, ca. 700 m long bridge over River Ili. Ili is the largest river of the entire project area and the main tributary to Lake Balkash. Several km before and after the crossing of Ili River the project alignment would follow the existing route A351, and a new bridge would be built immediately next to the existing one to accommodate 2 additional lanes. A few km after the river crossing the projected road would again turn off the existing route A351 to the West-North -West and run on a new alignment for the rest of the project. The bulk of the section would traverse grazing land, some irrigated agricultural land and water courses, one of which the River Usek is a major tributary of the Ili. At about 62 km from the start of section 3 there is a stretch of land used for irrigated agriculture which is close to a small settlement on the exiting main road which is bypassed at a distance of about 0.5 km. A section of the road approximately 70 km from the start of section 3 runs through a large field of sand dunes with sparse vegetation. The district center, Zharkent City, lies at a distance of about 10 km north and west from the alignment.

The last 5 km cross the broad flood plain of Khorgos River to the Chinese border, where a new border-crossing is planned. This development has been started some years ago and has advanced considerably on the Chinese side of the border.

Bridges and interchanges at Section 3 are shown in Table 2.9.

Table 2.9: Section 3: Bridges and interchanges

№	Section	Length	Pavement	Location
1	2	3	4	5
1	"Trumpet" type Interchange	-	Asphalt concrete	Km 272.8 (PK4.8)/ 5 km north from Tashkarasu settlement
2	Ili river bridge	683 m	Asphalt concrete	Km 283/ Ili river
3	Overpass (country road)	18 m	Asphalt concrete	Km 286 (PK18)/ 1 km southeast from Darbazakum village
4	"Trumpet" type Interchange	-	Asphalt concrete	Km 291.3 (PK23.3)/ 7 km after Ili bridge
5	Medium Bridge over canal	36.95 m	Asphalt concrete	Km 295.2 (PK27.2)/ 8 km after Ili bridge
6	Barahudzir river bridge	55 m	Asphalt concrete	Km 301.4 (PK33.4)/ 12 km south from Koktal village
7	Medium Bridge over canal	36.95 m	Asphalt concrete	Km 305.2 (PK37.2)/ 15 km south of Koktal
8	"Clover leaf" type Interchange	-	Asphalt concrete	Km 310.3 (PK42.3)/ 10 km south of Ucharal village
9	Medium Bridge over canal and secondary road	55 m	Asphalt concrete	Km 312.1 (PK44.1)/ 6 km southwest of Chulakai village
10	Medium Bridge over canal	36.95 m	Asphalt concrete	Km 313.3 (PK45.3)/ 6 km southwest of Chulakai Village
11	Usek river bridge	135 m	Asphalt concrete	Km 314.1 (PK46.1)/ 6 km southwest of Chulakai village
12	"Clover leaf" type Interchange	-	Asphalt concrete	Km 316.5 (PK48.5)/ 5 km to south of Chulakai village
13	Tishkan river bridge	108.6 m	Asphalt concrete	Km 327.9 (PK59.9)/ 6 km south of Great Shagan village
14	Chijim river bridge 1	126 m	Asphalt concrete	Km 332.1 (PK64.1)/ 4 km south of Zharkent village
15	Chijim river bridge 2	67.59 m	Asphalt concret	Km 334 (PK66)/ 4 km south of Zharkent village

			e	
16	Medium bridge over canal and country road	67.59 m	Asphalt concrete	Km 334.3 (PK66.3)/ 4 km south of Zharkent village
17	Medium Bridge over canal	36.95 m	Asphalt concrete	Km 338.5 (PK70.5)/ 0.2 km south of Avat village
18	Medium Bridge over canal	36.95 m	Asphalt concrete	Km 341.8 (PK73.8)/ 1.2 km southwest of Lower Pidjim village
19	"Shrunk Clover leaf" type Interchange	-	Asphalt concrete	Km 343.2 (PK75.2)/ 1 km to south of Lower Pidjim village
20	Overpass (country road)	24.9	Asphalt concrete	Km 353.2 (PK85.2)/ 6 km south of Khorgos village
21	Overpass (country road)	24.9	Asphalt concrete	Km 353.9 (PK85.9)/ 6 km south of Khorgos village
22	Khorgos river bridge	126.1	Asphalt concrete	Km 355.4 (PK87.4)/ 6 km south of Khogos village
23	Overpass (country road)	24.9	Asphalt concrete	Km 356.8 (PK88.8)/ 6 km south of Khogos village

The Ili Bridge referred to in the table above is located at km 283 and is 15.278 km from the start of Section 3. It is 683 meters long and has 16 spans of 42.72 meters each. The structure is 10 meters above the average river water height. It will be constructed of prefabricated reinforced concrete spans with monolithic pillars on pile foundations. The new bridge will be similar in appearance to the existing bridge. The new bridge will be located 30 meters downstream from the existing bridge. This bridge was constructed in 1976 to 1980. Once the new bridge is completed the new bridge will operate one way in a SW direction; traffic from China will use this bridge. The existing bridge will become one way and will take traffic in a NE direction towards the International border with China. Materials required for construction materials for Section 3 are shown in Table 2.10.

Table 2.10 – Section 3: Consumption of raw materials and building materials

No.	Name	Unit	Quantity
1	**2**	**3**	**4**
1	Soil	м^3	5176056
2	Cement	ton	195 211
3	Water	м^3	508 514
4	Crushed stone	м^3	685 303
5	Crushed stone-sand mix	м^3	1579436
6	Asphalt concrete	ton	51 760
7	Bitumen	ton	971

Numbers of machinery and equipment needed for Section 32 are shown in Table 2.11 and 2.12.

Table 2.11 – Section 3: Characteristics of the machinery with diesel fuel

№	Name of the machinery	The need	Sp. Fuel	Fuel	Fuel

		for an Project mach / h	consumption kg / h	consumption tons / year	consumption g / s
1	**2**	**3**	**4**	**5**	**6**
1	Graders average type 99kW	7706.94	4.50	34.6812	1.2500
2	Asphalt distributor 7000l	110.93	20.00	2.2186	5.5556
3	Asphalt	3114.4	14.00	43.6016	3.8889
4	Bulldozer 108 and 165 hp	43844.94	8.00	350.7595	2.2222
5	Bulldozer 80 HP	60.07	6.40	0.3844	1.7778
6	Rollers t-propelled 8,13,16	24837.12	13.00	322.8826	3.6111
7	Cranes 6.3 m for road course	108.99	14.00	1.5259	3.8889
8	25 ton crane on crawlers	1331.28	14.00	18.6379	3.8889
9	25t cranes on pneumatic move while working on other types of construction	10933.24	10.00	109.3324	2.7778
10	Marking machine T 40	85.65	11.00	0.9422	3.0556
11	Tractor 108 hp	11038.03	8.00	88.3042	2.2222
12	Tractor 80 hp	6.48	3.70	0.0240	1.0278
13	Excavator E-652 B 0.65 m3	5193.65	7.40	38.4330	2.0556
14	Excavator E-10 011 1.0 m3	10159.21	8.20	83.3055	2.2778
15	Earth borer	63.45	6.40	0.4061	1.7778
16	Drilling machines with Sec. 3.5 m of drilling on the tractor 85 kW 115 hp	34.78	8.40	0.2922	2.3333
17	Concrete paver	15531.15	15.4	**239.1797**	**4.2777**
18	**Total:**			**1334.9**	**47.89**

Table 2.12 – Section 3: Characteristics of the machinery using benzene fuel

№	Name of the machinery	The need for the project mach / h	Sp. Fuel consumption kg / h	Consumption t / year	Fuel consumption g / s
1	**2**	**3**	**4**	**5**	**6**
1	Watering machine, 6000l	44784.27	22.00	985.2539	6.1111

2.6 BORROW PITS

The Design Engineers have defined a number of existing and proposed borrow pits for all three sections of the alignment. These are shown in 2.13, 2.14 and 2.15. These are not part of the approved design since the contractor will make the final decision on the selection of borrow pits. The existing legal borrow pits have already received approval from the Rayon Akimat and all other responsible institutions including environmental approvals. They are available for use by any contractor depending on the contractor's precise requirements. The contractor does not normally own or have an interest in the ownership of a borrow pit. The contractor merely enters into a contract with the owner/operator of the borrow pit to buy specified amounts to an agreed specification. The road contractor would be responsible for maintaining any public and private access roads between the borrow pit and the construction site.

Extracting material from river beds is not normally acceptable and is normally not approved by the river, forestry and environmental authorities. The only normal exception is where a river is being 'improved or cleaned' by the river authority and where with the approval of the river authority any stones and gravel extracted from the site can be purchased and then used by a contractor. Normally borrow pits are not allowed within 500 meters of any river.

All proposed borrow pits require approval from a range of local government institutions including an inter regional committee of the Oblast. An EIA has to be prepared by consultants for the owner/operator. When the contractor submits his application he must include the EIA along with all documentation and expertise conclusions to Oblast Department of Environment Protection for getting permits for emissions and impacts. The final approval process will include a requirement that at the Borrow pit opening stage that the removal and storage of topsoil must be carried out and that the top soil must be reinstated at the closing stage. This document is prepared after signing extraction contract. The total approval process for a new borrow pit through the Oblast and Rayon can take up to 2 years for final approval and agreement. Any contractor is therefore most likely to use existing borrow pits with the existing approvals rather than try to use new sites for the extraction of material. No specific approval is required from the water/river authority but the EIA should refer to any impacts on surface and groundwater resources.

For the existing borrow pits defined by the Design Engineers it is understood that all sites are legal and formal sites and have completed EIA procedures and are environmentally acceptable and will not adversely impact on surface and groundwater resources or any other environmental issues. Nevertheless, once the borrow pits to be used have been identified by the Contractor a due diligence review will be carried out to confirm that those sites are indeed operating or operable in an appropriate manner.

Whichever sites are used existing local roads will be used as access to the road construction site. On the main road it is unlikely that the construction traffic will have a significant impact on traffic flows and noise disturbance to the existing communities. Nevertheless this will need to be reviewed and monitored in detail prior to the commencement of the construction period. For the minor roads that cross the new alignment and for any access routes construction traffic will significantly increase traffic flows and potential air and noise disturbance. A traffic count on all possible access roads to road construction site together with a regular monitoring program will be prepared prior to the commencement of the construction period as part of the environmental due diligence and management measures.

Table 2.13: Section 1 Borrow Pits

No.	Name	Material	Status	Mileage, km/Distance to alignment
1	Borrow pit No.5	Soil	Surveyed/Proposed by design engineers	Km 0/ 10 km
2	"Tas-Kum" deposit	Crushed stone, sand	Existing	Km 4.7/ 34 km
3	"Baiterek" deposit	Sand-gravel	Existing	Km 13.4/ 12 km
4	Borrow pit No. 4	Soil	Surveyed/Proposed by design engineers	Km 42/ 7 km
5	"Baltabai-3" deposit	Sand-gravel	Existing	Km 50/ 3 km
6	"Turgen-10" deposit	Sand-gravel	Existing	Km 50/ 8 km
7	Borrow pit No. 3	Soil	Surveyed/Proposed by design engineers	Km 61/ 9 km
8	Borrow pit No. 2	Soil	Surveyed/Proposed	Km 76/ 10 km
9	Borrow pit No. 1	Soil	Surveyed/Proposed	Km 88/ 7 km
10	"Shelek" deposit	Sand-gravel	Existing by design engineers	Km 112/ 26 km

Table 2.14: Section 2 Borrow Pits

No.	Name	Material	Status	Mileage, km/Distance to alignment
1	"Talgar" crushed stone quarry	Crushed stone	Existing	Talgar Rayon/ 12 km from existing road
2	Deposit near Shelek village	Sand-gravel	Existing (To be clarified)	Km 0/ 1.1-1.4 km
3	"Nurly" deposit	Sand-gravel	Existing (To be clarified)	Km 19.1/ 80 m
4	Borrow pit	Soil	Surveyed/Proposed by design engineers	Km 25/ 500 m
5	Borrow pit	Soil	Surveyed/Proposed by design engineers	Km 56.4/ 100 m
6	"Tashkarasu" deposit	Sand-gravel	Existing	Tashkarasu village/ 14.5 km
7	Borrow pit	Soil	Surveyed/Proposed by design engineers	Km 104/ 600 m
8	"Sengrupp" LLP crushed stone quarry	Crushed-stone	Existing	75 km from Tashkarasu village towards Zharkent city on existing road

Table 2.15: Section 3 Borrow Pits

No.	Name	Material	Status	Mileage, km/Distance to alignment
1	Borrow pit No.4	Gravel	Proposed by design engineers	Km 18, near Aidarly village/ 5 km from existing road
2	Borrow pit No.3	Pebble-gravel	Surveyed/Proposed by design engineers	Km 49, near Chulakai village/ 10 km
3	Borrow pit No.2	Gravel-sand	Surveyed/Proposed by design engineers	Km 19.1/ 80 m
4	Borrow pit No.1	Gravel-sand	Surveyed/Proposed by design engineers	Km 75/ 24 km
5	Borrow pit Zharkent	Gravel-sand	Surveyed/Proposed by design engineers	5 km to west of Zharkent/ ~20 km
6	"Shelek" deposit	Sand-gravel	Surveyed/Proposed by design engineers	Shelek village (km 125) / 8 km from ex. Road
7	Borrow pit	Soil	Surveyed/Proposed	Km 104/ 600 m

			by design engineers	
8	"Tas-Kum" deposit	Crushed stone, sand	Existing	Km 4.7/ 34 km

The extraction and use of soil and other material from within the alignment right of way can be done so without any additional approvals and contractors will use this material if suitable before using other sources of material.

3. ANALYSIS OF ALTERNATIVES

Alignment Alternatives

During the conceptual design and feasibility study phases a number of alternative alignments were considered, with the principal options referring to sections 2 and 3: There a Southern route was considered that would have run mainly along the existing alignment, and a corridor about 20-40 km further North, which would include a larger portion of new road sections. It is considered that the presently designed (Northern) alignment as defined in this report is the most suitable in environmental impact terms and causes the minimum of environmental and social impacts. The selected alignment has the maximum environmental benefits. It does not pass near to or through any existing or planned settlements, nor does it divide or isolate any existing communities. It passes through predominantly agricultural or grazing land and some unconverted land towards the east of the alignment and does not impact any sensitive or protected areas. The only settlement that it does pass near is Shelek but the proposed alignment follows the existing alignment which has a sufficiently wide ROW and along which no sensitive uses are located. The corridor passes along the outskirts of Shelek and has always been an area characterized by transport, business, roadside services and small industries, which renders the area little sensitive to noise and air pollution.

After the alignment revisions the alignment was agreed by Almaty Oblast and the various Rayons. The detailed considerations made on alternative options are briefly described below:

In Section 1 there were a number of minor alignment changes from the original FS to ensure that there was no impact on the Gas pipeline alignment which follows a similar corridor. It is an approved regulation that no development should take place within 200 meters of the centerline of the pipeline. The final road alignment that was selected was at a distance of at least 250 meters from the Gas pipeline.

There were two significant alternative alignments proposed and eventually included in the final design. These two alternatives, one in Section 2 and one in Section 3 were as follows:

In the vicinity of Tashkarasu and Charyn (Section 2). The original alignment for this section followed the existing road route which passes through the Charyn National Park. This original alignment was discarded at an early stage because it passes though the National Park and it not in accordance with Government environmental policy. This new alignment was proposed by Uigur Rayon Akimat as a means of (i) avoiding irrigated agricultural land to the south and east of the town of Tashkarasu and (ii) avoiding passing through the protected Charyn National Park south of Charyn. The selected alignment now passes through largely unconverted open land not activity used for agriculture or grazing and had significant environmental benefits on the agricultural activities within the area.

In the vicinity of Koktal and Zharkent (Section 3). This significant new alignment also avoided irrigated agricultural land north and west of Zharkent. The original proposed alignment followed the present route through Kaktal and then bypassed Zharkent immediately to the south. This affected irrigated land immediately to the south of Zharkent. The selected alignment passes approximately 10 km south of Koktal and Zharkent and avoids. all agricultural land and passes through unconverted land or low intensity grazing land.

Environmental Impact of a Do Nothing Alternative

Do nothing would involve no new capital investment in the road and the present road would take all future traffic flows. This would create significant environmental disturbance to the existing communities along the present alignment; approximately 20 communities are now located along the present road. There would be increased noise and vibration, air pollution, and significantly danger to local communities and road users, in particular pedestrians. Crossing the road would become more hazardous and the roadside communities would be physically segregated between the different sides of the road. Traffic congestion would increase and the economic disadvantages of this would be significant. Overall the quality of the environment and social conditions would deteriorate along the present road. Increased traffic volumes would also flow

through the section bisecting Charyn National Park which would likely have significant long term adverse impacts on the park.

Environmental Impact of a Widening Alternative

The widening alternative would involve the widening of the present carriageway to 4 lanes with a dividing strip. This would generally mean a widening of the ROW. In the existing communities there would be the need to purchase a strip of land and resettlement would be necessary which would be much greater and more expensive than the recommended new alignment. In the existing communities many buildings, including sensitive uses, would be exposed to higher noise and vibration levels and air quality reduction due to the reduced distance to the road, and the increased traffic flow. As with the do nothing alternative the communities would be physically separated between each side of the road. To reduce physical segregation of both sides of the road it will be necessary to provide numerous pedestrian crossings; either bridges or pedestrian controlled lights. Moreover this alternative would also cause increased traffic flows through Charyn National Park.

Conclusion

Both the do nothing and widening alternatives would have significantly larger adverse impacts on the environment and on the social conditions within the existing communities along the exiting road. Danger to local road users and pedestrians would increase, particular from the do nothing alternative. The selected alternative which involves a significant portion of greenfield alignment avoids all settlements and impacts on local communities will be minimal. There will be some disturbance to agricultural activities during construction and some smaller long term impacts on agriculture. There are no significant impacts on natural habitats associated from this alternative. Overall it is considered that the selected alignment offers the best environmental approach to solving the problems with the present alignment and encouraging greater economic and social links between China and Kazakhstan.

4. SECTION 1.

4.1 BASELINE DATA SECTION 1

4.1.1 GENERAL DESCRIPTION

The road "Almaty-Kokpek-Chundzha-Koktal-Khorgos" is part of the international transit corridor "Western Europe - Western China", which connects Central Asia with China under the "Program of development of transport infrastructure in Republic of Kazakhstan for 2010-2014" approved by Government Resolution No. 1006 on September 30, 2010.

Section 1 (024-126 km) starts about 20 km NNE from the city centre of Almaty (the chainage refers to road "Almaty-Ust-Kamenogorsk"). The first 10 km run through what can still be seen as suburban zone of Almaty, characterized by a dense network of infrastructure (roads, power lines, and railroad) and numerous satellite settlements, with intense agricultural land use in non-built-up areas. From the village of Baiserke the alignment then heads steadily in north-easterly direction, ca. 2-5 km north and parallel to the existing main traffic line, the A351 ("Kuldzhinskiy Trakt"). About 80% of the alignment runs through lands which are under intense agricultural use (with minor animal husbandry) and are mostly irrigated. Irrigation water is derived from the nearby Tian Shan range, whose foothills run parallel to the alignment ca. 8-10 km to the South. The alignment crosses between 10-15 seasonal rivers, which run dry in summer, but can carry considerable water and sediment loads in spring. Many of them are used for small scale gravel extraction some of which appears to be unlicensed and thus illegal. Ca. 15 km to the north (and downstream of the road alignment) lies the Kapchagai Reservoir formed by damming Ili River. Ili then continues to flow NW into Lake Balkash, which is the second largest lake in Kazakhstan and the receptacle for the entire surface water network in the project area.

From approximately 100 to 120 km of the alignment runs through more arid rangeland, which is mostly covered by brush and grass and used mainly as pastureland for animals. The end of the first Section is defined by river Shelek which lies just east of a major settlement of the same name. River Shelek appears to be a perennial watercourse, albeit with large fluctuations in discharge rate. It is under intense use for gravel extraction in the project area. In this Section (ca. 100-126 km) the new alignment will use the existing ROW. The existing bridge will be reconstructed and a new bridge built to accommodate two additional traffic lanes.

Overall, about 82% of the road would be constructed on a new alignment, the remainder following the existing route A351 (19,823 m out of 111,743 m).

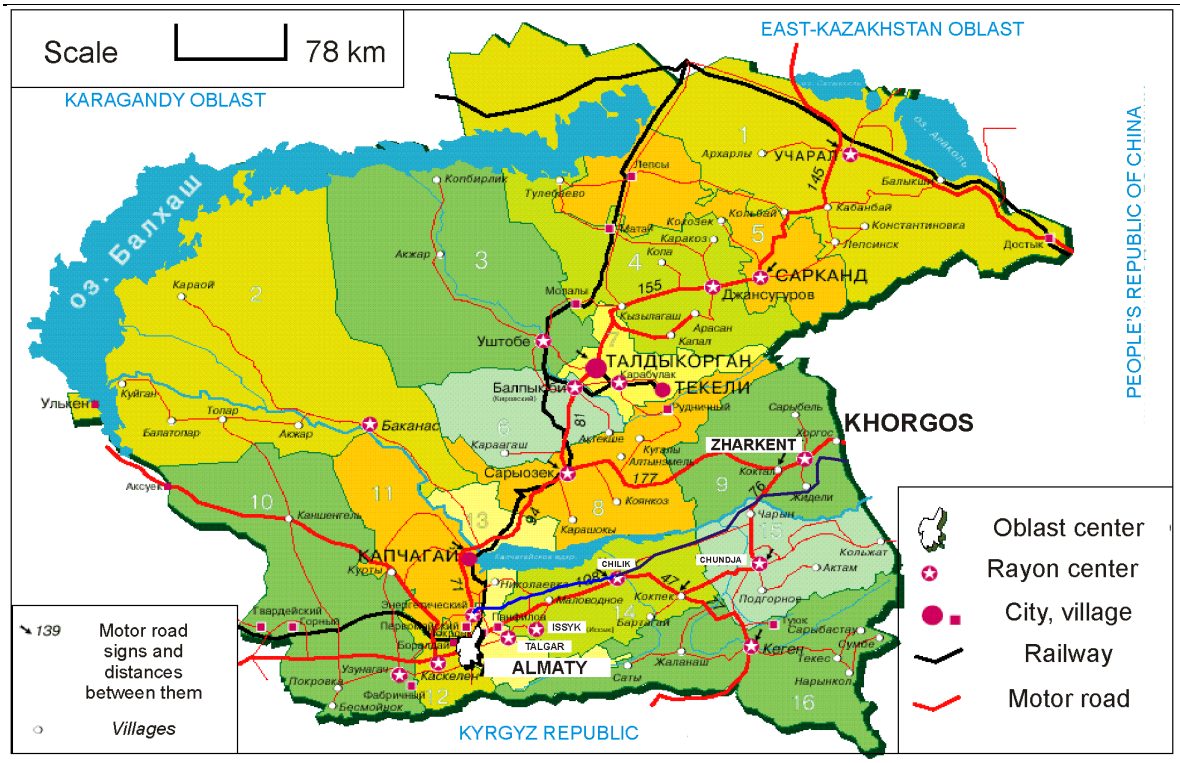


Figure 4.1. – Location map of Almaty region

The total area of Almaty Oblast is 428,000 square kilometers. The administrative centre is Taldykorgan. The Oblast includes 16 rural districts, 10 towns, 15 townships, 759 villages.

The population of the Oblast is approximately 1,631,400 inhabitants (excluding Almaty city).

The total length of this Section of the project is 111.9 km (Figure 4.1.

1. Ili rayon – The length of the project within Ili Rayon is 6.6 km.

2. Talgar rayon –The length of the project within Talgar Rayon is 7.6 km.

3. Enbekshikazakh rayon– The length of the project in Enbekshikazakh Rayon is 97.7 km.

4.1.2 CLIMATE

The climatic characteristics of key towns on the alignment corridor are shown in Table 4.1 The key climate factors are:

- Continental climate of cold winters and hot summers. Coldest winter months are approximately -8ºC to -11ºC, warmest summer months are +40ºC;
- Rainfall varies between 150 mm and 400 mm per year, with most rain in the spring and little rain during the summer;
- Snow cover starts in November and lasts on average 80-100 days with a depth of 21-38 cm;
- Snow depths protect the soil from continuous freezing;
- Winds are normally from the North East and North West;
- Dust storms occur during summer and soil erosion can occur.

The main climatic characteristics of the projected road are shown in the nearest weather stations at Almaty and Shelek in Table 4.1.

Table 4.1 - Key indicators of climatic long-term data MS "Almaty", "Shelek"

№	Climatic Indicators	Almaty	Shelek
1	2	3	6
1	Average annual temperature C	+ 8,9	+8,9
2	The average temperature in the coldest month (January) ^{0}C	- 6,5	-9,2
3	The average temperature for the warmest month (July) ^{0}C	+ 20,7	+23,9
4	The absolute minimum temperature ^{0}C	- 38,0	-39,0
5	The absolute maximum temperature ^{0}C	+ 42,0	+42,0
6	Average rainfall in mm including the winter period	491	233
7	The snow cover with a 5% probability of exceeding cm	50	-
8	Number of days per year: sleet hail blizzard Wind> 15 m / sec	 12 7 5 21	 2.0 2.0 25 25
9	Typical periods of air temperature More than 0 C start end duration	 13/03 11/11 242	 7/03 18/11 255
	More than 5 C start end duration	27/03 25/10 211	21/03 31/10 223
	More than 10 C start end duration	13/04 9/10 178	6/04 15/10 191
10	The average annual wind speed m / s	1,7	3,8

4.1.3 GEOMORPHOLOGY AND GEOLOGY

The project area has a complex geomorphology and varied terrain due to its location between the high ridges of the Northern Tien Shan to the south, and the planes of the foreland with Lake Balkhash to the north-west and the Ili River to the north-east.

The Almaty region is a sub mountain foreland of the south-western range of Karatau. A significant part of the region is occupied by the Balkhash-Alakol and Ileyskaya valleys (Fig 4.2).

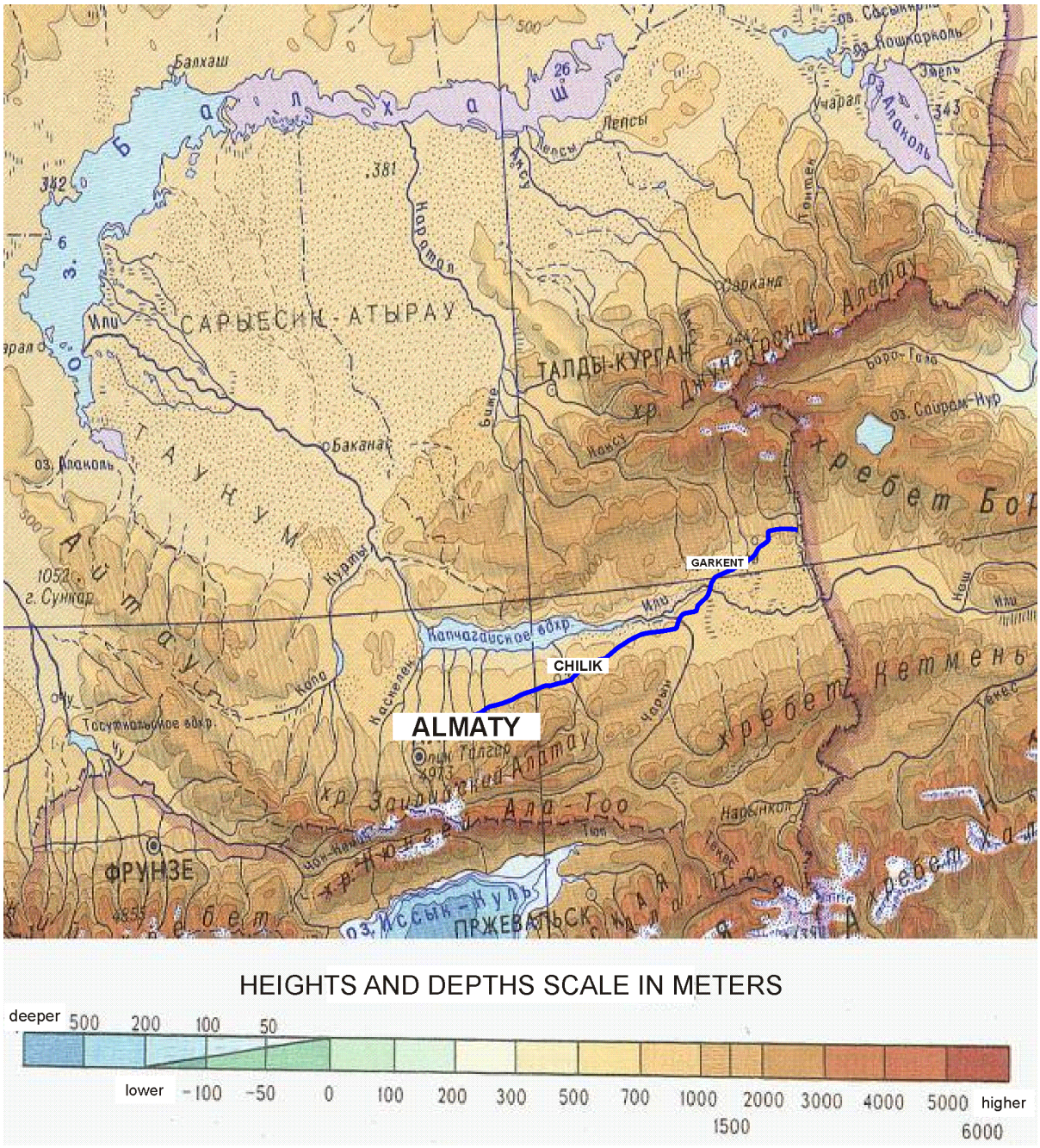


Fig. 4.2. Contour Map

Geographically, the area of the projected road is an extensive valley, which extends between the Junggar Alatau mountain ranges in the north and Ketmen Zailiyskiy and Tau in the south. Around the middle of this basin is a sharp narrowing of the valley passing almost to the Ili river with hills Katu and Kalkan on the right side and mountains on the left bank known as Boguty. Local morphological conditions in the Ili Valley

location determine the specific conditions of formation of runoff streams of northern exposure. The mountains here block the north -western direction air masses, so there is precipitation and streams.

Along the foothills bordering to the north and south of the mountains, Ili basin delineates technological faults that define its high seismicity. The area through which the alignment passes is classified as 9 out of 12 in the Modified Mercalli Intensity Scale (MMI) Destructive to Violent. The foreland plains are composed of a thick layer of red sandstone, sandy clays and sands with some gravel and conglomerates. In some sandy alluvial riverbeds in the valleys wind action has formed sand dunes particularly at the eastern end of the alignment.

4.1.4 SOILS AND SOIL FORMING ROCKS

Almaty Oblast has complex soil conditions. Soil characteristics and formation are affected by climate, hydrological conditions, geological structure, vegetation and other factors.

The project area is within a semi-desert and desert area. The examination and classification of soils was carried out according to the "Systematic list and main diagnostic indicators of soil of Kazakhstan" and included both a consultation of existing soil maps and atlases for Kazakhstan, as well as soil sampling and classification during the geotechnical investigations done during preparatory works. The soil cover includes heterogeneous light gray soils, underdeveloped, gray-brown, sand ridges and hilly areas in conjunction with clay saline soils. Soils are mostly saline. Mechanical composition differs from sands to clay loams and light clay. Soil-forming rocks are mostly saline alluvial with no talus deposits, represented by loam, sandy loam and sand.

Full details of the soil Characteristics of each of the 3 Rayon can be found in Appendix 1.3.

The most important aspect of the soil characteristics is its suitability for removal, retention and subsequent use. In accordance with GOST 17.5.3.06-85 (Definition requirements for removal of topsoil and excavation) Standard 15.5.1.03-86 (Classification of overburden and host rock for biological reclamation of land) all soils were investigated for fitness for removal and subsequent use for bioremediation are divided into two groups:

Group 1: Soils with limited agricultural value

Light-chestnut medium depth general, light chestnut slightly saline ferrous mixed with medium saline ferrous 10-30%, meadow-light chestnut general medium depth general, mixed with meadow boggy soil meadow gray general soil with slightly saliniferous 10-30 %

These soils have humus depth level from 20 to 47 cm. Humus content ranges from 1,65 to 3,31%. Mechanical makeup comprises medium-hard sand-loam. Recommended depth to remove from 20-40 cm

Group 1 accounts for approximately 100 km of Section 1 (90 % of total Section 1 alignment)

Group 2: Soils with significant agricultural value

The second group comprises: meadow light chestnut medium saline with meadow-boggy medium saline 10-30%, light chestnut slightly truncated (eroded) with flood meadow 10-30%, light chestnut heavily saline mixed with hydromorph 10-30%, grey common medium eroded oil, grey general heavily saline, grey common heavily saline medium eroded mixed with meadow boggy 10-30%.

Normally this soil is not recommended for removal but since it is common within river valleys in the area it is not possible to avoid. As this soil type is considered more valuable for agricultural purposes any activities disturbing or negatively affecting it shall be minimized to the extent possible, e.g. the soil type shall be considered for temporary works such as haul roads, laydown areas and camp-sites, to minimize impacts and ensure that restoration is diligently carried out. Group 2 accounts for approximately 12 km of Section 1 (10 % of total Section 1 alignment)

Fig. 4.3 - Soil map of the area of the projected area of the road "Almaty-Khorgos". (Group 1 – green, Group 2 – yellow)

4.1.5 LAND RESOURCES

Most of the land within Section 1 is irrigated agricultural land and pastures. Land will be required on a permanent basis for the road alignment and access roads and junctions: this includes in addition to the agricultural uses a limited number of commercial and industrial buildings. No residential uses will be required. Acquisition has now largely been completed and this is reported in full in the Resettlement Investigation report (RIR). Some acquisition (86 separate land plots) have not yet been acquired within all three Sections. Some commercial buildings will be required in Ili Rayon and Enbekshikazakh Rayon.

The definition of land required for the construction was made during the field survey by the land management agencies and environment protection agencies. The total private land required within each Rayon is shown below. Most of this land has already been acquired and compensated.

Table 4.2 Land required permanently for the alignment

Rayon	No. of Owners	Area of Land (ha)	Note
Ili	67	36.34	
Talgar	12	47.65	
Enbekshikazakh	470	491.72	Part also within Section 2 of alignment

Additional land will be required for borrow pits for construction material, and for temporary construction access and for construction depots, workshops and workers accommodation. Contractors will obtain access to all land required for temporary use solely through negotiation with the owner or user; there will be no temporary land acquisition through application of government acquisition taking powers. In all cases most of the land required permanently and temporary is agricultural crop and pasture land or unconverted land. In accordance with the requirements of Government land legislation it is necessary to ensure that all land used temporary for construction are returned to their original condition through a reclamation program. The technology, procedures and materials are specified in the relevant section of the design.

4.1.6 HYDROLOGICAL CHARACTERISTICS

Surface Water

Although rainfall is comparatively low as indicated in section 4.1.2 the Almaty region is fairly rich in water resources due to the proximity of the mountains, where precipitation is higher and snow-melt and glaciers provides a perennial runoff. The region is drained by a number of large rivers and lakes which flow into the internally closed (Endorheic) Balkhash Basin at Alakul. The most significant waterway is the Ili River. Other rivers include the rivers Karatal, Aksu, Tnetek, Yrgayty, Kaskelen Talgar, Large and Small Almatinka, Shyryn, Turgen, Sholak, Lepse, Issyk Shelek, Charyn, Horgos, etc. Section 1 lies between the Kaskelen River and Shelek River and all minor rivers flow into these two major rivers.

Since all major rivers originate in the high mountains where snow melt, glaciers and significant all year rain they are perennial but some of the smaller rivers become dry during the dry season. Short duration flooding may occur during the period March to June when river flows and rainfall levels are higher.

Ground Water

The Design Engineers supplemented the existing data and literature in the area by a series of boreholes along the alignment at approximately 500 meter intervals in relatively flat land and more frequent where there are gradients.

Groundwater characteristics of the area is shown in Fig. 4.4.

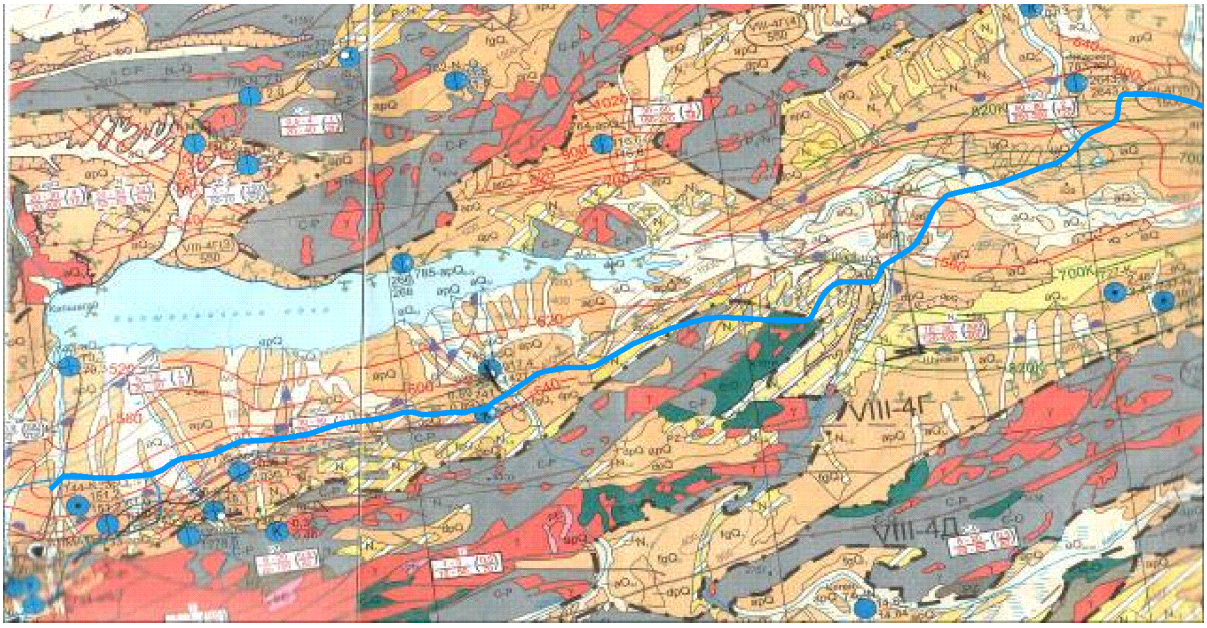


Fig. 4.4 - Hydro geological map of the projected road

УСЛОВНЫЕ ОБОЗНАЧЕНИЯ

1.ПЛОЩАДНОЕ РАСПРОСТРАНЕНИЕ ГИДРОГЕОЛОГИЧЕСКИХ ПОДРАЗДЕЛЕНИЙ
AREAL DISTRIBUTION OF THE HYDROGEOLOGICAL UNITS

aQ_{IV} — Водоносный горизонт современных аллювиальных отложений.
Пески, супеси, суглинки, галечники, гравийно-галечники
Recent alluvial aquifer.
Sand, sandy loam, loam, shingle, gravel-shingle

apQ — Водоносные комплексы четвертичных отложений различного генезиса (apQ, lQ, laQ, dpQ, mQ, mQ+vQ).
Валунно-и гравийно-галечники, пески, прослои суглинков и глин, дресвяно-щебенистые отложения с песчаным заполнителем, супеси, илы
Various in genesis Quaternary aquifer.
Boulder and gravel shingle, sand, loam and clay interbed, gruss-debri sediments with sand filling, sandy loam, silt

N_2 — Водоносный комплекс плиоценовых отложений.
Гравийно-галечники, реже валунно-галечники, пески разнозернистые, супеси, суглинки
Aquiferous Pliocene complex
Gravel-shingle, rare boulder-shingle, sand inequigranular, sandy loam, loam

3. РАЗВЕДАННЫЕ МЕСТОРОЖДЕНИЯ ПОДЗЕМНЫХ ВОД
EXPLORED DEPOSITS OF UNDERGROUND WATER

Месторождение подземных вод. Цифры: сверху- номер по каталогу и геологический возраст водовмещающих пород; справа - количество утвержденных эксплуатационных запасов, тыс.м ^{3}/сут: в числителе- по категориям $A+B+C_1$, в знаменателе - по категориям по $A+B+C_1+C_2$
Знаки внутри кружка соответствуют типу месторождения:
Underground water deposit. Figures: above- number in catalog and geological age of host rocks; on the right - amount of approved explotation resources (1000 cub.m/day,) in numerator - $A+B+C_1$ categories, in denominator $A+B+C_1+C_2$ categories
Signs in the circle corresponde to deposit type

Генетические типы месторождений:
Genetic types of deposits:

В пределах современных и погребенных речных долин
In frames of present and buried river valley

В конусах выноса предгорных шлейфов и межгорных впадин
In detrital cones of piedmont fans and mountain basins

В артезианских бассейнах
In artesian basins.

The general movement of groundwater is from the slopes of the mountain ranges in the south of the project area downwards into the plains in the north. In terms of groundwater flow four hydrological regions have been defined: mountain slope, foothill stage, piedmont and alluvial proluvial plain. Regarding the typical aquifers, on the mountain slopes groundwater is mainly stored in the fractured rocks, with the most intensive water recharge in the weathering zone and in tectonic fracture zones. Due to strongly dissected relief, only part of the flow goes into the valley by underground routes. In quantitative terms, the flow to the lowland area is at an average of 6.5 liter / sec per square km. The remaining flow, going into the valley by underground ways, according to data of the Institute of Hydrogeology, is estimated at 1.7 liter / sec per square km.

Generally underground waters occur between 1.0-20.0 m deep but is normally at a depth of 5 meters within the alignment corridor. In the irrigated parts of Section 1 it is up to 10 meters deep. Pressurized groundwater is normally at 20-25 meters deep. Chemical properties vary greatly. Slightly salty and salty waters dominate, with salt content from 1.5 to 5.0 g/l. Excessive mineralization occurs because of stagnant conditions and sandy salty soil.

Using data from the Almaty Hydro Geological Station, it is possible calculate the ratio of the quantities of water, coming from different sources. The figures are: filtration of water from the river beds (50-60%) and inter-farm network of irrigation (10-16%), underground drainage from the mountain range (8-14%), infiltration of rainfall (9%), filtering of irrigation water (9%) and condensation of water (2%), are involved in groundwater recharge of the alluvial fans. The total groundwater flow from the foothills is estimated at 27.2 liter / sec per square km.

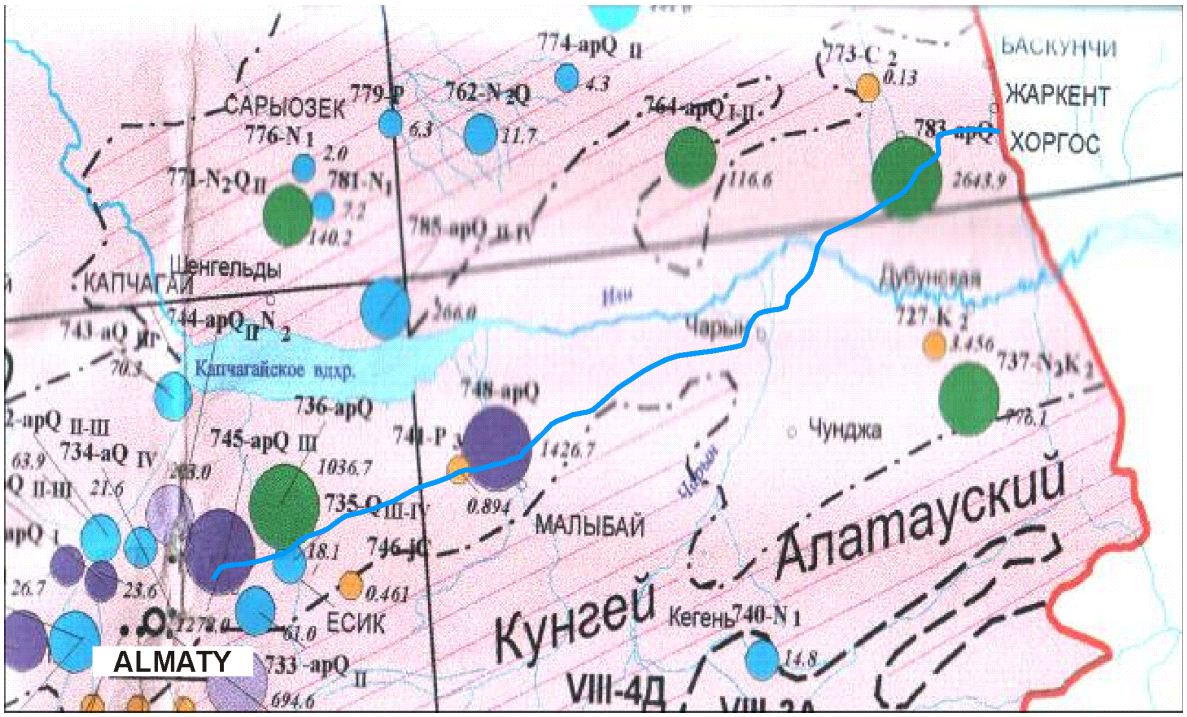
A proluvial-alluvial plain occupies the bottom of the valley. The deposits, forming the plain, are represented by sands, gravels, sandy loam and loam interbedded clays. Movement of groundwater from the wide part of the valley and alluvial fan to the valley of the base river creates an irregular flow. At a distance of 16-20 km from the mountains a single powerful stream, formed in the cones, is divided by layers of impermeable rock into several aquifers. In these areas groundwater flow is reduced as a result of impermeable layers, debris material, and in some areas is due to tectonic movements. The flow of groundwater divides and part of it flows and feeds the numerous rivers. The final discharge of groundwater flow occurs in three ways: passing out into the Ili River, the outflow of the alluvium of the valley and the vertical flow into upper aquifers. The main discharge of groundwater for the foothill plain occurs on the valley itself and the main loss is the evaporation.

Aquifers

An aquifer system of coarse boulder-pebble deposits of alluvial fans is located in the foothills. The deposits are characterized by high water abundance. Near the riverbeds the water is fresh, characterized by bicarbonate calcium, with dry weight of 0.2-0.3 g / l, the remaining area is dominated by sodium sulfate saline water (1.4-2.8 g / l).

The aquifer system is of sandy-clayey Quaternary piedmont plains. This complex contains the ground and artesian water. The ground water is at the depth of 3-9 m in the valley of the Ili River, and up to 15-20 m in interfluvial spaces. Water below the local base is fresh, calcium bicarbonate, with solids up to 1 g / l, in the upper aquifers it is brackish, sulphate-sodium, with a dry residue of 1-3 g / liter. Artesian water on the plains is wide spread. Typically, the thickness of alluvial deposits, proluvial piedmont plains contain some confined aquifer, whose thickness varies from 1 to 18 m. Artesian water is fresh hydro-carbonate-calcium and calcium-sodium.

At present, about 50 locations of ground water in the Almaty region have been exploited. The locations of that water is shown in Figure 4.5.



LEGEND

I. GROUND WATER DEPOSITS

748-apQ a) 783-apQ b) 764-apQ I-II c) 641-D3-C1 d) 740-N 1 e) 727-K 2 f)

Deposits with confirmed ground water reserves, thousand cubic meters/day
a) more than 1000; b) 500-1000;
c) 100-500; d) 50-100; e) 10-50;
f) less than 10.

Note:
numbers over symbol - index number of deposit;
after hyphen - geological age of aquiferous rocks.
To right - explored reserves, thousand cubic meters/day.

USE OF GROUND WATER

- Household-drinking water supply
- Production-technical water supply
- Household-drinking and production-technical water supply
- Household-drinking water supply and agricultural irrigation
- Household-drinking, production-technical and agricultural irrigation
- Agricultural irrigation
- Mineral

VIII Djungar Tyan-Shan region

1st order pools:

VIII-2 Central-Tyanshan
VIII-3 North Tyanshan
VIII-4 Djungar-Balkhash

Fig. 4.5– Deposits groundwater area of the projected road

4.1.7 FLORA AND FAUNA

The Flora and Fauna of the area is described below.

Botanic-geographical zoning, Ili Rayon

The investigated area belongs to the Asian desert region, the Irano-Turan sub region of Terskey-Ketmen-Yuzhnodjungarskaya province Yuzhnodjungarskaya sub province. The vegetation consists of:

- White land wormwood-black saxaul and -black saxaul.
- Communities of sedge white land wormwood-mixed saxaul, artemisia, and psammophyte shrub on hilly loose-ridge sands.
- Communities of sedge white land wormwood-mixed saxaul Artemisia and psammophyte shrub on hilly and hilly loose-ridge sands with Artemisia (East- North Turan)..
- Feather grass-twig-wormwood annual salt spike of grass-potash-tamarisk. Communities of reed, annual salt spike of grass tamarisk.

Botanic-geographical zoning Talgar Rayon

The investigated area belongs to the Asian desert region, the Iran-Turan sub region, Zailiiskiy-Severodjungarskaya province, and the Prizailiyskiy-Severodjungsharskayasub sub province. The vegetation found in this sub-province consists of:

- Dark coniferous forests, thickets of shrubs and meadows: deciduous and spruce, with an undergrowth of grass in conjunction with the tall grasslands and steppes vegetation. .
- Dark coniferous forests, thickets of shrubs and meadows of shrub-juniper with sparse forb plant cover, in places in combination with meadow and steppe vegetation .
- Steppes of rich-bunchgrass: or rich-fescu grass- in combination with thickets of shrubs.
- Steppes desert -bunchgrass: ephemeroid-wormwood-feather grass with shrubs sometimes in combination with sagebrush shrub communities .
- Desert and scrub with grasses and ephemeroids: sagebrush with grasses and ephemeroids and artemisia

The proposed route alignment is located in the desert-steppe zone of irrigated, dry farming and sheep and cattle breeding. Vegetation on the gray soils consists mainly of wormwood, mixed with summer cypress and ebelek can also be found. A significant part of the vegetation is Ephemera: bulbous bluegrass, brome, small sedge, poppies.

Specific Flora could not be obtained from local experts for Enbekshikazakh Rayon but the observations from the field visits carried out strongly suggest that the characteristics are largely similar to those in the Talgar Rayon described above. Moreover, a strong argument to assume that the road will not have significant impacts on rare or endangered species is the existing pervasive human influence in the project area, which is partly under intense agricultural use, partly used as rangeland for animal husbandry. The ecosystems in this area will thus already have adjusted to human influence and thus be of a much less sensitive nature as if this were an untouched natural area.

Fauna

A website review of was carried out of fauna characteristics in Almaty Oblast. The Fauna throughout Almaty Oblast is rich and diverse due to the extensive areas of deserts and mountains. The richest areas are the extensive mountain areas in the south of the Oblast bordering with Kirgizstan. Wolves, snow leopard, lynx bear can be found in these areas. Further north in the transition between mountain and desert the wildlife is less diverse and many of the larger mammals are not generally found. The diversity of species is further reduced because of the rapidly growing urban centre of Almaty (a population of nearly 2 million), adjacent urban centers and the extensive agricultural areas in the lower and flatter areas of the Oblast.

Nevertheless there are significant populations of rodents, badgers, rabbits, gerbils and others. Marmot are also found. Bird populations in the Oblast are extensive and various eagles, kites, harriers are recorded in the Oblast generally. The Great Bustard, Quail, Gray Crane, Sand Grouse, Jays and Sparrows are to be found. Pheasants are to be found. Since there are no large areas of water within section 1 there are no significant resident populations of ducks, geese, swans etc. Similarly the urbanizing influence and the extensive agricultural land within the alignment of Section 1 reduces the numbers and variety of birds within the area.

Specifically in Section 1 since most of the land is cultivated or is used for pasture the fauna is largely related to those animals populating cultivated or pasture areas. There is a population of rodents: ground squirrels, jerboa, field mouse and other rodents. Representatives of insectivores found include hedgehogs, shrews, reptiles including various lizards and snakes. Domesticated sheep, goats and cattle are common. Horses are used in farm activities. Dogs are also extensively used in herding animals and may already adversely impact on many mammals.

Because of the local urbanizing influence fauna in the area of Section 1 is not characterized by a high diversity of species and sub species. There is no record of rare, endangered or vulnerable species of animals and birds in the area. There is no record of any populations of Kazakhstan red list animals such as Saiga, Marmot or Gazelle. here are no large areas of wilderness or natural habitats including forest areas close to the alignment. In the vicinity of the proposed road there are no large areas of water or wetlands. There are no sensitive areas or areas of high landscape value within the rayon and there are no known proposals to include any part of the area as a legal protected area.

Flora and Fauna: Methodology for investigation of biodiversity issues on the alignment.

Based on the Consultant field work within the alignment and the knowledge and fieldwork of the Design Engineers there is no evidence to show that the alignment has any sensitive fauna or flora. During the consultation meetings in October the subject of fauna within Section 1 was not discussed or mentioned by the community or by Rayon representatives. At a meeting with The Ecological Society: Green Salvation, an Almaty Based NGO, the issue of wildlife in Section 1 and any impact that the road may have was not defined as an issue or a point of concern. The potential fauna issues in Section 2 were however discussed.

The Environmental team of PMC undertook a number of site visits to the alignment accompanied by the design engineers and other experts. They met with experts and others whilst on site, at consultation meetings, and at other meetings in Almaty,. Telephone interviews were conducted with officials and other experts, including the Directors of both Charyn and Altyn-Emel National Parks. The team also researched a number of Russian language and English language websites to determine and understand the Fauna resources and issues in the Almaty-Khorgos areas.

Site visits: The Environmental team of the PMC who were responsible for refining the previously prepared EIA undertook the following site visits:

- 23 September: Site visit with Design Engineers and representative of Regional director of roads to Sections, 1, 2 and 3. This was an initial general site visit, which focused on the general alignment and the immediate impacts of the road.
- 3 October: site visit focusing specially on Section 2 and Section 3: Site visit with Design engineers, including Hydrologist , to wet area and area between two National Parks and agricultural area near alignment.

Discussions with the following people on Fauna and potential issues connected with road alignment.

- Kamiljan Yuluashev, Department of Forestry of Uigur rayon, Zoology and hunting group (met on public consultations, phonecall, received fax letters on population characteristics)
- Shayakhmet Zamanov, Charyn National Park, Director (phone calls)
- Tohtem Bektemisov, Charyn National Park, Deputy Director (phone calls)
- Halyk Abedarovich, Altyn-Emel National Park, General Director (phone calls)
- Temirhan Kadyrbayev, Shelek Department of Forestry, Director (phone calls, discussed Nurly section wetland fauna)

Obviously the National Park sources of information and responses are considered to be both credible and reliable.

Design consultants met:

- Aigul Munaidarova, JSC "Kazakhstan Joldary", Executive director, Chief engineer of the project sections 1 & 3 (Accompanied on site visit and consultation meetings)
- Sergey Efimov, JSC "Kazakhstan Joldary", Head of Hydrology and Geology surveys group (site visit, meeting in WB Office)
- Yurii Sorokoletov, JSC "Kazakhstan Joldary", hydrologist
- Sultanbek Karimov, "Kazdorproject" Ltd., Executive director, Chief engineer of the project section 2 (Accompanied on site visit and consultation meetings: phonecalls, elaborated on wetland section)

An NGO meeting was arranged with Svetlana Spatar from NGO "Green Salvation", who is the coordinator of work with IFIs.

Websites reviewed and referred to:

1. ru.wikipedia.org
2. redbookkz.info
3. caspionet.kz
4. greensalvation.org
5. unesco.org/en/tentativelists
6. birdlife.org/datazone/sitefactsheet.
7. egov.kz/wps/portal/
8. en.wikipedia.org/wiki/Endangered_species
9. iucnredlist.org
10. wwf.panda.org

Additionally a number of travel and tourism websites provided useful indications of wildlife and likelihood of viewing these animals.

Conclusion: The PMC Environmental team obtained data from a range of sources and people who are familiar with the area and the alignment. It was particularly important that the team were able to directly discuss the fauna within the National Parks Directors and how some of the larger species would be impacted by the road proposal. Since the alignment passes through a corridor already impacted by development and the new road alignment will incrementally add to this anthropogenic impact, but not create substantial new impacts. Both National Park Directors considered that though the road may be a deterrent to the free movement of various mammals, with appropriate management and the use of underpasses and, if required, overpasses such as "green bridges", most fauna should continue to move through the area unimpeded. Continued monitoring will be necessary. The proposed alignment will take most traffic away from the present route that passes through Charyn National Park, which is a distinct advantage to the fauna within that area.

4.1.8 SOCIAL AND ECONOMIC CHARACTERISTICS

The road passes through a predominantly rural area with low population densities. The total populations of the 3 Rayon through which this Section of the road passes are as follows:

Table 4.3 Populations of Rayon in Section 1

Rayon	Population (2010 Estimate)
Ili	154,124
Talgar	156,940
Enbekshikazak	219,412

Since the alignment generally follows open land the population levels living close to the road is very small. The only exceptions are at two locations where the alignment passes close to sensitive uses, i.e. housing at: Km 0 and at km 107. These are existing housing adjacent to existing alignments which will be used for the new alignment. At km 0 approximately 20 dwellings are within 50 meters of the existing road edge and at km 107 approximately 10 dwellings are within 50 meters of the existing road edge. This is acceptable under Kazakh standards, but to ensure international acceptability, during the construction period it will be necessary to monitor and review impacts and any potential mitigation methods. .

Ili Rayon

Ili Rayon is part of the greater Almaty area and has a wide range of industrial and commercial developments and is undergoing rapid urbanization with a significant growth in residential and all other developments.

Talgar Rayon

Talgar district is located in the southern part of Almaty region, in the foothills of the Trans-Ili Alatau and occupies an area of 3.8 sq km. The district was organized in 1969. The Administrative Center is at Talgar which is located 25 km from Almaty. The total population of the District is 156,940. The area is predominantly agricultural with a strong industrial complex and private sector infrastructure.

Industrial activities include an experimental foundry-mechanical factory, a printing factory and 2 garment factories. Also in the area there is manufacturing of alcohol, brick building, soft drinks, , detergents, etc.

The agricultural Sector of the district is very strong. One of the oldest farms in the area is SHPK "Almaty", which was organized in 1929. The main activity is the production of potatoes, vegetables, milk and grain. The small business sector is strong in the area.

The are a range of industrial and commercial enterprises in Talgar town, but the existing main road (A351) is the location for many service industry and commercial activities. Petrol station and vehicle sales and repairs are the most common uses located on the road. Restaurants, convenience stores and temporary stalls selling local fruit, vegetables and other local produce are also located adjacent to the road and provide a service to the local community and to the travelers along the road.

Enbekshikazakh Rayon

The District was formed in 1952, the area is 8.3 km2. The area comprises irrigated and rain-fed agriculture and includes horticulture, poultry, wine, fruit and tobacco growing. The agricultural sector is very strong and represents 64% of the local economy. The industry sector occupies about 34% of the local economy. with 13 large and 24 medium-sized enterprises, which accounted for about 75% of all production. The industrial sector is represented by enterprises that process agricultural products.

Similar to Talgar Rayon there are a range of industrial and commercial enterprises in Talgar town, but the existing main road (A351) is the location for many service industry and commercial activities. Petrol station and vehicle sales and repairs are the most common uses located on the road. Restaurants, convenience stores and temporary stalls selling local fruit, vegetables and other local produce are also located adjacent to the road and provide a service to the local community and to the travelers along the road. The regularity of these establishments becomes less further from Almaty. There are a number of service and commercial uses along the existing route that by passes Shelek.

4.1.9 PHYSICAL CULTURAL RESOURCES

One of the issues that must be considered during the construction of the road is the preservation of physical cultural resources (PCR) such as historic and cultural monuments and including structures, memorials, cemeteries and burial sites, and other objects associated with historical events in the life of the community. This includes materials of historical, scientific, artistic value (old buildings, graves, archaeological sites), as well as unique natural reserves, national parks etc.

An archaeological survey of the proposed alignment from km 24.1 "Almaty-Ust-Kamenogorsk" to 126 km of the road "Almaty - Chundzha - Koktal - Khorgos» № 54-20-599 from 29.10.2008g was conducted by State Enterprise "Institute of Archaeology AH Margulan KH MES. The regulation states that "the economic development of the area through the construction of roads in the specified area is allowed subject to the conditions stipulated in Article 39 of the Law of the Republic of Kazakhstan On protection and use of historical and cultural heritage. " This includes a full archaeological investigation of monuments located in the area of road construction and recording and removing them as necessary. The requirements are:

13. In development areas research must be carried out to identify sites of historical and cultural heritage.
14. In the case of objects of historical, scientific, artistic and other values, all persons are obliged to suspend the further construction conduct of the work and notify the authority.
15. Prohibition of activities that may pose a threat to the existence of historical and cultural heritage.

Based on the above law, studies were carried out at the following archaeological sites in the Almaty catchment area with the following overall results:

In Almaty Oblast area there are numerous ancient mounds and other archaeological remains. The existence of historical and cultural heritage of the Kazakh people along the projected highway are of great importance in the development of tourism. The most famous among them - the burial locations of Talgar Novoalekseevskaya, Boroldai, Issyk, Turgenev, Shelek, Kegen. Issyk burial and Besshatyr have gained worldwide fame. None of these are in the vicinity of the alignment and are not directly or are indirectly affected by the project. Three other sites are affected by the alignment as referred to below.

Archaeological sites located in or near the area of the road construction.

According to a study on the alignment the following three sites will be affected by the road:

1. The cemetery Bayserke;

2. The cemetery Alga;

3. The cemetery Salamatka.

Bayserke cemetery: The Cemetery is located at Km 8 north of the alignment, in the plains, consists of five mounds, oriented to the north-south. The closest mound lies within the alignment corridor, the remaining 4 are located outside the alignment corridor and the furthest is 500 Km from the centerline of the alignment.

Geographic coordinates of barrows:

Mound number 1 - 43028/4.85 / / N 7704/12.69 / / E - (located in the immediate vicinity of the construction zone of the road and will be destroyed).

Mound number 2 - 43028/08.03 / / N 7704/09.83 / / E

Mound number 3 - 43028/11.23 / / N 7704/08.83 / / E

Mound № 4 - 43028/14.77 / / N 7704/04.97 / / E

Mound number 5 - 43028/20.22 / / N 7704/03.07 / / E

Mounds up to 18m diameter., Height 0.5 - 0.7m Mound mounds of earth and stone. South of the cemetery is a dirt road.

Alga cemetery: Located at Km 16 and consists of three mounds, oriented to the north-south. The mounds lie approximately 400 km north of the centerline of the road. They will not be directly affected by the construction of the road.

Geographic coordinates of barrows:

Mound number 1 - 43027/49.69 / / N 77010/3.27 / / E

Mound number 2 - 43027/50.24 / / N 77010/3.40 / / E

Mound number 3 - 43027/51.18 / / N 77010/3.53 / / E.

Mounds built of earth and stones, mounds are flat, enlarged, sodded, size: diameter from 12 to 14 m, height of 0.5 to 0.9 m.

Salamatka cemetery: Located at Km 27 the repository consists of two mounds, elongated in the general direction from southeast to northwest. The barrows lie 1-2 km north of the centerline of the road. They will not be directly affected by the construction of the road.

Geographic coordinates of barrows:

Mound number 1 - 43028/54.48 / / N 77017/46.85 / / E

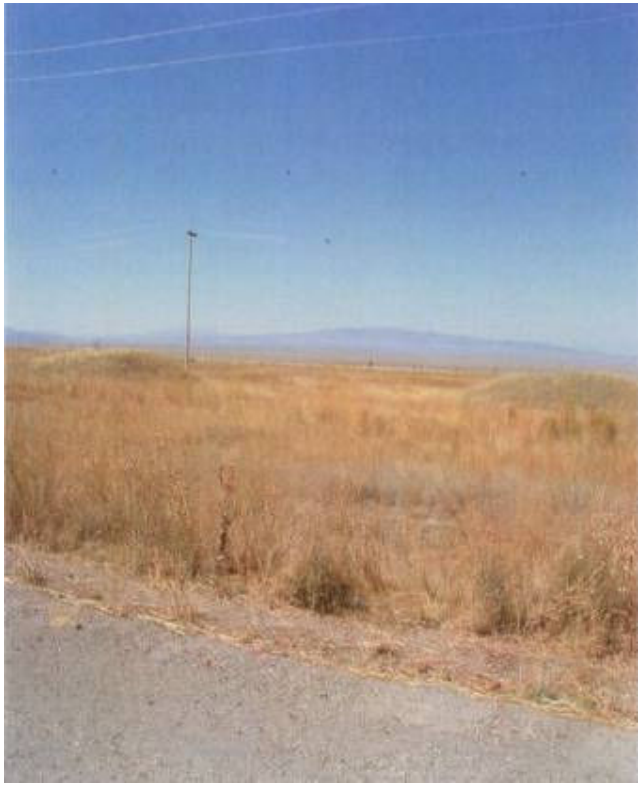
Mound number 2 - 43029/12.65 / / N 77017/39.30 / / E

The mound is composed of mounds of earth and stones, sodded. Diameter mounds of 18 to 21 m, height of 0.9 to 1.4 m.

Archaeological monuments located along the route of the original Silk Road can be at least two thousand years old and are defined as of archaeological and scientific significant value.

Bayserke cemetery. General view.

Alga cemetery. General view.



Salamatka cemetery. General view.

Figure 4.6 - Historical Archaeology in the projected area of the road "Almaty-Khorgos"

4.2 ENVIRONMENTAL IMPACT ASSESSMENT: SECTION 1

4.2.1 INTRODUCTION

During the construction of roads the main types of environmental impacts normally are:

- Air pollution caused by exhaust gases of various construction vehicles and various moving and stationary equipment;
- Noise caused by machines and equipment and various other construction activities;
- Contamination by dust from wear of road surface, from construction materials and from the transportation of construction materials.;
- Possible contamination of agricultural food production activities during the extraction of road building materials, dredging, and new construction activities;
- Potential contamination of top soil, surface water sources, ground water resources, and vegetation adjacent to the road;
- Disturbance to nesting birds and the habitats of animals;

During operation phase impacts such as air, noise etc are dependent on the distance from the carriageway:

- Air pollution and noise from all vehicles passing along the new route;
- Contamination by dust from wear of road surface and erosion of adjacent soil Pollution of road by dumping of industrial and household waste;
- Potential pollution of surface runoff from the roadway;
- Potential pollution of groundwater from run off and other contamination;

Zones of Impact

The following corridors adjacent to the carriageway have been defined:

- Zone of Impact: A corridor over 3,000 meters, where some impacts from the road may occur or be measurable (e.g. noise, dust, air pollution);
- Protection zone: A strip adjacent to the right of way where impacts are expected to occur with higher intensity or magnitude. In some cases, the impact may be significant; noise and air quality, drainage impacts, soil contamination etc.
- Reserve zone: A strip within the right of way that is required for emergencies, potential long term use for the road, for road services and cuttings, and embankments. Significant impacts will occur and changes to the local environment will already have been carried out during the construction of the road.

Approximate dimensions of the zone of impact, protection strip, and reserve strip are shown in Table 4.4

Table 4.4 - Estimated size of the zone of impact, the protection strip and reserve strip

Impacted zones	Distance from road, m, For environmental class of road		
	I	II	III
Zone of Impact	3000/1500	2000/1000	600
Protection strip	250/150	150/90	60/30
Reserve strip	30	12	-

4.2.2 AIR IMPACT

Construction and Operation Period

The proposed construction and operation of the road will be accompanied by emissions of pollutants during the construction period (emissions from construction activities and operation of motor vehicles and machinery), and emissions from vehicles traveling on highways during the operation period. Table 4.5 lists the typical emission sources during the construction and operation of a major highway.

Table 4.5 – Emission source characteristics

Works type	Name and characteristics of emission sources	Name of potential air emissions
1	2	3
Construction	Dust generation during works	Inorganic dust
	Exhaust gases from internal combustion engines	Nitrogen dioxide, soot, carbon monoxide, benz(a)pyrene, carbohydrates
	Welding	Iron oxide, manganese and its compounds, hydrogen fluoride
	Paint works	White spirit, xylol
Operation	Exhaust gases from internal combustion engines	Nitrogen dioxide, soot, sulfur dioxide, Carbon monoxide, carbohydrates C12-C19, lead compounds

The composition of engine emissions comprise : carbon monoxide, hydrocarbons, nitrogen dioxide, lead, sulfur dioxide and particulate matter (soot).

The assessment of the level of air pollution caused by exhaust gases is based on a computer program. The predicted amount of pollutants emitted into the atmosphere during the construction and operation of the facility is presented in Table 4.6. The values of maximum permissible concentration (MPC) of pollutants is obtained from the sanitary-epidemiological regulations and guidelines "Sanitary-epidemiological requirements to the atmospheric air." № 629 of the Republic of Kazakhstan of 18 August 2004. The data listed in the table are obtained by summing the emissions for each component calculated in Appendix 1.1 using the methods agreed upon by the Ministry of Environment of the Republic of Kazakhstan. Assessing the impact on the air during the operation period is based on traffic forecasts up to 2028 prepared for the Feasibility Study.

The calculated value of acceptable concentration of harmful substances contained in exhaust gases from the various types of cars in mixed-flow traffic is shown. The impact on the atmosphere is considered acceptable if the content of harmful substances in atmospheric air of populated areas does not exceed the maximum permissible concentration laid down in SanPiN "Sanitary-epidemiological requirements to the atmospheric air" dated August 18, 2004 N 629.

Table 4.6 – Section 1: Calculated air emission pollutants' maximum permissible concentrations (MPC)

Pollutant code	Name of pollutant	MPC m.s.mg/m^3	MPC a.d.mg/ m^3	TSEL mg/m^3	Hazard class	Predicted Emissions, Tons
1	2	3	4	5	6	7
Air emissions during construction						
0123	Iron oxide		0,04		3	0,0849
0143	Manganese oxide	0,01	0,001		2	0,0094
0301	Nitrogen dioxide	0,085	0,04		2	80,2623
0328	Soot	0,15	0,05		2	14,2779
0330	Sulfur dioxide	0,5	0,05		3	16,5329
0337	Carbon monoxide	5,0	3,0		4	595,0564
0342	Fluorides	0,020	0,005		2	0,0034
0703	Benz(a)pyrene		$1*10^{-5}$		1	0,0002
0616	Xylol	0,2			3	0,1845
2752	White spirit			1,0		0,1845

2754	Carbohydrates	1			4	84,5841
1310	Aldehydes	0,015	0,075		3	6,2764
2907	Inorganic dust (SiO_2 more than 70%)	0,150	0,05		3	1827,7552
2908	Inorganic dust (SiO_2 70-20%)	0,300	0,100		3	1115,6786
	Total:					**3740,8907**
Air emissions during operation						
0328	Solid particles (soot)	0,15	0,05		2	56
0337	Carbon monoxide	5	3		4	193974
0301	Nitrogen dioxide	0,085	0,04		2	3586
0330	Sulfur dioxide	0,5	0,05		3	266
2754	Carbohydrates			50		1109
0184	Lead and its inorganic compounds	0,001	0,0003	0,005	1	487
	Total:					**199478**

Assessing the level of impact on adjacent residential areas and sensitive uses is based on modeling of emissions in the atmosphere, according to "Methods of calculating concentrations of air pollutants contained in the emissions of businesses. RND 211.2.01.01-97" In calculating the dispersal of emissions from vehicles and to determine the concentration of toxic substances at a distance of 20 meters from the road the model used a Gaussian model distribution of pollutants in the atmosphere at low altitudes. The results of calculations of air pollution are presented in *Annex 1.2*.

Calculations have been made for a single concentration (MPC) in accordance with SanPiN "Requirements for atmospheric air of populated areas» No. 3076 issued on 18.09.2004 and No. 841 issued on 3.12.2004, approved by the Ministry of Health of the Republic of Kazakhstan. Calculations have been prepared and are shown in Table 4.7.

Table 4.7 – Motor vehicle emissions dispersion calculation

Emission type	Calculated at 20 meters from road, mg/m^3	MPC m.s.,mg/m^3	Average daily MPC, mg/m^3	Hazard class
1	2	3	3	4
Carbon monoxide	0,056	5,0	3,0	4
Hydrocarbons	0,011	1,0	1,5	3
Nitrogen oxide	0,0056	0,085	0,04	2
Lead compounds	0,000032	0,0010	0,0003	1

Conclusion Construction and Operation Periods

Construction: The detailed calculations for construction and operation periods yield results that are within the limit values prescribed by Kazakh legislation. Also, since the alignment passes through predominantly open rural land with only a few sensitive uses in two specific locations the adverse impact on any communities will be minimal. At only two locations does the alignment pass close to sensitive uses, i.e. housing at: Km 0 and at km 107. These are existing housing adjacent to existing alignments which will be used for the new alignment. At km 0 approximately 20 dwellings are within 50 meters of the existing road edge and at km 107 approximately 10 dwellings are within 50 meters of the existing road edge. It will be essential to ensure no depots or worksites are located in these areas. Regular monitoring of air pollution against Kazakh standards (and international, e.g. WHO, for any parameters not covered by local regulations) shall be carried out throughout the construction period. The party responsible for monitoring will be the Contractor, who will be obliged to report to the Engineer as well as local environmental authorities.

Operation: The results show that the magnitude of the impact of transport on the air quality does not exceed the maximum allowable concentrations to a distance of 20 m from the nearest traffic lane. During the operation phase concentrations of toxic substances contained in exhaust gases within the areas adjacent to the road are within the allowable MAC, and do not adversely impact on the environment or sensitive uses.

4.2.3 NOISE AND VIBRATION IMPACT

Construction Period

The various mechanical processes during the construction of roads are a source of intense noise, which can adversely affect humans. The intensity of the ambient noise of road machinery depends on the type of machinery and equipment and the distance from the workplace to sensitive and residential development. Especially problematic is the noise created by the work of bulldozers, vibrators, compressors, excavators, and Diesel Trucks. The noise produced during construction is temporary and localized but can still create an annoying impact.

According to GOST 12.1.003-83 Section "Noise" standards for noise level have been adopted of 70-80 dBA. Zones with noise level above 80 dBA must be marked with safety signs. To ensure acceptable noise levels construction activities should not take place at night. Soundproofing of the engines of construction road vehicles should be carried out with multilayer insulating coatings of rubber, foam rubber, etc. This action can reduce the noise by up to 5 dBA.

Conclusion: Construction Period

In view of the generally isolated characteristics of the area through which the road passes it is concluded that there will be only limited construction noise impact on any housing or sensitive uses. At only two locations does the alignment pass close to sensitive uses, i.e. housing at: Km 0 and at km 107. These are existing housing adjacent to existing alignments which will be used for the new alignment. At km 0 approximately 20 dwellings are within 50 meters of the existing road edge and at km 107 approximately 10 dwellings are at 50 meters of the existing road edge. From experience and engineering judgment it is still predicted that noise levels will remain below the levels recommended in the regulations referred to above. There will be insignificant increase in construction traffic using the existing main road and the minor roads leading to the road alignment.

Possible existing borrow pit locations have already been indicated by the Design Engineers for Section 1. All are located north of the alignment, typically at a distance of less than 5 km. The sites are approved locations and the selected Contractor will – in consultation with Engineer and local environmental authorities – propose at which locations are most suitable to start exploitation activities. Nevertheless whichever sites are used existing local roads will be used as access to the road construction site. On the main road it is unlikely that the construction traffic will have a significant impact on traffic flows and noise disturbance to the existing communities, but noise levels shall be monitored by contractor prior to the commencement of the construction period. For the minor roads that cross the new alignment and for any access routes, construction traffic will significantly increase traffic flows and potential noise disturbance.

Operation Period

Operation noise levels are influenced by traffic volume, fleet composition, speed, vehicle operating condition, age of vehicle, and condition of the road. Sources of noise on the car are the engine and the tire noise hitting the road surface. The noisiest are heavy trucks and trailers with diesel engines; the most "quiet" are new and more expensive cars.

Maximum allowable noise levels (PDU) of noise - this is the factor level which is in daily work (during the working experience) should not cause annoyance, distress or cause or worsen health of the present or future generations.

These calculations of noise during operating period are shown in Appendix 1.2.

Calculated MPL are adopted in accordance with the "Standard Specifications of noise levels in residential and public buildings and housing areas» № 841 dated from December 3, 2004, by the Ministry of Public Health of the Republic of Kazakhstan.

Permissible maximum levels of noise, caused by vehicles, are adopted in accordance with the above standards, it is 70 dBA. Analysis of the results obtained from noise level calculations shows that the distance

from the road for the 70 dBA standard is approximately 20 meters without installation of any noise barriers, and 10 meters with the installation of appropriately designed barriers.

Conclusion for the Operation Period

As referred to above at only two locations does the alignment pass close to sensitive uses, i.e. housing at: Km 0 and at km 107. These are existing housing adjacent to existing alignments which will be used for the new alignment. At km 0 approximately 20 dwellings are within 50 meters of the existing road edge and at km 107 approximately 10 dwellings are within 50 meters of the existing road edge. From experience and engineering judgment it is still predicted that noise levels will remain below the levels recommended in the regulations referred to above. .

In conclusion during the operation period the predicted noise impact to any residential or sensitive uses will be minimal, and where required can be further reduced by appropriate engineering measures, such as sound barriers, plantations and landscaping elements. This approach has successfully been implemented in the World Bank financed "South West Roads Project" which has similar objectives, approach, dimensions and issues. During operation regular monitoring of the noise situation and characteristics along the alignment and the access roads will be necessary. If any additional mitigation measures are considered necessary they will be included in the repair and maintenance budget on a running basis and carried out within those activities. No changes to the design of the alignment will be necessary.

4.2.4 HYDROLOGICAL IMPACT

This Section covers 1) the availability of water for the construction and operation of the road and 2) the potential impacts including contamination impacts that the road will have on water resources in the area: surface and groundwater.

Water Needs for Construction Period

The planned construction work on the site of the proposed road will require water for construction activities and for drinking and domestic needs of the construction workers.

Consumption of water for construction for compaction of sub grade and washing of road-building materials is estimated to be 451 733 m^3. The required amount of water is based on "Estimated ratios and costs for construction work."

Water consumption for drinking water supply is calculated in accordance with the legislation of the Republic of Kazakhstan. The water consumption for the period of construction of the road is based on and average of 27 l/day per person according to SNIP 2.04. 01-85. Consumption of water for drinking and domestic needs (washing, cooking etc), based on the number of employees - 600 people is shown in Table 4.8.

Table 4.8 – Water needs for drinking and household use and generation of wastewaters during construction period

Water use type	Number of workers	Number of working days	Consumption norm, m^3/day	Discharge norm, m^3/day	Water use		Wastewater	
					m^3/day	m^3/yr	m^3/day	m^3/yr
1	2	3	4	5	6	7	8	9
Drinking	600	347	0,002	0,002	1,2	416,4	1,2	416,4
Domestic Uses	600	347	0,025	0,025	15	5205	15	5205
Total					**16,2**	**5621,4**	**16,2**	**5621,4**

Water for construction and domestic will be taken from existing wells located along the projected road. All Rayon administrations have prepared letters authorizing use of water wells in their areas for construction needs. The source of water for drinking purposes can be transported by water tanker or from the public supply systems of the nearest towns. .

Prior to construction all proposals for extraction of water for any purpose must be presented and discussed first with the local or regional organizations and bodies of the Sanitary and Epidemiological Department.

Water Resources Conclusion Construction Period

Based on the water requirements during the construction period and the abundance of estimated reserves of ground and other water resources (Shelek River alone has an average water flow of 5-7 m³/sec) and it is considered that there is adequate water for all construction activities and total resources will not be affected.

Water Needs for Operation Period

A continuous supply of water will be required for routine cleaning and maintenance requirements and for cleaning after accidents. Water will also be required for the various uses within the rest/service areas.

Water Resources Conclusion Operation Period

Based on the potential water requirements during the operation period and the known reserves of surface and groundwater there is adequate water for all operation activities and total resources will not be affected

Contamination of Water Sources

Contamination can impact in the following ways:

- Seepage of contaminated water into groundwater and aquifers
- Contaminated runoff into streams and rivers
- Exposure and contamination of groundwater in borrow pits
- Impacts of wastewater management at construction camps

Sources of contamination are widespread during construction and operation. There is a moderate contamination potential from vehicles used on construction sites, which can contain, use, release or carry a number of hazardous substances: heavy metals, NOx, SOx and soot from the combustion of fuels, particles from wear of tires, oil, lubricants and payloads of fuel, cement, paint, construction chemicals etc.

Within Section 1 the groundwater is generally at a depth of 5 to 10 meters. The majority of Section 1 road will be constructed on embankment at an average height of 2-4 meters above present ground level. There are no cuttings in Section 1. Except at bridge construction locations any impact on groundwater levels is likely to be minimal and contamination will be unlikely. It is unlikely that any groundwater resources will be impacted by the construction activities. The groundwater used for household use or irrigation at depths of 10 meters or more which will not be impacted by any construction activities.

Possible pollution sources during operation may be roadside filling stations, service stations, workshops, points of inspection and locations where vehicles are cleaned. Also a potential pollutant is salt and chemicals used for deicing, which, when washed out by rain and melted snow can lead to concentrations of various pollutants in runoff water. Additionally , there is the risk of unwanted spills of hazardous or toxic substances due to road accidents.

Among the more serious pollutants would be particulate matter such as soot (which may be enriched by lead due to the lead content still added to some gasoline), rubber particles and heavy metal containing abrasives from brake pads, and liquids such as fuels, oil and lubricants containing aliphatic and aromatic hydrocarbons, PAH (polycyclic aromatic hydrocarbons) and phenols.

During intensive run off during heavy rainfall which normally occurs in the period March to June accumulated dust may become mobilized and contaminate runoff water and subsequent recipients. Calculations of maximum water flow were carried out in accordance with the recommendations of "Handbook to determine the hydrological characteristics of the settlement" and SNIP 2.01.14-83.

Contamination of Groundwater Resources Conclusion: Construction and Operation Period

Based on the groundwater levels within Section 1 and the design characteristics of Section 1 it is concluded that pollution of Groundwater Resources during the construction period will not occur. There will be no substantive subsoil works such as major cuts or deep. Water for the construction activities as well as the camps will be extracted in relatively small quantities from existing wells or the public supply system. Generally water availability is unconstrained in the project area. There will be spill prevention measures in place. Also, only the uppermost aquifer, which is commonly not used for drinking water extraction, could at all be impacted by the project activities.

Also during the operation period pollution of groundwater will not occur provided that the provisions of good practice are reflected by the design and properly implemented. Examples of key design features to be implemented for groundwater protection can be effective drainage systems that convey storm water quickly towards the surface drainage network and avoid stagnant ponds that may infiltrate. Also, although the total pollutant loads over the Section are significant, the concentrations expected during runoff will be relatively small.

Contamination of surface water during operation period

The road drainage system, designed as part of the project consists of several drainage and structural measures designed to prevent water logging and flooding of the roadbed and to intercept and divert water flowing to the sub grade. For surface water diversion the project design provides for side drainage ditches, pipes for the passage of watercourses and water under the roadbed to prevent any possibility of stagnation, which can lead to water logging of the land adjacent to the road.

Culverts are arranged at the intersections of roads with streams, dry valleys, irrigation channels and waste channels. Pipe and box culverts have been included in the project. A description of the designed structures for watercourses, channels and ditches, culverts and sewers are shown in Appendix 1.4.

Although the design of the drainage system has been carried out in accordance with best engineering design practice in exceptional circumstance some local drainage problems and deficiencies may become apparent during or on completion of construction. Any deficiencies should be overcome at the earliest opportunity and monitoring of the drainage will be a long term operational activity.

Road surface run-off pollutant emissions

To assess pollution runoff from roads and identify the need to mitigate any pollution it is necessary to calculate the maximum permissible discharge of substances into water bodies. Under the maximum permissible discharge (MPD) of substances in the water body defines the mass of matter in the wastewater, the maximum allowable abstraction from source the established regime in the provision of water volume per unit time in order to ensure water quality control.

Maximum permissible discharge (MPD) from bridges, located at the sections of the designed road, through rivers, which have permanent runoff have been calculated for this project.

The calculation of the MPD is in accordance with "Recommendations on accounting requirements for the protection of the environment when designing roads and bridges", Moscow, 1995.

Estimated flow of surface wastewater is defined as the hourly flow rate of the actual period of rainfall runoff (storm) water. Calculations of the level of water pollution runoff from the road has been proposed for rivers Shelek, Turgen and Issyk. The data is included in *Appendix 1.4*. Detailed calculation show that the calculated discharge of pollutants are all within the regulated maximum permissible discharge rates. See Appendix 1.4 for details.

The calculations are performed on a computer program «CREDO», according to the recommendations of PDD Ministry of Transportation, the method of Main Geophysical Observatory.

Contamination of Surface Water Conclusion: Operation Period

The investigation outlined above indicates that the calculated discharge of pollutants are all within the regulated maximum permissible discharge rates and that provided all regulations and legal procedures are carried out will be no impact on water resources from pollution during the operation period.

Borrow pits

Possible borrow pits have been defined by the design engineers but these are not part of the approved design since the contractor will make the final decision on the selection of borrow pits. (Section 2.6) The existing borrow pits have received EIA approval from the Rayon and it thus may be assumed that they will not be interfering with sensitive aquifers that have any significance as drinking water resource. Moreover, aside from accidental spills (by themselves unlikely) the operation of borrow pits has little contamination potential. The main risk is the failure to properly close and recultivate the pits, which may lead to their conversion into illegal waste deposit sites, which would have a substantial contamination potential. An important part of closure will thus be to dismantle and / or block all access roads.

The environmental impacts from river bed extraction are likely to be acceptably low where such operations are carried out under valid licensing and supervision by the authorities. Generally the high dynamics of the rivers in the project area, especially the very high sediment loads due to the proximity of the mountains, and the floods in spring that carry these loads down the river beds, speak for a low environmental sensitivity of these rivers towards gravel extraction. This potential source of construction materials, especially aggregates, thus need not a priori be excluded due to environmental considerations.

Irrigation

Section 1 passes through some irrigated agricultural land. Any loss of water for even short periods can adversely impact on the growing crops and can be critical during the spring and summer growing season. In some cases the road permanently disrupts and disconnects the irrigation channels though this is not common. However in most cases disruption to the irrigation channels will only be temporary and realigned channels and culverts under the road alignment will ensure that irrigation water will not be disrupted for any long period and water will still be provided to the agricultural land.

Construction camps

Construction camps will generate significant sanitary waste from workers and staff who work and will live close to the alignment. In view of the scale of the construction activity the number of workers at any one time will be many hundreds and possibly more. For Section 1 it is estimated that there will be 600 workers employed on the site. At this stage it has not been possible to define the locations of the construction camps. Since this is an agricultural area it will be necessary to ensure that no contamination of the soil, groundwater, and existing agricultural produce takes place. It will therefore be essential to ensure appropriate offsite disposal facilities are incorporated into the design of any construction camps.

Hydrology Conclusion

Overall the impact on groundwater and surface water is expected to be low. No sub-grade works of cut slopes will be executed in Section 1 that might affect the groundwater regime and change the water table. Streams and rivers will be crossed by appropriately dimensioned bridges, and embankments will have sufficient culverts to prevent damming of surface runoff and subsequent water logging.

4.2.5 SOIL AND LAND IMPACT

Soil Damage

The site clearance, the cut and fill activities, and the construction of the sub grade usually causes the most damage to the soil and the sub soil environment. A significant volume of topsoil will be required to be removed for the alignment itself and for diversion roads, borrow pits, construction camps and other construction activities. In these areas there will be potential for contamination, disturbance and damage to the soil cover. In particular soil can become compacted and damaged along temporary access routes and in

construction work areas. Disturbance and damage is inevitable and this will be more critical in the areas defined as Group 2 soils but this can be minimized with correct construction procedures.

Soil Contamination

Of equal importance is the potential for pollution and contamination of the soil and sub soil on the alignment itself and sites immediately adjacent. This pollution can have an impact on the surface and groundwater resources in the area and on the agricultural activities in the areas adjacent to the alignment. Some contamination can occur during normal construction activities, but the most serious contamination can occur from accidental fuel spills and storage of materials for long periods of time without any precautions.

During the construction phase the most important potential for contamination will be on the sub soil. This is the subsurface crust, below the soil layer. This will be exposed during the construction of the road sub grade and materials used in the construction of the sub grade could cause contamination. Provided common natural resources (sand and gravel, sand, soil, rubble) are used from local quarries for the construction, contamination is unlikely to occur to the road sub base.

Contamination may also occur during the operation period. The main criterion for evaluating the risk of soil contamination by chemicals is maximum permissible concentration(MPC) - the maximum amount of substance in mg / kg oven-dry soil, which guarantees the absence of a negative direct impact on human health. Lead is considered the most frequent and toxic transport pollutant due to its continued presence in fuels in Kazakhstan and is used as an indicator of contamination. . maximum permissible concentration of lead in soil (MPC) in the Republic of Kazakhstan is calculated according to the "standards of maximum permissible concentrations of harmful substances, harmful microorganisms and other biological contaminants soil", approved by joint order of the Minister of Health from 30.01.2004 № 99 and the Minister Environmental Protection from 27.01.2004 № 21-p, and is set at 32 mg / kg.

According to the calculations lead levels at a distance of 20 meters from the roadway from 14 to 47 mg / kg. MP:C of lead in soil is 32 mg / kg. Consequently, at a distance of 20 meters measured lead in soil in some areas is slightly higher than the MPC. Where there is debris, broken pavements and tires, broken engine exhaust of cars, leaking fuel and lubricants, or negligent acts of drivers and maintenance personnel, and other poor management and maintenance additional pollution and lead levels may occur.

De-icing materials, especially salts, are also toxic. Because of the limit of permissible concentration of CL (chlorides) when exposed to anti-icing agents on the ground in the roadside of the zone approved level - 0.04%. With a significant accumulation, they can change the biological composition of roadside soils.

Soil Erosion

Although the general area through which the alignment passes is surrounded by mountain areas particularly to the north and south the selected road alignment passes through a generally flat or undulating terrain. Based on a review of the design by PMC it is noted that Section 1 lies between 560 and 625 meters elevation, there are no cuttings and gradients are very low. The average embankment height is 2-3 meters above existing ground level. With these characteristics, even in extreme dry or extreme wet conditions, erosion or landslides will neither be exacerbated by the road project, nor will the road be negatively impacted by such natural hazards.

Soil Impact Conclusions: Construction and Operation Periods

Based on the investigations and the characteristics of the area provided appropriate construction techniques and management are followed there will be no adverse impact on soils and sub soils during the construction and operation periods. Soil contamination, erosion and landslides will not occur. Similarly during the operation period contamination of the soil and sub soil will not be a significant impact.

4.2.6 FLORA AND FAUNA IMPACT

One of the key environmental objectives of the construction and operation of this road should be to protect the natural ecological system including vegetation, wildlife, and natural landscapes. Additional special protection is necessary where rare or endangered plant and animal species may be present.

Road construction and operation may have impact on flora and fauna either 1) during construction through loss of habitat and destruction, or 2) during the operation through the impact of vehicle traffic and various pollutants on the flora or fauna. Road traffic emissions can cause the destruction of the pigments, the suppression of the synthesis of proteins, enzymes and other functions of plants. The road can also cause impact on individual animals that pass along or live close to the road alignment and fragment some animal populations into unsustainable small groups

For flora pollution can lead to disruption of growth and development, and can accelerate the aging process, especially in perennial plants. In designing interventions to reduce harmful impacts on the flora it should be noted that broad leafed plants survive better than conifers in tolerating air pollution, because the processes of transpiration occurs quicker. Pollution of the ground and vegetation from traffic emissions occurs gradually and is directly dependent on the distance from the carriageway of the road. Some plants are more sensitive to pollution from exhaust gases of vehicles than that of humans and of many animals. Of the inorganic pollutants that have a significant impact on plants, de-icing chemicals, mainly salt are the most relevant and significant. Salts used for de-icing have a negative effect on the surrounding area to the road, including VECs such as soils, plants, insects, animals and birds. Additionally, under the influence of these salts, the structure and physico-chemical properties of soils deteriorate which will have an adverse impact on all plants.

Adverse effects of salts on plants result from direct contact with the pollutants, and from absorption through the root system. Direct contact with the salts leads to the destruction of plant tissues, especially the leaves. Sodium ions, concentrated in the soil, inhibit the absorption of nutrients by the root system so slowing growth and accelerating death of the plants.

Generally, the construction of any road can have major short-term impacts on habitats of animals, on short and long distance travel and migration routes, and contribute to the fragmentation of populations. Disturbances start occurring during the clearance of vegetation for construction and continue into the operation of the project. However, operational impacts can be mitigated effectively once the construction is completed, by planting and landscaping, as well as under and overpasses for migrating animals, including "green bridges"

During the operation stage as a result of roadside pollution by heavy metals, salts, oils and other harmful substances, animals and birds may be poisoned though direct contact or through eating vegetation in the vicinity of the road. However the new planting and landscaping may minimize pollution impacts in the immediate vicinity of the road.

Additionally larger and slower moving mammals crossing the road may be killed. Hedgehogs are frequently affected, but also foxes and mice, rats etc can be regularly killed. Though these individual events are unfortunate the total number of animals killed in this way is commonly not high. In section 1 road-kill risk for larger mammals (deer, foxes) is lessened by the absence of dense shrub or forest in close road vicinity.

Flora and Fauna Impact Conclusion: Construction and Operation Periods

In conclusion there is a potential that the natural flora and agricultural products growing close to the road may be adversely impacted by the construction and operation activities. This is, however, unlikely to be significant, but appropriate mitigation, management and monitoring should be planned for the construction period and included into tender and contract documents.

According to calculations made by the designer a total of 11,330 trees will be cut within the ROW, which consists of 38 spruce, 10,701 elm trees, 350 Elaeagnus, 241 different shrubs. Some of the trees will be existing roadside trees at Km 0 – Km 5.0 and at Km 103 – km 110. The compensation measures, i.e. the replanting of at least an equal amount of trees, plus a contingency for abortive seedlings, are based on these quantities. All replanting will be carried out by a separate contract and will not be part of the road construction contract.

Because of the influence from urbanization and agriculture the fauna in the area of Section 1 is not characterized by a high diversity of species and sub species. There is no record of rare, endangered or

vulnerable species of animals and birds in the area. There is no record of any populations of Kazakhstan red list animals such as Saiga, Marmot or Gazelle. here are no large areas of wilderness or natural habitats including forest areas close to the alignment. In the vicinity of the proposed road there are no large areas of water or wetlands. There are no sensitive areas or areas of high landscape value within the rayon and there are no known proposals to include any part of the area as a legal protected area. Based on the Consultant field work within the alignment and the knowledge and fieldwork of the Design Engineers there is no evidence to show that the alignment has any sensitive fauna or flora. During the consultation meetings in October the subject of fauna within Section 1 was not discussed or mentioned by the community or by Rayon representatives. At a meeting with The Ecological Society: Green Salvation, an Almaty Based NGO, the issue of wildlife in Section 1 and any impact that the road may have was not defined as an issue or a point of concern. The potential fauna issues in Section 2 were however discussed.

Based on the above review, site examinations, and discussions there is no evidence to indicate that the Section 1 alignment, which is predominantly agricultural, would have a significant impact on the fauna in the area or would impact on any rare, endangered or vulnerable animals.

4.2.7 SOCIAL AND ECONOMIC IMPACT

Social impacts during the construction and operation stages of the project are likely to be significant and of a long duration. These impacts will largely be positive, but some less significant adverse impacts may also occur.

During construction and operation noise, air pollution and water pollution may affect the nearby residents and in extreme conditions could impact on people's health, particularly amongst the more vulnerable groups; the old, those already sick, and children. However, as referred to above, noise, air pollution and water pollution are not predicted to be a significant impact for this road project.

The road development will also require the acquisition of some land and buildings which may affect people's income and livelihoods particularly in the short term. In the case of this road the number of buildings required for the road is not significant; there are 14 buildings along the entire alignment all of which are in Section 1. This matter is described in detail in the Resettlement Implementation report (RIR).

A more important impact will be on those families; exclusively farmers, who will have had some of their land acquired for the development of the road. Though generally the amount of land lost by each farmer is not significant the most import impact will be that a farmer's land holding may now be located on two sides of the road, separated by the road. This will create difficulties on operation and could make the operation of the farm inefficient and in extreme cases in operative. In order that the farmer can still operate his farm in an efficient manner it will be essential that regular crossing points are provided for the farmer.

The road development may have some impact on the economic activities of the local communities on the present road. Alongside the present road there are various permanent and temporary commercial activities including restaurants, convenience stores, car repair establishments, and temporary stalls selling local fruit, vegetables and other local produce. These businesses rely predominantly on passing traffic for their customers. This is particularly strong in the western part of the road, closer to Almaty where there is a significant amount of traffic generated from the communities along the road and other communities near the road, for example the town of Talgar south of the A351. With the construction of the new alignment some of the business will lose some, though clearly not all the passing trade.. The consultants have no access to reliable traffic counts and it is not possible to make a reliable prediction of the likely diverted traffic from A351 to the new road. However it is likely that much of the existing trade will not be lost when the new road is constructed though it is impossible to make any assessment of the impact on local businesses and traders. The roadside settlements further east in Section 2 and Section 3 are likely to be more impacted. Baiset south east of Shelek and the small communities east of Zharkent to the International border could be more sensitive to a lost of trade caused by less long distance traffic.

For a distance of 300 kilometers long distance traffic (buses and tracks) will possibly only stop at the International border at Khorgos and within the Almaty area. Nevertheless it will be important for the Roads Department to consider the establishment of service areas and it is understood that five potential rest/service areas are being considered though no sites have yet been agreed. Normally these areas will provide facilities for resting, for buying petrol, for buying other goods and for eating and possibly overnight accommodation. These service areas could accommodate areas for local traders and farmers to sell produce. Signage to

existing communities and local services and the provision of temporary spaces for local businesses can offset some of the potential for loss of trade. These matters are outlined in part 4.3.6 of this report.

There is no mechanism in Kazakhstan to compensate businesses for loss of trade. This loss of business and profits does not come within any World Bank Operational Policies and there is no evidence to show that it is included in any national requirements both in the developed and developing economies. In some countries (UK for example) businesses who can prove that their business has been adversely impacted by a nearby road construction can claim a reduction in their local taxes.

Although there may be some local economic adverse impacts overall economically the road will bring significant benefits to the local, regional, and national economy. A fast, safe and all weather road will allow the efficient and rapid movement of goods between China, Kazakhstan, Russia and beyond in Europe and Central Asia. Goods manufactured within all the linked countries will benefit form the fast route. Agricultural produce from the area, which is a major employment sector and a significant part of the local economy can be transported rapidly to a wider market, not just Almaty. Labor will be able to move more freely between the countries, and most important for regional and international economies tourism will be encouraged and the natural and social features of Kazakhstan can be exploited sustainably. On a regional basis the larger communities along the alignment, Zharkent, Shelek and Almaty will benefit from faster travel times between the towns and to other urban centers in the south and south west of Kazakhstan. More opportunities for employment and business will be opened up.

Social and Economic Impact Conclusion: Construction and Operation Periods

There will be some negative social and economic including disturbance during the construction period and some potential loss of trade to businesses on the existing main road, but overall the social and economic impacts of a purpose built fast route within southern Kazakhstan will be beneficial.

4.2.8 PHYSICAL CULTURAL RESOURCES IMPACT

In general, archaeological research at sites that fall within the zone of road construction should be carried out in advance. During a detailed survey of the site in close proximity to the site of a road has found 3 archeological sites which may be affected due to their proximity to the alignment:

- An ancient burial mound at Bayserke;
- An ancient burial mound at Alga;
- An ancient burial mound at Salamatka.

All of the three monuments and their buffer zones are located within 2 km of the centerline of the alignment. Based on the Consultants review only one mound within Bayserke Cemetery will be directly affected and lies directly within the alignment. This mound will undergo a complete excavation and archeological study prior to the commencement of construction activities in this area. Thus the site can be documented and any significant items can be retrieved and either archived or made available to a museum. It is general practice in Kazakhstan to publish academic papers on the recovered materials, thus contributing to knowledge and awareness on the history of the Central Asian region and Kazakhstan.

For any PCR that are discovered during the construction works chance find procedures shall apply that are governed by Kazakh legislation and guidelines, specifically by paragraph 2 of Article 39 of the “Law on Protection and Use of Historical and Cultural Heritage in the Republic of Kazakhstan” which stipulates: "*In case of detection of objects of historical, scientific, artistic, and other cultural value, physical and legal persons are obliged to suspend the further conduct of the work and inform the authorized body*. "

The time required for investigation and salvage dig at the burial mound one field season will be required, which will be taken into account in the construction schedule. In the unlikely event that ancient settlements would be discovered, two field seasons would be required for investigations and salvage digging.

The four mounds not directly affected by the road construction, are at approximate distances of 150, 300, 450, and 600 meters from the centre line of the road. The mounds not directly affected may, because of the improved access and public knowledge, come under pressure from illegal damage and removal of objects. This can be managed in two ways: 1) Complete and secure closure of the mounds to ensure no illegal damage takes place, or 2) to open the mound up to public view and information ensuring that the community can understand the history of the area. If it is opened up to public view there is less incentive to rob or damage and proper security can also be installed. If the monument is opened up to public view road and pedestrian access should not be off the new road and access should be via minor access roads. The Institute of Archeology should review the situation and take the necessary actions.

Conclusion Historic and Archeological Impacts Construction and Operation

One mound within Bayserke Cemetery will be directly affected and complete excavation and study required. This will be investigated in detail by competent experts and a salvage dig carried out before any construction works will start in the area. The remaining mounds not directly impacted should be managed and monitored as recommended above.

4.2.9 ROAD SAFETY AND AESTHETICS IMPACT

Road Safety

Road safety and the potential for accidents to pedestrians and all road users is an important issue for all new road developments. On the existing route traffic flows, particularly of long distance trucks and buses, are expected to reduce and the incidence of traffic accidents should also be reduced. Correspondingly, hazards to pedestrians and non-motorized traffic along the existing route should also decrease.

For motorized traffic the project road itself will be significantly safer because of its upgraded design (e.g. optimized curve radii), separated carriageways, better visibility and limited access points. Randomly crossing traffic as well as slow moving non motorized traffic will be eliminated.

Nevertheless there will still be a residual element of danger for pedestrians. Farmers, farm workers and herdsmen may need to cross the road at certain points and there will be some pedestrian traffic near settlements. There is a range of engineering and organizational measures available to slow down motorized traffic and improve traffic safety for pedestrians, animals, animal-powered carriages and cyclists. This includes signposting and speed enforcement with speed cameras; pedestrian crossings, if required with traffic lights; rumble strips and speed bumps to force speed reduction; light signals to warn drivers of crossings or non-motorized traffic participants. The design already foresees a number of these measures, the final scope, layout and locations will be decided in consultation with the affected communities prior to construction.

Aesthetics

The proposed road passes through areas of high aesthetic quality landscape with limited adverse visual impacts. The landscape in Section 1 though not significant in itself in the alignment area, has the important and visually impressive backdrop of the Almaty mountains some 10 kilometers to the south. The retention and conservation of the natural landscape is therefore important. The design of the proposed road will ensure that this landscape quality is not negatively impacted by the new road construction and does not in any way detract from the landscape and views southwards.

4.2.10 WASTE GENERATION IMPACT

Estimated wastes during construction

During construction and operation of the projected road a number of waste streams will be generated:

- Inert mineral materials such as excavated earth, sand and gravel asphalt and concrete rubble, which will be entirely recycled and used as construction materials for filling, grading and landscaping.

- Potentially noxious or hazardous materials such as waste from construction camps and workshops, concrete slurries from washing plants, barrels and containers from fuels, lubricants and construction chemicals, scrap metal, and spent welding electrodes. This will be disposed via existing municipal waste management facilities, treatment or recycling plants, in accordance with Kazakh regulations.
- Timber from felled trees and other organic matter from the clearing of the alignment will be collected and stored in appropriate locations outside the immediate construction zone and if suitable made available for sale to the public as firewood.

The following volumes of waste generation have been calculated for Section 1:

Table 4.9 – Construction waste generation (prepared by Design Engineers)

№	Name	Unit	Amount	Density t/unit.	Amount, t	Loss norm	Losses, t
1	2	3	4	5	6	7	8
1	Heavy masonry	m^3	130,334	2	260,669	2	5,213
2	Heavy concrete B7,5	m^3	353180,93	2,1	741679,94	2	14833,599
3	Nails and bolts	T	4,660		4,660	1	0,047
4	Painting materials	Kg	23942,921	0,001	23,943	3	0,718
5	Reinforcement steel	T	1,428		1,428	3	0,043
6	Geotextiles	m^2	475,73	0,0017	0,809	3	0,024
	Total:						**14839,644**

Waste Estimates During Operation

Waste generated during operation will mainly be gravel and salt remnants from winter care, sludge / cake from settling ponds for storm-water, and asphalt, concrete and gravel from repair and maintenance works. None of these wastes is very hazardous and disposal pathways will either be existing municipal waste management facilities, landfills for mineral materials (gravel, rubble) or recycling facilities (cement kilns or asphalt plants). The annual quantities will fluctuate depending on weather conditions (length and severity of wintery conditions) and volume of maintenance works. The range is expected to lie between an few 100s to a few 1,000s of m^3 per annum.

In addition there will be waste and litter from users of the road and from the various activities within the planned rest/service areas. This waste was could be quite significant if all 5 service areas area operational, though this is unlikely that all will be operating for many years.

Table 4.10–Construction and all other waste types for the project Almaty-Khorgos

Name	Generation	Standard	Quantities, t/yr	Hazard class	Physical chemical traits, toxicity	Components	Storage, utilization and (or) disposal
1	2	3	4	6	7	8	9
Construction wastes	Construction works		14839,644	IV	Solid non-flammable insoluble.	Concrete debris, bricks, glass, construction waste	Temporary storage at special places. Passed to specialized company for disposal.
Scrap metal (remnants of pipes and metal structures)	Building and construction works	120 kg/t	6,08	IV	Solid non-flammable insoluble	Iron – 95-98%, Iron oxides – 2-1%, carbon – 3%	Temporary storage at special places. Passed to specialized companies, which operate along the entire alignment, for disposal.[1]
Burnt remainders of welding electrodes	Welding works	0,15 from electrode mass	0,13	IV	Solid, non-flammable.	Iron – 96-97%, Coating – 2-3 %	Storage at properly equipped locations in construction camps until collected by specialized companies for disposal.
Solid household wastes	During construction period	0,07 t/year 0,006 t/month	131,76	IV	Solid flammable. Non-toxic.	Paper and wood – 60%, Rags – 7%, Food wastes – 10%, glass – 6 - %, Metal – 5,%, Plastic –12%	Temporary storage in containers. Passed to landfills.
Total			15620,97				

[1] Scrap metal is a highly sought after commodity in Central Asia, as the Chinese market lies geographically close. There are numerous collectors that travel considerable distances. In case of the project it will be highly attractive to drive from site to site and collect relatively large quantities of recyclables which are stored in defined locations and ready for pickup.

4.3. ENVIRONMENTAL MANAGEMENT: MITIGATION MEASURES: SECTION 1

4.3.1 AIR QUALITY MITIGATION

Vehicle Exhaust Mitigation

In general the amount and concentration of exhaust emissions of vehicles during the construction and operation periods depends on several factors, most important of which are:

- Design features and technical condition of vehicles, especially emission standards and related technical specifications;
- Traffic volume and traffic composition (mix of motor vehicle types);
- Road conditions: curve radii, longitudinal slope, carriageway width, visibility, type of road, smoothness and roughness of the road surface, the presence of human settlements, intersections and junctions of roads, railway crossings, and other factors that regulate the speed of the traffic flow;
- Driving habits of drivers;
- Meteorological factors, wind speed and direction, air temperature, humidity, solar radiation, temperature inversions, and air turbulence in the surface layer, etc.

Mitigation During Construction Period

The concentration of pollutants for each source of contamination when working on the construction of the road shall not exceed the maximum allowable limits set by the Kazakh standard SanPiN RK № 3.03.015-97. Various measures to ensure accordance with this requirement and to reduce the intensity and toxicity of emissions during road construction can be summarized as follows;

- Ensuring that all construction vehicles and equipment are maintained in accordance with manufacturers recommendations and that any repairs are carried out immediately in accordance with manufacturers recommendations. ;
- Systematic monitoring of the technical state of fuel equipment of diesel engines, the exhaust gases of which are prone to contain significant amounts of soot;
- Ensuring the uniform and proper operation of paving machinery, sealing equipment and asphalting machines that will help prevent unacceptable concentrations of pollutants (e.g. aliphatic and aromatic hydrocarbons, including carcinogenic benz-a-pyrene, PAH)the working area and the surrounding areas.
- As a means of reducing annoyance to and potential harmful impacts eliminate nighttime construction operation within the vicinity of the sensitive uses (adjacent settlements) at Km 0 and Km 107. No mixing of materials, storage of materials and construction camps or depots to be located within 200 meters of these sensitive areas.
- Regular monitoring of air pollution shall be carried out throughout the construction period and focusing specifically on the two sections in the vicinity of the sensitive uses at Km 0 and Km 107.

Mitigation During Operation Period

- Improving the design of highways. Reduced longitudinal slopes, improved visibility in the horizontal vertical curves, the increase in their radius leads to ensure a higher operating speed of traffic flow and reduce toxic emissions. These requirements are incorporated into the design of this alignment.

- Given that the projected road passes through flat terrain, the longitudinal slope does not exceed 10% of the radii of curves and visibility on the road comply with the technical categories, thus providing the highest operational condition of the road, giving significant reductions in emissions of toxic pollutants. These requirements are incorporated into the design of this alignment.
- To reduce frequent braking and acceleration of vehicles as a means of reducing emissions install appropriate traffic and warning signs and roadway markings. These requirements are incorporated into the design of this alignment.
- One of the easiest ways to reduce the toxic components in exhaust gases (exhaust) is to convert vehicles to pressurized natural gas, resulting in the reduction of NOx emissions by the factor 4-10;
- legislation has established requirement for every motor vehicle to be inspected and checked once per year for basic technical functionality, including emission standards. The inspection certificate has to stay with the vehicle at all times and is checked by road police during routine traffic controls.
- The use of unleaded gasoline is increasing in Kazakhstan and leaded gasoline will be phased out, which will progressively reduce lead emissions into the environment.
- Regular monitoring of air pollution should be carried out throughout the operation period and focusing specifically on the two sections in the vicinity of the sensitive uses at Km 0 and Km 107.

Dust Mitigation During Construction and Operation

Dust can be a major problem during construction and is caused by a range of activities including site preparation where the soil is disturbed, during aggregate and cement handling for concrete production, from the transportation of materials particularly cement, and transport generally on unpaved surfaces.

To reduce dust pollution during construction and repair work on the road during operation the following mitigation should be carried out:

- Maintaining, cleaning and watering of road sections where there is intensive dust formation. When choosing the dusting materials, preference should be given to Calcium Chloride, inhibited by Phosphates (CCP).
- Periodic watering of dirt roads at a rate of 2 l/m^2 per watering cycle;
- Set and enforce speed limit on sections of roads subject to intense dust formation;
- Ensure that the transport of all potentially dusty materials is done in covered trucks or the material is contained in secure bags.

Dust mitigation must be enforced with special care and attention in the locations at Km 0 and Km 107 where there is enhanced sensitivity due to nearby settlements.

4.3.2 NOISE AND VIBRATION MITIGATION

The level of traffic noise at any sensitive point generated by vehicles traveling on the highway, shall not exceed the values set in, SanPiN № 841 from 12.03.2004, Republic of Kazakhstan, at 70 dBA.

Mitigation of Noise During Construction Period

Noise can be caused by a range of equipment and by vehicles transporting goods and equipment. Significant noise can be created by bulldozers, scrapers, pneumatic hammers, vibrators, cutters.

Reducing construction noise is achieved through the following activities:

- Impose a speed limit of traffic during construction to 60km/h. This can reduce noise by 7 dB (as compared to 80 km/h);
- Undertake construction work during the daytime to reduce any potential impact on sensitive uses particularly in construction access roads;

- Effective soundproofing of all vehicles and equipment by the use of foam, rubber and other soundproofing materials, as well as through the use of hoods with multilayer coatings; ensure that Contractors either have modern equipment that fulfill noise reduction norms, or that equipment is retrofitted to meet the required standards;
- Stationary units (e.g. aggregates or compressors) shall be placed in sound-absorbing areas or tents, which can reduce the noise level by up to 70%.
- The definition of road construction zones with high sound levels above 80 dBA must be designated with safety signs, and workers in this area should be provided with personal protective equipment (ear mufflers of plugs).
- All depots, special working areas, batching or mixing plants should be located at a distance from any sensitive areas
- As a means of reducing annoyance to and potential harmful impacts eliminate nighttime construction operation within the vicinity of the sensitive uses at Km 0 and Km 107 (settlements). No plants for batching and mixing of materials, for asphalt or concrete production, and no storage sites, lay down areas or construction camps shall be located within 200 meters of these sensitive areas.
- Regular monitoring of noise levels near any sensitive areas particularly at Km 0 and Km 107 must be carried out to ensure there is no disturbance to those uses. If acceptable night time noise levels are exceeded the community must be consulted and additional mitigation methods such as the installation of temporary noise control barriers by the contractors should be considered.

Operation Noise Mitigation

The calculation of noise during the operation period indicates that traffic noise does not exceed the maximum permissible standards (Appendix 1.2) at any location along the alignment. However it will be particularly important to monitor operation noise levels at Km 0 and Km 107 to determine whether the community is disturbed by the noise. If any additional mitigation measures are considered necessary they will be included in the repair and maintenance budget on a running basis and carried out within those activities. No changes to the design of the alignment will be necessary.

Vibration Mitigation

Vibration normally occurs when piling takes place. This may only occur at a number of locations mainly at bridge construction. If it does not take place near the sensitive uses the impacts on the community will be small. The most important impact will be the impact on workers on the construction site. All workers exposed to vibration should be given special clothing, earplugs and given regular breaks.

4.3.3 HYDROLOGICAL MITIGATION

Construction

Overall the impact on groundwater and surface water is expected to be low. There are no cuttings in Section 1. Except at bridge construction locations any impact on groundwater levels is likely to be minimal and contamination will be unlikely. It is unlikely that any groundwater resources will be impacted by the construction activities. Streams and rivers will be crossed by appropriately dimensioned bridges, and embankments will have sufficient culverts to prevent damming of surface runoff and subsequent waterlogging.

During road construction in order to prevent pollution watercourses must be constantly monitored These pollutants risk entering the water and releasing harmful toxic substances and pollution with particulate matter of mineral and organic origin, represented suspended particles of sand, clay, silt and other materials.

Discharge of Waste Water from Construction Camps

The discharge of wastewater to water courses is only allowed with permission of the sanitary-epidemiological service and fisheries. The composition of the wastewater must comply with SanPiN to protect surface waters from pollution № 3.02.002.04.

For domestic wastewater disposal a pit of precast concrete rings with a diameter of 1.5 meters and a depth of not less than 3 meters should be used. To eliminate the filtration of waste water into the groundwater the floor of the pit should be concreted. From these pits water and sludge will be periodically pumped into tanker lorries and transported to the nearest licensed waste water treatment plants (WWTP).

Surface and Groundwater Protection

Defined water protection zones prohibit the establishment of landfills, use as industrial waste sites, as parking, refueling, cleaning and repair of motor vehicles and road equipment. The pollution and contamination of water, during construction without devices to prevent pollution and contamination of water, wasteful use of water, the violation of water protection regime in catchments and other violations, will be banned.

The water protection zones are defined as follows: for small rivers the zone is, 100 meters, and for large rives it is 500 meters. Works within the water protection zone are allowed only by special permission of local water protection authorities, fishery protection and sanitary-epidemiological services.

Irrigation

In some cases the road permanently disrupts and disconnects the irrigation channels though this is not common. In this case it is important that farmers and the community are given advance warning by the contractor to ensure that the farmers can make timely alternative arrangements for their water supply.

However in most cases disruption to the irrigation channels will only be temporary and realigned channels and culverts under the road alignment will ensure that irrigation water will not be disrupted for any long period and water will still be provided to agricultural land. Where temporary disruption occurs the famers must be notified by the contractor (with the support of the supervision consultants) of the disruption in advance and what temporary arrangements will be put into place. In addition the Contractor must ensure by all appropriate means that irrigation channels are interrupted for the minimal period and that adjacent farmers are not necessarily disturbed during the construction period, especially if coinciding with the growing season. The supervision engineers should constantly monitor the situation and report to the Contractor and the Rayon administration where farmers have not been given adequate notice and where disruption has been longer than programmed.

Specific Mitigation during Construction should include:

Department of Roads, Committee of Water Resources and Rayon in consultation with Contractors to ensure all water extraction for construction and workers only takes place from sustainable resources from wells (for construction activities) and from piped supply system (for domestic use in camps etc). The contractor shall be responsible for obtaining all permits required for use of surface and groundwater resources from the Rayon and competent authorities. No water shall be used without those specific permits.

- Good management of all areas of the construction site to ensure no short term flooding occurs.
- Good management of all areas of the construction site to ensure contamination from all construction activities does not occur.
- All surface water courses in all construction are to be protected by settling ponds and filters.
- Waste water from construction camps to be treated on site before discharge into surface rivers;
- Septic sludge from toilets to be taken to offsite treatment plants
- Ensure minimal disruption to irrigation water and maintain dialogue with farmers.

Operation

During operation to prevent contamination, the road will include drainage channels and culverts for removing waste water from the carriageway of the road outside. Drainage from the roadway and bridges shall be treated in settlement ponds where necessary, before reaching natural streams and rivers, or canals.

Water from road bridges passes to the paving blocks and curbs along the borders assigned to drainage cradles at the beginning and end of the bridge, then enters the water receiving wells, where the filtering occurs. To ensure the removal of pollutants from the roadway of the bridge sidewalk concrete curbs are located along the entire length of the bridge. Rain water on the pedestrian part of the bridge is protected from harmful toxic substances from the roadway of the bridge by a continuous barrier so there is no threat to the ecosystem. On small bridges pollution is also excluded from entering the surface water by a continuous curb railing.

Discharge of water from the carriageway flows by longitudinal trays along the edge of the roadway, and then cross-trays, arranged on the slopes of the embankment height greater than 4 meters, with a longitudinal slope of a slope of 0.03, as well as for concave curves. The ends of the trays are arranged along the slope embankment to prevent erosion of the sub grade.

4.3.4 SOIL EROSION AND SOIL CONTAMINATION MITIGATION

Soil Erosion

During the construction phase it will be essential to ensure that all efforts are taken to eliminate soil erosion and the causes of erosion. However as referred to in section 4.1.4 above because of the characteristics of the landscape and of the design even in extreme dry or extreme wet conditions, erosion or landslides will not take place to any extent. Nevertheless all construction activities must be undertaken to eliminate potential erosion.

Soil Reclamation

The Construction of the road will require the use of land for a temporary period for construction activities and it is a legal requirement that all land used for a temporary period for construction must be reclaimed and returned to the original users and owners in a condition suitable for its original agricultural use. Any use of land that involves the removal of any soil creates instability to the local environment and wider environment and it is essential to preserve the natural topography and existing vegetation.

Guided by the Land Code of the Republic of Kazakhstan from 20.06.2003g. and "Guidelines for the assessment of proposed economic and other activities on the environment in developing pre, design and project documentation" Astana 2007. All land used must be returned in a condition suitable for agriculture.

Biological reclamation allows for the planting of grasses to encourage the restoration of fertility. Land reclamation should be done during or after the completion of the construction activities. It is important to reclaim in all place where soil and sub soil has been disturbed by construction and associated activities.

Remediation activities to reduce loss and erosion of soil during construction includes the following:

- Removal of sand and detritus mixture (20 cm) from the surface of the road with a bulldozer moving into piles up to 50m, followed by loading an excavator to dump 0.65 m2 to transport up to 1 km (35,000 x 0.20);
- The preparation of the road surface by bulldozer;
- Deep subsoil loosening by bulldozer;
- Backward sliding of topsoil from the dumps to the prepared surface layer by the bulldozer

Activities on the site after construction should include:

- Use of tillage cultivator;
- Mechanized sowing of perennial grasses as follows: alfalfa - 25% of 18 kg / ha 30% perennial ryegrass - 75% of 35 kg / ha of 30%.

- After sowing, rolling the surface by a ring-roller

The best perennial grasses are wheatgrass and sainfoin. Wheat has a high resistance to drought. The wheat grass grows equally well in early spring and autumn. Sainfoin - a long-standing drought-resistant and extremely valuable winter-hardy legume crop is sown in wide aisles with 30-60cm. It is planted mainly in the early spring period and the green mass is eaten by cattle, and also provides excellent hay.

Immediate and proper reclamation of land reduces the adverse impact of disturbed land on the environment. It will reduce dust and pollution, can have a beneficial impact on human health and eliminates environmental damage.

Soil Contamination

During the construction period it is important that the contractor undertakes all activities in accordance with contract specifications and manages all site activities in an environmentally sustainable manner.

To ensure soil is not polluted it is essential to undertake the following activities:

- Ensure, through proper construction management, that oil and other spills do not occur, and that if they do immediate action is taken to minimize impacts on the soil.
- Storage of construction materials only takes place in properly prepared locations;
- Immediate sorting and removal of construction debris to an offsite landfill;
- Dismantling after use the base of construction sites and access/haul roads
- Apply topsoil on all vacant sites as soon as practical;

Operation

During operation it will be important that all pollution is minimized and managed. All liquid wastes of any kind must be taken from the road and disposed of in an approved landfill. It will be the responsibility of the road agency to ensure speedy and full clearance of all waste from the road and from its vicinity.

4.3.5 FLORA AND FAUNA MITIGATION

Flora and fauna will be impacted by the construction and operation of the road. Air pollution, noise and vibration and potential for occasional flooding and wind and water erosion will all have an impact, normally adverse on the local and sometimes wider original ecology.

The mitigation methods referred to above for air pollution and noise and vibration impacts will also benefit the flora and fauna. Specifically to reduce the negative impact on flora and fauna of the road development the following environmental protection measures are proposed:

- Ensuring high quality condition of the road surface throughout the operation period to minimize noise and particularly air pollution which has adverse impacts on fauna and can also impact sensitive flora;
- Ensure fauna can make use of culvert and other crossing points by special treatment of ground surface;
- Reduce and minimize the use of salt and chemical materials used to disperse snow and ice in winter so that soils, plant tissues, animals and birds are not adversely affected or destroyed. An alternative is to replace salt and other chemicals with friction materials such as sand or gravel;
- Use de-icing materials that are less toxic to the environment including anti-HCF-type materials (calcium chloride, inhibited phosphate) or MRA (potassium-magnesium acetate), which do not lead to irreversible changes in photosynthesis and the subsequent destruction of plant tissues and animal deaths;
- Reduce the incidence of dust pollution by good maintenance of the road, regular cleaning and watering to reduce negative effect on vegetation.

Dust, depending on the chemical composition, has a specific effect on plants, caused by the penetration of harmful compounds into the leaf tissue. At the same time accumulation of compounds in plant tissues causes a disturbance of metabolic functions of the body, reducing the amount absorbed by the leaves of photo synthetically active energy and results in accelerated aging. Additionally all transport and haulage vehicles using the road, including construction traffic, should use dust protection tarpaulin or other suitable cover.

Temporary or longer term localized flooding and waterlogging shall be prevented by culverts and drainage systems to ensure flora and fauna are not affected.

The loss of trees as defined in Chapter 5.6 will be offset by a tree replacement ratio of at least 1:1 plus a contingency for the portion of saplings that does not grow (typically 25%) This replanting will be undertaken in a separate planting contract.

Specific Fauna mitigation during Construction:

The Contractor is required to ensure that no unnecessary disturbance to fauna within or close to the alignment takes place. The Contractor and Supervision Engineers shall monitor the incidence of any sightings of any larger or unusual fauna within or close to the alignment and to notify the Rayon Administration. Any accidental injury or death of larger fauna to be reported and the Rayon notified.

4.3.6 SOCIAL AND ECONOMIC MITIGATION

Local Businesses

The road development may have some impact on the economic activities of the local communities on the present road alignment. Alongside the present road there are various permanent and temporary commercial activities including restaurants, convenience stores, car repair establishments, and temporary stalls selling local fruit, vegetables and other local produce. These businesses rely predominantly on passing traffic for their customers. This is particularly strong in the western part of the road, closer to Almaty. With the construction of the new alignment some of the businesses may lose some, though clearly not all, of the passing trade. It is likely that much of the existing trade will not be lost when the new road is constructed though it is impossible to make any definite predictions. There are no World Bank or domestic policy requirements to compensate persons indirectly affected in this manner. During the recent consultation process this matter was not referred to by any members of the community or the Rayon administrations.

There are however a number of approaches that would provide opportunities for the local community adversely impacted by the road development. Three approaches would be:

- Providing sites for local businesses and farmers to sell their produce to travelers using the new road. Information obtained from Regional Department of Roads, Almaty is that there will be 5 Rest/Service areas along the alignment. These sites are not part of the present design and land will be purchased on a willing buyer-willing seller basis and design and development will take place at a later date. They are the responsibility of the ministry of Tourism. It is recommended the design should included sites for local farmers and business as a means to ensure that the local community can benefit from the new road and as a means of offsetting potential losses to existing businesses on the present road.
- Good signage on the new road and at junctions to show the location of the nearest petrol station, shops, market, restaurants etc. located on the original road. This will enable users of the new road to make easy access to the local commercial uses on the original road. A good example would be to include signs at junction at km 126 in Section 2 informing travelers on the new road of the restaurant and market facilities at Baiseit
- After the construction of the road and prior to opening of the Service/rest areas to allow small traders to set up at vacant sites at some interchanges. This would need to be in accordance with road safety regulations and should only occur at specific approved sites where space is available of the road for parking and visibility is good. Signs informing roads users of these locations should be incorporated into the proposed road signage.

Livestock crossing points

During the first consultation many farmers were concerned about ensuring that sufficient livestock and farm equipment crossing points were included in the design. This is particularly important where a farmer's land is along both sides of the road alignment. But it is also an issue where the road blocks traditional routes for farmers moving livestock and machinery, e.g. from villages to fields and pastures. The design has included 36 under road crossing points for livestock and farm machinery. In addition there are local road overpasses. The Regional Department of Roads, Almaty has agreed that additional crossing points can be provided if the community shows that a route is necessary for the famers or other land users in the area, and that it is possible in engineering terms. At the commencement of the construction activity, the Rayon administration, the Contractors, the Supervision Engineers and representatives of the Regional Department of Roads should discuss and agree if any additional culverts are needed and their approximate locations. If any additional culverts are considered necessary they will be included into the construction scope of works as variation orders. At this timer no changes to the design of the alignment will be necessary.

Land acquisition mitigation aspects are covered in the Resettlement Implementation Report but it is important to stress that the outstanding acquisition is to be completed as soon as possible in accordance with Government procedures and the Resettlement Implementation Report. Any objections and complaints should be in accordance with the Grievance Mechanism included in the RIR for the completion of the acquisition and for the construction period. The issue of crossing points for livestock and farm vehicles and equipment is also covered in the RIR.

4.3.7 PHYSICAL CULTURAL RESOURCES MITIGATION

All of the three monuments and their buffer zones are located within 2 km of the centerline of the alignment. Based on the Consultants review only one mound within Bayserke Cemetery will be directly affected and lies directly within the alignment. This mound shall undergo a complete excavation, archeological study and recording. Items of significance shall be retained for archiving or made available to a museum.

The four mounts not directly affected by the road construction are at approximate distances of 150, 300, 450, and 600 meters from the centre line of the road. The mounds not directly affected may, because of the improved access and public knowledge, come under pressure from illegal damage and removal of objects. This can be managed in two ways: 1) Complete and secure closure of the mounds to ensure no illegal damage takes place, or 2) to open the mound up to public view and information ensuring that the community can understand the history of the area. If it is opened up to public view there is less incentive to rob or damage and proper security can also be installed. If the monument is opened up to public view road and pedestrian access should not be off the new road and access should be via minor access roads. The Institute of Archeology should review the situation and take the necessary actions.

For any PCR that are discovered during the construction works chance find procedures shall apply that are governed by Kazakh legislation and guidelines, specifically by paragraph 2 of Article 39 of the "Law on Protection and Use of Historical and Cultural Heritage in the Republic of Kazakhstan" which stipulates: "*In case of detection of objects of historical, scientific, artistic, and other cultural value, physical and legal persons are obliged to suspend the further conduct of the work and inform the authorized body*. "

The time required for investigation and salvage dig at the burial mound one field season will be required, which will be taken into account in the construction schedule. In the unlikely event that ancient settlements would be discovered, two field seasons would be required for investigations and salvage digging.

4.3.8 ROAD SAFETY AND AESTHETICS MITIGATION

Road Safety

The provision of a new well designed restricted access divided highway ensures many inbuilt safety features not provided in an existing traditional road. Specifically the design of the proposed road will incorporate the following:

- Divided carriageways;

- Limited access and exit;
- Multi level interchanges at busy junctions;
- Good horizontal and vertical sight lines and visibility;
- Clear and consistent road markings;
- Absence of pedestrians and non motorized vehicles;
- Emergency lanes and emergency parking areas;
- High intensity lighting at key intersections and other locations;
- Clear warning and information signs;
- Safety barriers in accordance with international standards, at junctions, embankments and cuttings.

At junctions and access roads to the proposed road it will be necessary to ensure appropriate warning and information signs, street lighting where necessary, and safe facilities for pedestrians and non motorized traffic. Specifically the design has included speed cameras at intersections connected to a central control area. Rumble strips prior to junctions and at other locations have been also included in the design to warn drivers of junctions and slow traffic.

Pedestrian Crossing Points

No specific pedestrian crossing points have been included in the design of Section 1. Consideration must be given to the provision of pedestrian crossing points where there may be pedestrian movement in Section 1. At Shelek it may be necessary to review the need for a pedestrian crossing at the road junction at Km 107. At grade pedestrian crossing points should include white (zebra) strips on the carriageway, signs and advance warning signs.

At junctions and access roads to the proposed road it will be necessary to ensure appropriate warning and information signs, street lighting where necessary, and safe facilities for pedestrians and non motorized traffic. Specifically the design has included speed cameras at intersections connected to a central control area. Rumble strips prior to junctions and at other locations have been also included in the design to warn drivers of junctions and slow traffic.

Aesthetics

The objective of good aesthetics is to ensure a high quality of design, construction and operation to ensure that the road and its associated structures enhance and improve the landscape and esthetic quality of the area. This can be done through the following design and operation requirements:

- The design of the road and its associated development is of the highest quality, in keeping with the local landscape characteristics and features, and visually pleasing to the eye;
- Wherever possible for the road to be designed to follow existing contours so reducing the need for visually obtrusive deep cuttings and embankments:

The above two requirements have already been incorporated into the design of the road.

- Ensure that all non operational land is planted and landscaped to the highest level with trees and vegetation that are endemic and suitable for the severe Kazakhstan climatic conditions
- Ensuring the all warning signs, kilometers signs and all other road furniture is designed as a whole and are compatible with the landscape features of the area.

The above two requirements will be incorporated into the detailed design of the road.

- Ensuring that all elements of the road are well maintained, particularly the adjacent landscaped areas and any embankments and cuttings;

This will be an operational requirements of the road operators.

4.3.9 WASTE MITIGATION

Waste During Construction Period

The project preparatory work should provide special site provision for temporary storage of waste, indicating methods of removal to a place of disposal, processing or marketing. Disposal of wood and waste from tree and plant trimming should be carried out during the season of felling (preferably in winter).

Contractors must provide containers for all construction waste and should be separated; metals, plastics and construction materials. Any waste and scrap that can be recycled or reused must be separated and stored or taken off site as necessary. Waste materials for recycling and reusing within the construction site should be clearly marked and separated. In all cases storage must take place in clearly marked areas and taken off site as soon as practical. The Waste Management Authority and Rayon Akimat should be consulted in all waste maters. It must be the responsibility of the Contractor to dispose of all waste and to do so in accordance with local and national regulations. Any hazardous waste must be disposed of in accordance with local and national regulations. Disposal of any waste on adjacent sites with or without the land owner's permission, outside the construction site perimeter is not permitted unless the sites are approved waste disposal sites. Prevention of construction waste incineration: burning or incineration of any waste should not normally be permitted Unless specifically approved by the waste disposal authority and environmental authority.

All general waste from the workers camps and office locations will be regularly taken by the contractor to the nearest approved waste disposal site. Disposal and incineration at the construction site will not be allowed. Temporary collection points will be provided within the site for all general waste and these will be clearly signed and will be collected regularly. Any medical waste will be disposed of separately to approved medical waste sites.

At the completion of the contract all waste including all temporary site buildings and installations and all unused materials shall be taken off site by the contractor. No waste should be left on any part of the construction site.

Waste During Operation Period

Waste generated during operation will mainly be gravel and salt remnants from winter care, sludge / cake from settling ponds for storm-water, and asphalt, concrete and gravel from repair and maintenance works. None of these wastes is very hazardous and disposal pathways will either be existing municipal waste management facilities, landfills for mineral materials (gravel, rubble) or recycling facilities (cement kilns or asphalt plants). The annual quantities will fluctuate depending on weather conditions (length and severity of wintery conditions) and volume of maintenance works. The range is expected to lie between a few 100s to a few 1,000s of m^3 per annum.

Existing waste management disposal facilities within the area are the responsibility of the Rayon. The operator will agree prior to operation on what waste will be delivered to the publicly operated waste management sites. Other waste disposal will be agreed with the Rayon prior to any disposal. Only Rayon approved disposal sites will be used. Any hazardous or medical waste will be disposed of at separate approved disposal sites. The operator will be responsible for all collection within the road and service areas and disposal to the approved and agreed sites. No disposal will take place on the alignment or at the service/rest areas. No incineration will take place on the alignment or service rest areas unless it is in accordance with local and national incineration regulations.

5. SECTION 2.

5.1 BASELINE DATA: SECTION 2

5.1.1 GENERAL DESCRIPTION

The road "Almaty-Kokpek-Chundzha-Koktal-Khorgos" is part of the international transit corridor "Western Europe - Western China", which connects Central Asia with China under the "Program of development of road sector of RK for 2006-2012" approved by Government Resolution № 1227 from 09.12.2005g.

Section 2 (126-268 km) continues NE from river Shelek, while A351 turns off due south, running roughly parallel to the project alignment at a distance of about 20-25 km to the southeast. The alignment follows a secondary road, which is a narrow asphalted road for the first 25-30 km and then turns into a gravel road for about 70-80 km. This part of the alignment was projected to be upgraded to a transit highway in the 1980s, but construction did not proceed beyond a gravel platform. Alignment adjustments and new sections are planned in 3 parts of this Section: (i) ca. 5 km at the start of the section (new alignment crossing agricultural lands), (ii) ca. 2-3 km about 15 km from the Section start, near settlement 8, where the new alignment will cross a poorly drainage area, and (iii) a ca. 20 km stretch towards the end of the Section, where the new section will be routed between an alluvial fan with irrigated agriculture, and a semi-desert type area.

At ca. km 250-255 the road alignment will pass ca. 10 km to the north of the Charyn National Park, an ancient woodland which has survived in a narrow, sheltered canyon along a 25 km stretch of Charyn River. The park's Southern boundary lies only several hundred meters north of the existing highway A351. This forest is one of the last remnants of a much larger forest which once stretched along the foothills of the Tian Shan Mountains after the last Ice Age. It is the last location in Central Asia and one of the few places in the world which still supports a large population of the endangered Sogdian ash tree.

Following the alignment to NE directions there is a visible trend towards a more arid climate, thus the bulk of the alignment of this Section would run through arid steppe or semi-desert type rangeland, with no perennial rivers, no wetlands (except the aforementioned) and few temporal rivers (located in the NE of the Section, at ca. km 230-268). Agricultural lands will be affected only along ca. 25% of the Section. Ca. 80% of Section 2 will run along existing, albeit much smaller and lower capacity roads. The Section ends ca. 5 km South of River Ili, where the project alignment rejoins route A351.

Overall, about 60% of the road would be constructed on a new alignment, the remainder following the existing route A351.

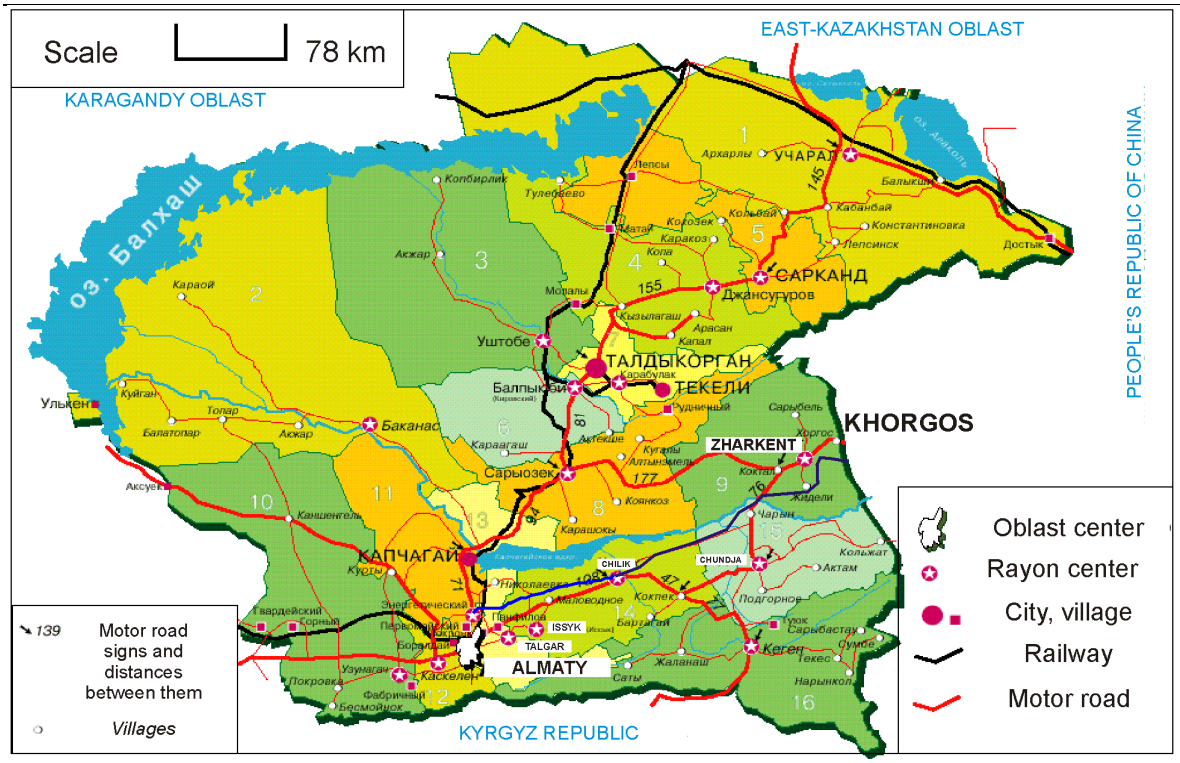


Figure 5.1. – Location map of Almaty region

The total area of Almaty Oblast is 428,000 square kilometers. The administrative centre is Taldykorgan. The Oblast includes 16 rural districts, 10 towns, 15 townships, 759 villages (villages).

The population of the area was 1, 631, 400 (Excluding Almaty city).

The total length of the project is 111.9 km (Figure 5.1).

Enbekshikazakh rayon – The length of the project in Enbekshikazakh Rayon is 56 km.

Uigur rayon –The length of the project in Enbekshikazakh Rayon is 46.65 km.

5.1.2 CLIMATE

The climatic characteristics of key towns on the alignment corridor are shown in Table 5.1. The key climate factors are:

- Continental climate of cold winters and hot summers. Coldest winter months are approximately -8ºC to -11ºC, warmest summer months are +40ºC;
- Rainfall varies between 150 mm and 400 mm per year, with most rain in the spring and little rain during the summer;
- Snow cover starts in November and lasts on average 80-100 days with a depth of 21-38 cm;
- Snow depths protect the soil from continuous freezing;
- Winds are normally from the North East and North West;
- Dust storms occur during summer and soil erosion can occur.

The main climatic characteristics of the projected road are shown in the nearest weather stations at Almaty and Shelek in Table 5.1.

Table 5.1 - Key indicators of climatic data MSC "Almaty", "Shelek"

№	Climatic Indicators	Name of weather stations				
		Almaty	Kaskelen	Issyk	Shelek	Zharkent
1	2	3	4	5	6	7
1	Average annual temperature C	+ 8,9	+ 7,8	+8,0	+8,9	+8,5
2	The average temperature in the coldest month (January) ^{0}C	- 6,5	- 5,8	-6,0	-9,2	-11,1
3	The average temperature for the warmest month (July) ^{0}C	+ 20,7	+ 21,3	+21,7	+23,9	+24,1
4	The absolute minimum temperature ^{0}C	- 38,0	- 34,0	-35,0	-39,0	-42,0
5	The absolute maximum temperature ^{0}C	+ 42,0	+ 40,0	+41,0	+42,0	+42,0
6	Average rainfall in mm including the winter period	491	546	599	233	164
7	The snow cover with a 5% probability of exceeding cm	50	49	-	-	24
8	Number of days per year:					
	sleet	12	12	-	2.0	-
	hail	7	1,4	-	2.0	2,0
	blizzard	5	-	-	25	-
	Wind> 15 m / sec	21	24	5	25	27
9	Typical periods of air temperature					
	More than 0 C start	13/03	13/03	12/03	7/03	7/03
	end	11/11	19/11	18/10	18/11	14/11
	duration	242	250	212	255	251
	More than 5 C start	27/03	31/03	28/3	21/03	20/03
	end	25/10	27/10	27/10	31/10	30/10
	duration	211	209	212	223	223
	More than 10 C start	13/04	21/04	18/04	6/04	5/04
	end	9/10	8/10	8/10	15/10	14/10
	duration	178	169	172	191	191
10	The average annual wind speed m / s	1,7	-	1,8	3,8	2,4

5.1.3 GEOMORPHOLOGY AND GEOLOGY

The project area has a complicated geographical characteristics and very varied terrain, is located between the ridges of the Northern Tien Shan in the south, Lake Balkhash - the north-west and the Ili River - the north-east, to the east by China.

The Almaty region is a sub mountain plain of the south-western range of Karatau. A significant part of the region is occupied by the Balkhash-Alakol and Ileyskaya valleys (fig 5.2.).

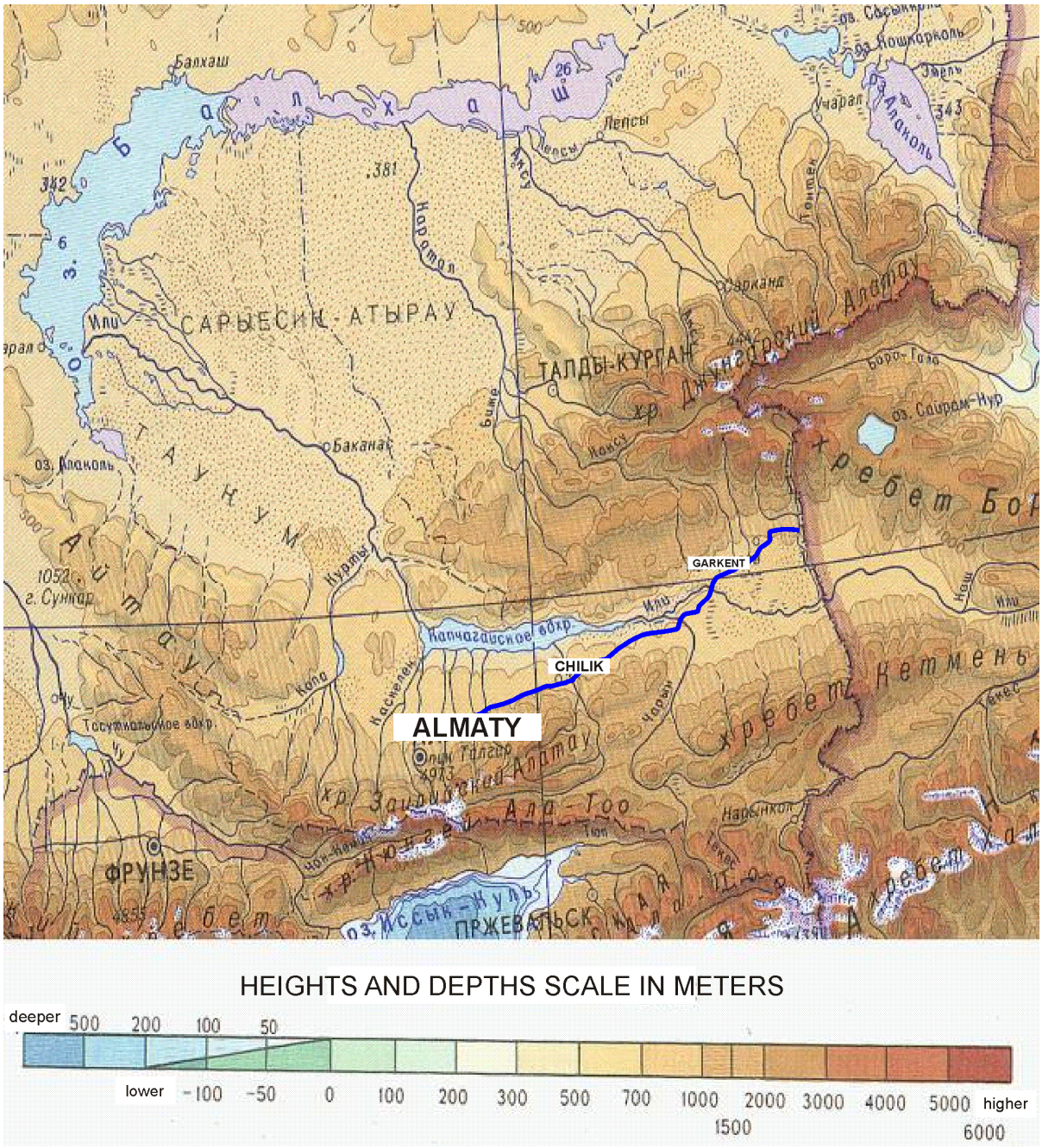


Fig. 5.2. Contour Map

Geographically, the area of the projected road in Ili Rayon is an extensive mountain valley, which extends between the Junggar Alatau mountain ranges in the north and Ketmen Zailiyskiy and Tau in the south. Around the middle of this basin is a sharp narrowing of the valley passing almost to the river and hills Katu and Kalkan on the right side and mountains on the left bank known as Boguty. Local morphological conditions in the Ili Valley location determine the specific conditions of formation of runoff streams of

northern exposure. The mountains here block the north -westerly direction air masses, so there is precipitation and streams.

Along the foothills bordering to the north and south of the mountains, Ili basin delineates technological faults that define its high seismicity. The area through which the alignment passes is classified as a 9 out of 12 in the Modified Mercalli Intensity Scale (MMI) Destructive to Violent. . The valley is composed of a thick layer of red sandstone, sandy clays and sands with some gravel and conglomerates. Sandy alluvial riverbeds in the valleys have been affected by the wind and have formed sand dunes.

5.1.4 SOILS AND SOIL FORMING ROCKS

Almaty Oblast has complex soil conditions. Soil characteristics and formation are affected by climate, hydrological conditions, geological structure, vegetation and other factors.

The project area is within a semi-desert and desert area. Examination and classification of soils was carried out according to the "systematic list and the main diagnostic indicators of soil of Kazakhstan." and included both a consultation of existing soil maps and atlases for Kazakhstan, as well as soil sampling and classification during the geotechnical investigations done during preparatory works. The soil cover includes heterogeneous light gray soils, underdeveloped, gray-brown, sand ridges and hilly areas in conjunction with clay saline soils. Soils are mostly saline. Mechanical composition differs from sands to clay loams and light clay. Soil-forming rocks are mostly saline alluvial - talus deposits, represented by loam, sandy loam and sand.

The most important aspect of the soil characteristics is its suitability for removal, retention and subsequent use. In accordance with GOST 17.5.3.06-85 (Definition requirements for removal of topsoil and excavation) Standard 15.5.1.03-86 (Classification of overburden and host rock for biological reclamation of land) all soils were investigated for fitness for removal and subsequent use for bioremediation are divided into two groups:

Group 1: Soils with limited agricultural value

Light-chestnut medium depth general, light chestnut slightly saline ferrous mixed with medium saline ferrous 10-30%, meadow-light chestnut general medium depth general, mixed with meadow boggy soil meadow gray general soil with slightly saline 10-30 %

These soils have humus depth level from 20 to 47 cm. Humus content ranges from 1,65 to 3,31%. Mechanical makeup comprises medium-hard sand-loam. Recommended depth to remove from 20-40 cm

Group 2 Soils with significant agricultural value

The second group comprises: meadow light chestnut medium saline with meadow-boggy medium saline 10-30%, light chestnut slightly truncated (eroded) with flood meadow 10-30%, light chestnut heavily saline mixed with hydromorph 10-30%, grey common medium eroded oil, grey general heavily saline, grey common heavily saline medium eroded mixed with meadow boggy 10-30%.

Normally this soil is not recommended for removal but since it is common within river valleys in the area it is not possible to avoid. As this soil type is considered more valuable for agricultural purposes any activities disturbing or negatively affecting it shall be minimized to the extent possible, e.g. the soil type shall be considered for temporary works such as haul roads, laydown areas and camp-sites, to minimize impacts and ensure that restoration is diligently carried out. .

is largely not irrigated comprises low quality grazing land or unused semi arid desert. Land will be required on a permanent basis for the road alignment and access roads and junctions: this includes in addition to the agricultural uses a limited number of commercial and industrial buildings. No residential uses will be required. Acquisition has now largely been completed and this is reported in full in the Resettlement Investigation report (RIR). Some acquisition (86 separate land plots) have not yet been acquired for all 3 Sections of the alignment.

The definition of land required for the construction was made during the field survey by the land management agencies and environment protection agencies. The total private land required within each Rayon is shown below. Most of this land has already been acquired and compensated.

Table 5.2 Land required permanently for the alignment

Rayon	No. of Owners	Area of Land	Note
Enbekshikazakh	470	491.72	Part also within Section 1 of alignment
Uigur	2	3.38	Part also within Section 3 of alignment

Additional land will be required for borrow pits for construction material, and for temporary construction access and for construction depots, workshops and workers accommodation. Contractors will obtain access to all land required for temporary use solely through negotiation with the owner or user; there will be no temporary land acquisition through application of government acquisition taking powers. In all cases most of the land required permanently and temporary is agricultural crop and pasture land or unconverted land. In accordance with the requirements of Government land legislation it is necessary to ensure that all land used temporary for construction are returned to their original condition through a reclamation program. The technology, procedures and materials are specified in the relevant section of the design.

5.1.6 HYDROLOGICAL CHARACTERISTICS

Surface water

Although rainfall is comparatively low as indicated in section 4.2 the Almaty region is fairly rich in water resources due to the proximity of the mountains, where precipitation is higher and snow-melt and glaciers provides a perennial runoff. The region is drained by a number of large rivers and lakes which flow into the internally closed (Endorheic) Balkhash Basin at Alakul. The most significant waterway is the Ili River. Other rivers include the rivers Karatal, Aksu, Tnetek, Yrgayty, Kaskelen Talgar, Large and Small Almatinka, Shyryn, Turgen, Sholak, Lepse, Issyk Shelek, Charyn, Horgos, etc.

Since all major rivers originate in the high mountains and are perennial due to snow melt, melting of glaciers and significant all year rain, but some of the smaller rivers become dry during the summer season. Short duration flooding may occur during the period March to June when river flows and rainfall levels are higher. The planned road is located between two main rivers, the Shelek and the Charyn. The Charyn River is the largest tributary and is known in the upper reaches as the Chalkudyksu. The total basin area is 7720km ^{2} and river has a total length of 427km. Source of the river is located on the southern slope of the Ketmen ridge.

The main watercourses in the Charyn river basin are:

Dungan canal which is an artificial canal. It is used for conveying water from Charyn river, and to collect extra irrigation water. This canal's main feature is that it crosses and partially regulates the whole temporary water runoff from northern side of Ulken-Boguty mountains.

Karakuldek distributor – does not have direct connection with Charyn river. Water flow is created by runoff from Boguty mountain slopes and runoff from irrigation system.

Charyn distributor – this was the main distributor in the lower reaches of the river. However due to agricultural activity, water flow regimes have changed significantly.

Zhalysu duct – does not have direct connection with Charyn river, and is formed by water runoff from the irrigation system.

Karayeren distributor – has connection with Charyn river through irrigation canals.

Tashkarasu distributor – is the mainstream of the river. A new water reservoir is constructed in the upper reaches, which regulates water flow.

Zhilisu creek – does not have direct connection with the main Charyn river (Tashkarasu). Water flow is formed from waterlogged lowlands in Akterisken tract, which is created by runoff from irrigation system, return flows from irrigated lands and precipitation.

Ground water

The Design Engineers supplemented the existing data and literature in the area by a series of boreholes along the alignment at approximately 500 meter intervals in relatively flat land and more frequent where there are gradients.

Groundwater characteristics of the area is shown in Fig. 5.3.

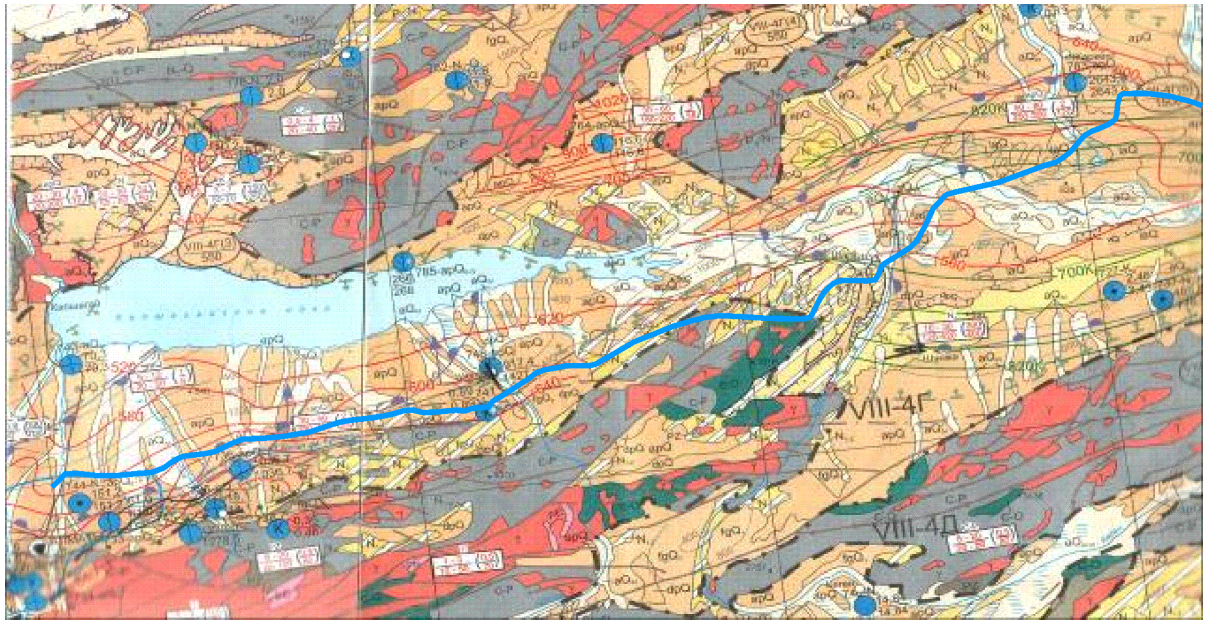
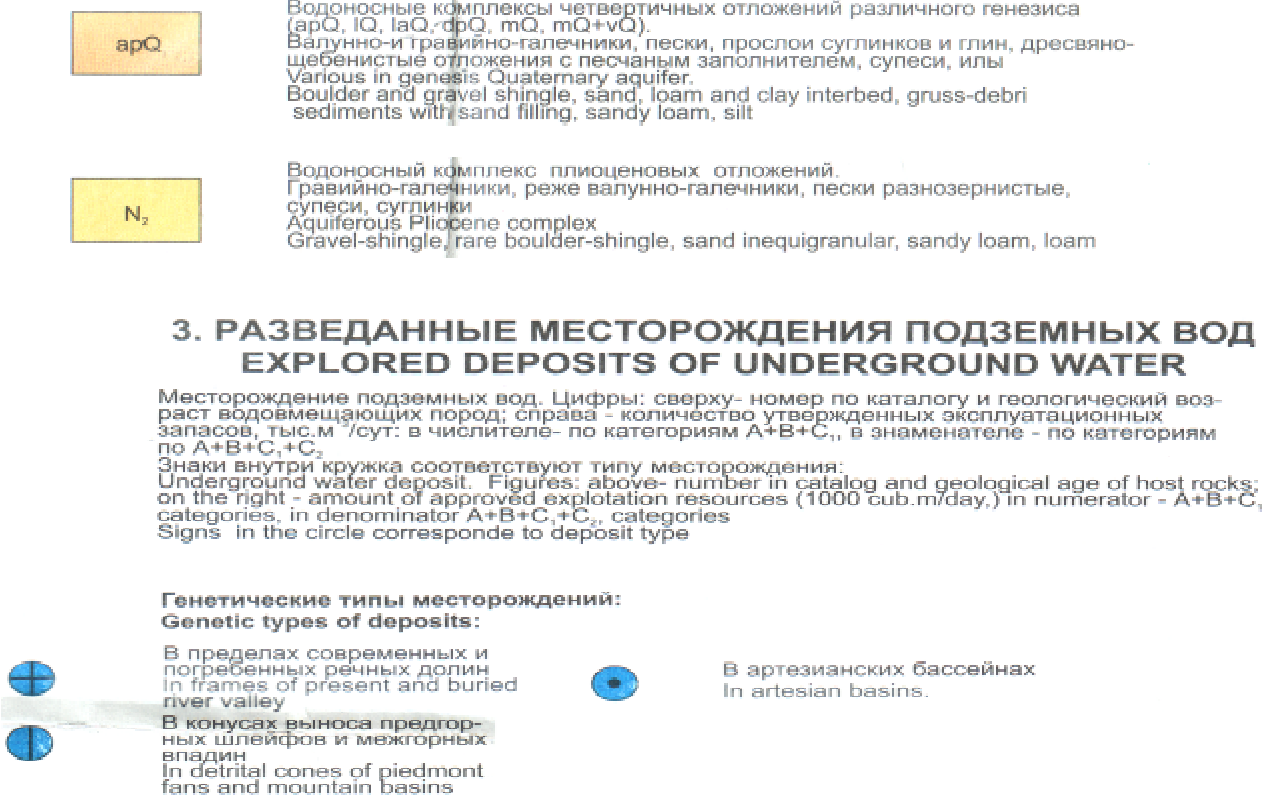


Fig. 5.3 - Hydro geological map of the projected road



The general movement of groundwater is from the slopes of the mountain ranges in the south of the project area downwards into the plains in the north. In terms of groundwater flow four hydrological regions have been defined: mountain slope, foothill stage, piedmont and alluvial proluvial plain. Regarding the typical aquifers, on the mountain slopes groundwater is mainly stored in the fractured rocks, with the most intensive water recharge in the weathering zone and in tectonic fracture zones. Due to strongly dissected relief, only part of the flow goes into the valley by underground routes. In quantitative terms, the flow to the lowland area is at an average of 6.5 liter / sec per square km. The remaining flow, going into the valley by underground ways, according to data of the Institute of Hydrogeology, is estimated at 1.7 liter / sec per square km.

Generally underground waters occur between 1.0-20.0 m deep. In irrigated land underground water level occurs at 0,8-1,0 m depth. Chemical properties vary greatly. Slightly salty and salty waters dominate, with salt content from 1.5 to 5.0 g/l. Excessive mineralization occurs because of stagnant conditions and sandy salty soil.

Using data from the Almaty Hydro Geological Station, it is possible calculate the ratio of the quantities of water, coming from different sources. The figures are, filtration of water from the river beds (50-60%) and inter-farm network of irrigation (10-16%), underground drainage from the mountain range (8-14%), infiltration of rainfall (9%), filtering of irrigation water (9%) and condensation of water (2%), are involved in groundwater recharge of the alluvial fans.

The total groundwater flow from the foothills is estimated at 27.2 liter / sec per square km.

A proluvial-alluvial plain occupies the bottom of the valley. The deposits, forming the plain, are represented by sands, gravels, sandy loam and loam interbedded clays. Movement of groundwater

final discharge of groundwater flow occurs in three ways: passing out into the Ili River, the outflow of the alluvium of the valley and the vertical flow into upper aquifers. The main discharge of groundwater for the foothill plain occurs on the valley itself and the main loss is the evaporation.

Ground water levels lie at 3-9 m in Ili river basin and 15-20 m on the interim spaces between rivers.

Aquifers

An aquifer system of coarse boulder-pebble deposits of alluvial fans is located in the foothills. The deposits are characterized by high water abundance. Near the riverbeds the water is fresh, characterized by bicarbonate calcium, with dry weight of 0.2-0.3 g / l, the remaining area is dominated by sodium sulfate saline water (1.4-2.8 g / l).

The aquifer system is of sandy-clayey Quaternary piedmont plains. This complex contains the ground and artesian water. The ground water is at the depth of 3-9 m in the valley of the Ili River, and up to 15-20 m in interfluvial spaces. Water below the local base is fresh, calcium bicarbonate, with solids up to 1 g / l, in the upper aquifers it is brackish, sulphate-sodium, with a dry residue of 1-3 g / liter. Artesian water on the plains is wide spread. Typically, the thickness of alluvial deposits, proluvial piedmont plains contain some confined aquifer, whose thickness varies from 1 to 18 m. Artesian water is fresh hydro-carbonate-calcium and calcium-sodium.

At present, about 50 locations of ground water in the Almaty region have been exploited. The locations of that water is shown in Figure 5.4.

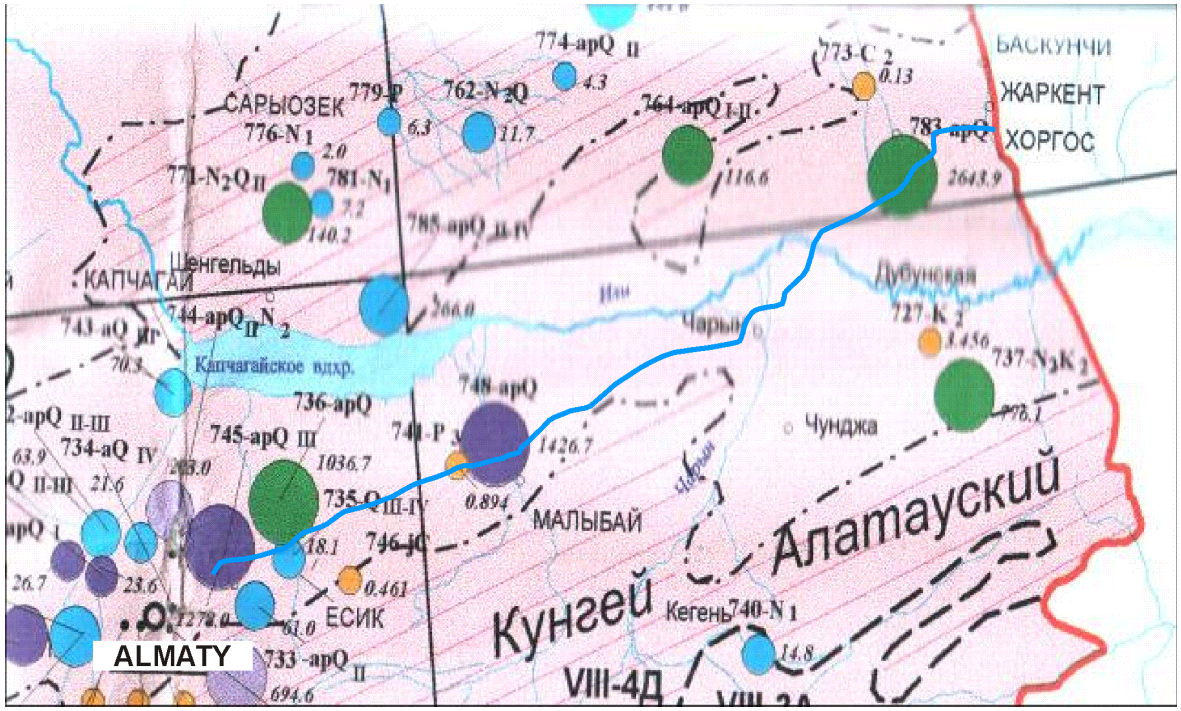
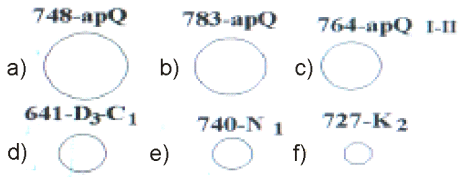


Fig. 5.4 – Deposits groundwater area of the projected road



Deposits with confirmed ground water reserves, thousand cubic meters/day
a) more than 1000; b) 500-1000;
c) 100-500; d) 50-100; e) 10-50;
f) less than 10.

Note:
numbers over symbol - index number of deposit;
after hyphen - geological age of aquiferous rocks.
To right - explored reserves, thousand cubic meters/day.

USE OF GROUND WATER

- Household-drinking water supply
- Production-technical water supply
- Household-drinking and production-technical water supply
- Household-drinking water supply and agricultural irrigation
- Household-drinking, production-technical and agricultural irrigation
- Agricultural irrigation
- Mineral

VIII Djungar Tyan-Shan region

1st order pools:

VIII-2 Central-Tyanshan
VIII-3 North Tyanshan
VIII-4 Djungar-Balkhash

The semi arid area support limited plant and tree growth. The light-chestnut and gray soils are suitable for fescue-wormwood vegetation with some summer cypress. Other vegetation includes: bulbous bluegrass, broom, small sedge, and poppies.

Fauna

Within the vicinity of the road are rodents: squirrels, jerboa, field mouse. Representatives of insectivores include hedgehogs, shrews, and reptiles such as lizards and snakes.

Although the area between the villages of Norly and near to Charyn could be described as a natural landscape with arid and semi arid vegetation there have been significant changes and disturbance in recent years. The provision of irrigation to areas west of Norly and in areas to the north and west surrounding Charyn has converted large areas to crop cultivation and denser grazing. This has obviously affected the original natural flora and fauna. In addition the construction of the first road east to west in the early 1980's brought further disturbance to the area. In more recent times the construction of the railway line, the gas pipeline and an electricity supply line has brought further development and disturbance to the natural environment. The flora and fauna will obviously have been impacted and the area can no longer be classified as pristine and natural. Some grazing of animals takes place by traditional herds and local farmers.

Norly Drainage Area

Near Nurly the introduction of irrigation to the landscape, probably in the 1980's has also probably caused the changes to the landscape and flora north and north east of the settlement. There is now an extensive waterlogged area of about 1-2 km^3 which crosses the existing road, built in 1984, though most of the wet area lies to the north of the road. The proposed alignment straightens this section of the exiting road and will cross the wet area. This section from km 19 to km 27 (6.2 km) of the new alignment creates a shortening of about 2.6 km. The "wetland" area appears to be a result of the extensive irrigation program that took place in the 1980s some of which is leaking and has never been properly repaired. The design engineers were fully aware of the issue and a separate hydrology report was prepared for the area. According to the report the road in the proposed alignment that crosses the water logged area will assist in the drainage of the area. The road will be on an embankment (3.0 -3.5 m high) and culverts will allow the flow of water downhill to the north. The general conclusion is that the wet area is not natural and was caused by irrigation problems. This specific wet area is considered a consequence of improper methods and regimes of agricultural irrigation, which led to salinization, which in turn led to lower rates of surface evaporation.

The Hydrology report gives no detailed description of flora and fauna, except general mentioning of reed plants and their decaying residuals in soil. During the Consultants site visit to the area there was no obvious presence of any significant numbers of birds or any other animals. Nevertheless there may be a possibility that some fauna, particularly bird species may have moved into the area attracted by the water environment and the possible presence of insects and other food. However based on information obtained from the Shelek Forestry Office of Enbekshikazakh Rayon they have not observed any evidence of any number of Flora and Fauna habiting the wet area. Pheasants have been spotted and there are some Silverberry or Oleaster, all of which occur throughout the project area and are not dependent on this specific habitat type.

Cattle grazing occurs around the edge of the wet area which may inhibit some birds and mammals

Although there have been changes to the local environment there has also been a process of strengthening the conservation and sustainability of the existing flora and fauna, as well as the natural landscape in the area. The Altyn-Emel National Park north of the Ili River was created a National Park in 1996 and south of the Section 2 alignment the Charyn National Park was created in 2004. The Altyn-Emel National Park lies approximately 6 kilometers north of Section 2 at its closest point. The Charyn National Park lies approximately 2 kilometers south of Section 2 at its closest point. At their closest points the two National Parks are approximately 10 km apart. The existing and proposed 'communication corridor' between the villages of Shelek and Charyn may have been one of the reasons why the two National Parks were not defined as a contiguous area.

National Park Relationship

There have obviously been many changes to the local environment in recent years but it is importance to determine whether the proposed road will have a significant impact on the wildlife in the immediate area outside the two National Parks and whether there will be any impact on wildlife within the two National Parks. Many animals will still be able to travel across the alignment. The main impact will however be on animal movements (if any) between the two national parks. Although there will be no direct disturbance to the National Parks during the construction and operation periods there may during certain periods be indirect impacts to fauna in both parks. As referred to above, although disturbance has been taking place to the Norly to Charyn corridor for many years (due to the railway, gas pipeline and former road alignment), some Fauna still use part of the corridor to pass between Charyn and Altyn-Emel.

The Consultants have had discussions with the Forestry Departments in Enbekshikaskh and Uigur Rayons and with the Directors and Deputy Directors of Charyn National Park and Altyn-Emel National Park. All institutions confirm that there are populations of the following:

The Goitered Gazelle is normally 60-75 cm high with a weight of 18-33 kg. Goitered Gazelle are defined as "Vulnerable" by the International Union for Conservation of Nature - IUCN and is included in the Kazakhstan Red Book. The National Park at Altyn-Emel has stated that there is a population of approximately 3000 Gazelle within the Almaty Oblast. Charyn National Park believes that there are 15-20 individuals in the northern part of the Park. The Gazelle roam in small groups within the area, depending on water and food sources, weather conditions and any disturbance from livestock and human presence. They tend to move to lower areas near the Ili River during the winter period, but there are no recorded long distance migrations or recognized patterns of movement.
Both National Parks are involved in ensuring the long term future of the Gazelle and a first response from the authorities gave no indication that the planned road would substantially affect the migration behavior of the Gazelle and could lead to negative impacts such as high numbers of road-kill or the fragmentation and isolation of habitats. It is recommended that during the disclosure period this issue is investigated in more detail, including further field research, consultations with authorities (national parks, forests) and academia, and a thorough research of published literature and national or regional strategies, programs or initiatives. Based on the findings of these additional, detailed investigations design changes would be suggested, if indicated, and included into the construction designs of the Contractors upon request by the Client, and processed as variation orders.

Siberian Roe Deer are to be found throughout the area both within and outside the National Parks. These Deer are widespread throughout Russia and Central Asia. They are not defined as Threatened, Vulnerable or Endangered and are common throughout the area. No information on the population levels apart from those provided by the Uigur Rayon (see below). They can be found both within and

Separate information obtained from the Forestry Department at Uigur Rayon has shown that there is a population of Goitered Gazelle (Listed in the Kazakhstan Red Book), the Siberian Roe Deer and Wild Boar within the Rayon. These populations are regularly monitored and a small quota is allowed to be hunted (7% of Goitered Gazelle and 10% each of Siberian Roe Deer and Wild Boar). Estimated total populations in a 2010 survey within forest areas in the Rayon was 455 Gazelle, 432 Roe Deer, and 427 Wild Boar. These figures relate to populations in designated Rayon forest areas within and outside the National Parks within Uigur Rayon.

In general the National Parks Directors and the Rayon Forestry Departments conclude that the proposed road will not act as a major barrier or deterrent to the movement of any of the lager mammals referred to above provided adequately positioned and spaced, and sufficiently dimensioned underpasses are provided. The Charyn National Park and the Rayon Forestry Department is particularly concerned about the recently completed railway line which has few crossing points and does create a barrier to free movement at present, albeit much easier to cross due to much less frequent traffic

Flora and Fauna Impact Conclusion: Construction and Operation Periods

In conclusion there is a potential that the natural flora growing close to the road may be adversely impacted by the construction and operation activities. This is, however, unlikely to be significant, but appropriate mitigation, management and monitoring should be planned for the construction period and included into tender and contract documents.

Concerning Fauna, the area, though acting as a communication route is still in many respects a sensitive area, particular in terms of ensuring all wildlife can pass through the area without disturbance and physical deterrents. The conclusions from the Directors of the National Parks and the Rayon Forestry Departments is that with the provision of suitable crossing points the potential impact on wildlife in the area can be sufficiently mitigated and the sustainability of the vulnerable Goittered Gazelle will not be affected.

5.1.8 SOCIAL AND ECONOMIC CHARACTERISTICS

The road passes through a rural area with low population densities. The total populations of the 2 Rayon through which this Section of the road passes are as follows:

Table 5.3 Population of Rayons in Section 2

Rayon	Population (Estimate Year 2010)
Enbekshikazakh	219,412
Uigur	64,762

The area through which Section 2 passes is predominantly semi arid with some irrigated agriculture up to approximately Norly village at km 144. Apart from the largely deserted settlement of Norly there is no other settlement in the vicinity of the road alignment. Irrigated land at Charyn and Tashkarasu lies some 5-10 kilometers south of the alignment.

The Uighur district was formed in 1934 and is located in the foothills of the Trans-Ili Alatau ranges between Ketmenskim ridge and the plains of the Ili basin.

The district's area is 8.7 thousand sq. km with a population of 63.8 thousand people. There are 25 settlements and 14 rural districts. The centre of the Rayon lies 243 km from Almaty. The population density is 7.3 persons. per sq. km. Uighur Rayon produces a large variety of herbs, apricot, apple, grape and berry crops. The Rayon has coal deposits and has some gold deposits at Altynkentskoe.

The Rayon has irrigated agriculture and sheep and beef cattle. In the recent past the district had 42.2 thousand head of cattle, 202.6 thousand head of sheep and goats, 12.1 thousand head of horses, 85.8 thousand head of poultry. The main production is grain, vegetables, various fruit, grapes, beef, milk, eggs and wool. Also some 10 years ago the district had 195 economic entities, including 57 small businesses and 1520 farms. There are approximately 30,000 economically active people in the Rayon.

Enbekshikazakh Rayon

The following paragraph describes the whole Enbekshikazakh Rayon. Most of the industrial and commercial activities described are located west of Shelek in Section 1 and are not in the vicinity of Section 2 of the alignment.

The District was formed in 1952, the area is 8.3 thousand km^2. The area comprises irrigated and rain-fed agriculture and includes horticulture, poultry, wine, fruit and tobacco growing. The agricultural sector is very strong and represents 64% of the local economy. The industry sector occupies about 34% of the local economy. with 13 large and 24 medium-sized enterprises, which accounted for about 75% of all production. The industrial sector is represented by enterprises that process agricultural products.

Similar to Talgar Rayon there are a range of industrial and commercial enterprises in Talgar town, but the existing main road (A351) is the location for many service industry and commercial activities. Petrol station and vehicle sales and repairs are the most common uses located on the road. Restaurants, convenience stores and temporary stalls selling local fruit, vegetables and other local produce are also located adjacent to the road and provide a service to the local community and to the travelers along the road. The regularity of these establishments becomes less further from Almaty. There are a number of service and commercial uses along the existing route that by passes Shelek.

5.1.9 PHYSICAL CULTURAL RESOURCES

One of the issues that must be considered during the construction of the road is the preservation of historic and cultural monuments which includes structures, memorials and other objects associated with historical events in the life of the community. This includes materials of historical, scientific, artistic value (old buildings, graves, archaeological sites), as well as unique natural reserves, national parks etc.

An archaeological survey of the proposed alignment was conducted by State Enterprise "Institute of Archaeology AH Margulan KH MES. The regulation states that "the economic development of the area through the construction of roads in the specified area is allowed subject to the conditions stipulated in Article 39 of the Law of the Republic of Kazakhstan On protection and use of historical and cultural heritage. " This includes a full archaeological investigation of monuments located in the

cultural heritage.

Based on the above law, studies were carried out at the following archaeological sites in the Almaty catchment area.

In the Almaty Oblast area there are numerous mounds and remains. However based on the survey carried out for this Section of the alignment there were no cultural or archeological sites or remains found directly on or immediately adjacent to the alignment.

5.2 ENVIRONMENTAL IMPACT ASSESSMENT: SECTION 2

5.2.1 INTRODUCTION

During the construction of roads the main types of environmental impacts normally are:

- Air pollution caused by exhaust gases of various construction vehicles and various moving and stationary equipment;
- Noise caused by machines and equipment and various other construction activities;
- Contamination by dust from wear of road surface, from construction materials and from the transportation of construction materials.;
- Possible contamination of agricultural food production activities during the extraction of road building materials, dredging, and new construction activities;
- Potential contamination of top soil, surface water sources, ground water resources, and vegetation adjacent to the road;
- Disturbance to nesting birds and the habitats of animals;

During operation phase impacts such as air, noise etc are dependant on the distance from the carriageway.

- Air pollution and noise from all vehicles passing along the new route;
- Contamination by dust from, wear of road surface and erosion of adjacent soil ;
- Potential pollution of surface runoff from the roadway;
- Potential pollution of groundwater from run off and other contamination;

Zones of Impact

The following corridors adjacent to the carriageway have been defined:

- Zone of Impact: A corridor of up to 3,000 meters where some impact of the road may occur or be measurable;
- Protection Strip: A strip adjacent to the right of way where some impacts will occur. In some cases the impact may be significant; noise and air quality, drainage impacts, soil contamination etc.
- Reserve strip: A strip within the right of way that is required for emergencies, potential long term use for the road, for road services and cuttings, and embankments. Significant impacts will occur and changes to the local environment will already have been carried out during the construction of the road.

Approximate dimensions of the zone of impact, protection strip, and reserve strip are shown in Table 5.4.

Table 5.4 - Estimated size of the zone of impact, the protection strip and reserve strip

Impacted zones	Distance from road, m, For environmental class of road		
	I	II	III
Zone of Impact	3000/1500	2000/1000	600
Protection strip	250/150	150/90	60/30
Reserve strip	30	12	-

5.2.2 AIR IMPACT

Construction and Operation Period

The proposed construction and operation of the road will be accompanied by emissions of pollutants during the construction period (emissions from construction activities and operation of motor vehicles and machinery), and emissions from vehicles traveling on highways during the operation period.

Table 5.5 lists the typical emission sources during the construction and operation of a major highway.

Table 5.5 – Emission source characteristics

Works type	Name and characteristics of emission sources	Name of potential air emissions
1	2	3
Construction	Dust generation during works	Inorganic dust
	Exhaust gases from internal combustion engines	Nitrogen dioxide, soot, carbon monoxide, benz(a)pyrene, carbohydrates
	Welding	Iron oxide, manganese and its compounds, hydrogen fluoride
	Paint works	White spirit, xylol
Operation	Exhaust gases from internal combustion engines	Nitrogen dioxide, soot, sulfur dioxide, Carbon monoxide, carbohydrates C12-C19, lead compounds

The composition of engine emissions comprise: carbon monoxide, hydrocarbons, nitrogen dioxide, lead, sulfur dioxide and particulate matter (soot).

The assessment of the level of air pollution caused by exhaust gases is based on a computer program. The predicted amount of pollutants emitted into the atmosphere during the construction and operation of the facility is presented in Table 5.6. The values of maximum permissible concentration (MPC) of pollutants is obtained from the sanitary-epidemiological regulations and guidelines "Sanitary-epidemiological requirements to the atmospheric air." № 629 of the Republic of Kazakhstan of 18 August 2004. The data listed in the table are obtained by summing the emissions for each component calculated in Appendix 2.1 using the methods agreed upon by the Ministry of Environment of the Republic of Kazakhstan. Assessing the impact on the air during the operation period is based on traffic forecasts up to 2028 prepared for the Feasibility Study.

The calculated value of acceptable concentration of harmful substances contained in exhaust gases from the various types of cars in mixed-flow traffic is shown. The impact on the atmosphere is considered acceptable if the content of harmful substances in atmospheric air of populated areas does not exceed the maximum permissible concentration laid down in SanPiN "Sanitary-epidemiological requirements to the atmospheric air" dated August 18, 2004 N 629.

Table 5.6 Section 2: Calculated exhaust emissions (MPE) of operating machinery during construction of the road

№ pp	Source selection hazardous substances	View Fuel	Consumption Fuel, tons	Emissions for the period construction, t				
				CO_2	CH	NO_2	C	SO_2
	Specific emissions of tons / tonnes of fuel	diesel gasoline		0.01 0.07	0.03 0.10	0.04 0.04	0.05 0.005	0.02 0.002
1	Watering machine ZIL - 130 6000 l	gasoline	1598.93	111.9	159.9	333.1	63.96	3.20
2	Grader DZ-31	diesel	56.28	0.56	1.69	2.25	0.28	0.11
3	Asphalt distributor	diesel	3.60	0.36	0.11	0.14	0.18	0.05
4	Asphalt	diesel	70.76	0.71	2.12	2.83	3.54	1.41
5	Bulldozers	diesel	569.23	5.69	17.08	22.77	38.46	11.38
6	Rollers-propelled 8 tons, 13 tons, 16 tons	diesel	523.99	5.24	15.72	20.96	26.20	10.48

7	6.3t cranes to move car	diesel	2.47	0.02	0.07	0.10	0.12	0.05
8	25t crane on crawlers	diesel	30.24	0.30	0.91	1.21	1.51	0.60
9	25 ton crane to move pneumatic	diesel	177.43	11.77	5.32	7.09	8.87	3.55
10	Marking machine	diesel	1.54	0.015	0.05	0.062	0.08	0.031
11	Tractor 108 hp	diesel	143.30	1.43	4.78	3.58	2.87	7.16
12	Tractor 80 hp	diesel	0.04	1.33	1.0	0.8	0.019	2
13	Excavator E-652B, 0.65 m^3	diesel	62.37	2.08	0.42	0.64	0.70	0.28
14	Excavator E-10011, 1 m^3	diesel	1351.93	13.52	40.56	54.08	67.60	27.03
15	Drilling machines with a tractor of 85 kW 115 hp	diesel	0.47	47	15.66	11.75	9.4	23.5
16	Earth borer	diesel	0.66	66	22	16.5	13.2	33
	Total:	diesel	2994.31	156.0	127.5	144.76	173.0	120.6
	for the period of construction	gasoline	1598.93	111.9	159.9	333.1	63.96	3.20
	Total:		4593.24	267.9	287.4	477.86	237.0	123.8

Assessing the level of impact on adjacent residential areas and sensitive uses is based on modeling of emissions in the atmosphere, according to "Methods of calculating concentrations of air pollutants contained in the emissions of businesses. RND 211.2.01.01-97" In calculating the dispersal of emissions from vehicles and to determine the concentration of toxic substances at a distance of 20 meters from the road the model used a Gaussian model distribution of pollutants in the atmosphere at low altitudes. The results of calculations of air pollution are presented in Appendix 2.1.

Calculations have been made for a single concentration (MPC) in accordance with SanPiN "Requirements for atmospheric air of populated areas» № 3076 from 841 from 18.09.2004g 3.12.2004g. Approved by the Ministry of Health of the Republic of Kazakhstan. Calculations have been prepared and are shown in Table 5.7.

Table 5.7 – Motor vehicle emissions dispersion calculation

Emission type	Calculated at 20 meters from road, mg/m^3	MPC m.s., mg/m^3	Average daily MPC, mg/m^3	Hazard class
1	2	3	3	4
Carbon monoxide	0,056	5,0	3,0	4
Hydrocarbons	0,011	1,0	1,5	3
Nitrogen oxide	0,0056	0,085	0,04	2
Lead compounds	0,000032	0,0010	0,0003	1

Conclusion Construction and Operation Periods

Construction: Construction: The detailed calculations for construction and operation periods yield results that are within the limit values prescribed by Kazakh legislation. Also since the alignment passes through predominantly open rural land with no sensitive uses near the alignment the adverse impact on any community will be minimal. Regular monitoring of air pollution against Kazakh standards (and international, e.g. WHO, for any parameters not covered by local regulations) shall be carried out throughout the construction period. The party responsible for monitoring will be the Contractor, who will be obliged to report to the Engineer as well as local environmental authorities.

Operation: The results show that the magnitude of the impact of transport on the air quality does not exceed the maximum allowable concentrations to a distance of 20 m from the nearest traffic lane. During the

operation phase concentrations of toxic substances contained in exhaust gases within the areas adjacent to the road are within the allowable MAC, and do not adversely impact on the environment or sensitive uses.

5.2.3 NOISE AND VIBRATION IMPACT

Construction Period

The various mechanical processes during the construction of roads are a source of intense noise, which can adversely affect humans. The intensity of the ambient noise of road machinery depends on the type of machinery and equipment and the distance from the workplace to sensitive and residential development. Especially problematic is the noise created by the work of bulldozers, vibrators, compressors, excavators, and Diesel Trucks. The noise produced during construction is temporary and localized but can still create an annoying impact.

Noise from trucks greatly exceed noise from most other vehicles and can become a particular problem during construction. Factors such as traffic volume, fleet composition, speed, operational condition of the vehicle freight operating condition of the road have the greatest impact on the noise level. Trucks, especially from diesel engines can cause noise levels up to 15 dB higher than cars.

A special problem is the noise of heavy trucks, working in quarries, where their limited speed capabilities and long periods working on idling. The noise level of trucks and all road construction machinery used for road reconstruction can be within 75-90 dB range. Noise from bulldozers, scrapers, pneumatic hammers, vibrators and other machines can be considerable. The noise from a single the scraper is 83-85 dBA, while unloading dump 82-83 dBA, from working with soil compaction rollers is estimated at 76-78 dB.

According to GOST 12.1.003-83 Section "Noise" standards for noise level have been adopted of 70-80 dBA. Zones with noise level above 80 dBA must be marked with safety signs.

To ensure acceptable noise levels construction activities should not take place at night. Soundproofing of the engines of construction road vehicles should be carried out with multilayer coatings of rubber, foam rubber, etc. Through the application of insulating coatings the noise of cars can be reduced by 5 dBA.

Conclusion Construction Period: In view of the isolated characteristics of the area through which the road passes it is concluded that there will be no construction noise impact on any housing or sensitive uses. From experience and engineering judgment it is predicted that noise levels will remain below the levels recommended in the regulations referred to above.

Possible existing borrow pit locations have already been indicated by the Design Engineers for Section 2. The sites are approved locations and the selected Contractor will – in consultation with Engineer and local environmental authorities – propose at which locations are most suitable to start exploitation activities. .

Whichever sites are used existing local roads will be used as access to the road construction site. On the main road it is unlikely that the construction traffic will have a significant impact on traffic flows and noise disturbance to the existing communities but this will need to be reviewed and monitored in detail prior to the commencement of the construction period. For the minor roads that cross the new alignment and for any access routes construction traffic will significantly increase traffic flows and potential noise disturbance. A traffic count on all possible access roads to road construction site together with a regular monitoring program will be prepared prior to the commencement of the construction period as part of the environmental due diligence and management measures.

Operation Period

Operation noise levels are influenced by traffic volume, fleet composition, speed, vehicle operating condition, age of vehicle, and condition of the road. Sources of noise on the car are the engine and the tire noise hitting the road surface. The noisiest are heavy trucks and trailers with diesel engines; the most "quiet" are new and more expensive cars.

Maximum allowable noise levels (PDU) of noise - this is the factor level which is in daily work (during the working experience) should not cause annoyance, distress or cause or worsen health of the present or future generations.

Calculated MPL are adopted in accordance with the "Standard Specifications of noise levels in residential and public buildings and housing areas» № 841 dated from December 3, 2004, by the Ministry of Public Health of the Republic of Kazakhstan.

Permissible maximum levels of noise, caused by vehicles, are adopted in accordance with the above standards, it is 70 dBA. Analysis of the results obtained from noise level calculations shows that the distance from the road for the 70 dBA standard is approximately 20 meters without installation of any noise barriers, and 10 meters with the installation of appropriately designed barriers.

Conclusion for the Operation Period

In conclusion during the operation period the predicted noise impact to any residential or sensitive uses will be minimal, and where required can be further reduced by appropriate engineering measures, such as sound barriers, plantations and landscaping elements. This approach has successfully been implemented in the World Bank financed “South West Roads Project” which has similar objectives, approach, dimensions and issues. During operation regular monitoring of the noise situation and characteristics along the alignment and the access roads will be necessary. If any additional mitigation measures will be included in the repair and maintenance budget on a running basis and carried out within those activities. No changes to the design of the alignment will be necessary.

5.2.4 HYDROLOGICAL IMPACTS

This Section covers 1) the availability of water for the construction and operation of the road and 2) the potential impacts including contamination impacts that the road will have on water resources in the area: surface and groundwater.

Water Needs for Construction Period

The planned construction work on the site of the proposed road will require water for construction activities and for drinking and domestic needs of the construction workers.

Consumption of water for construction for compaction of sub grade and washing of road-building materials is estimated to be 451 733 m3. The required amount of water is based on "Estimated ratios and costs for construction work."

Water consumption for drinking water supply is calculated out in accordance with the legislation of the Republic of Kazakhstan. The water consumption for the period of construction of the road is based on and average of 27 l / day per person according to SNIP 2.04. 01-85. Consumption of water for domestic needs (washing, cooking etc), based on the number of employees, estimated at 400 people for a projected construction period (12 months) are shown in Table 5.8.

Table 5.8 – Water needs for drinking and household use and generation of wastewaters during construction period

Type of water use	Number of workers	Number of working days	Rate of consumption, m^3 / day	Discharge, m^3/ day	Water consumption		Wastewater	
					m^3 / day	m^3 / year	m^3 / day	m^3 / year
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Drinking purposes	400	347	0.002	0.002	0.8	277.6	0.8	277.6
Domestic use	400	347	0.025	0.025	10	3470	10	3470
In total					**10.8**	**3747.6**	**10.8**	**3747.6**

Water take for construction and domestic use will use existing wells located along the projected road. All Rayon administrations have prepared letters authorizing use of water wells in their areas for construction. The source of water for drinking purposes can be transported by water tankers from the public supply systems of the nearest towns. .

Prior to construction all proposals for extraction of water for any purpose must be presented and discussed first with the local or regional organizations and bodies of the Sanitary and Epidemiological Department.

Water Resources Conclusion Construction Period

Based on the water requirements during the construction period and the abundance of estimated reserves of ground and other water resources (The Charyn has an average water flow of 170m³/sec) and it is considered that there is adequate water for all construction activities and total resources will not be affected.

Water Needs for Operation Period

A continuous supply of water will be required for routine cleaning and maintenance requirements and for cleaning after accidents. Water will also be required for the various uses within the rest/service areas.

Water Resources Conclusion Operation Period

Based on the potential water requirements during the operation period and the known reserves of surface and groundwater there is adequate water for all operation activities and total resources will not be affected

Contamination of Water Sources

Contamination can impact in the following ways:

- Seepage of contaminated water into groundwater and aquifers
- Contaminated runoff into streams and rivers
- Exposure and contamination of groundwater in borrow pits
- Impacts of wastewater management at construction camps

Sources of contamination are widespread during construction and operation. There is a moderate contamination potential from vehicles used on construction sites which can contain, use, release or carry a number of hazardous substances: heavy metals, NOx, SOx and soot from the combustion of fuels, particles from wear of tires, oil, lubricants and payloads of fuel, cement, paint, construction chemicals etc.

Within Section 2 the groundwater is generally at a depth of 5 meters. The majority of Section 2 up to km 85, will be constructed on embankment at an average height of 2-4 meters above present ground level with few cuttings. Beyond 85 km the terrain becomes more undulating but not hilly or mountainous. Some cuttings, approximately 15 in all occur at local changes in height at rivers and small valleys. Most cuttings are below 5 meters, with only 6 short cuttings over 6 meters deep. on 1. Except at bridge construction locations any impact on groundwater levels is not likely to be significant and contamination will be unlikely and it is unlikely that any groundwater resources will be impacted by the construction activities. The groundwater used for household use or irrigation at depths of 10 meters or more which will not be impacted by any construction activities.

Possible pollution sources during operation may be roadside filling stations, service stations, workshops, points of inspection and locations where vehicles are cleaned. Also a potential pollutant is salt and chemicals used for deicing, which, when washout by rain and melted snow lead to concentrations of various pollutants in runoff water. Additionally , there is the risk of unwanted spills of hazardous or toxic substances due to road accidents.

Among the more serious pollutants would be particulate matter such as soot (which may be enriched by lead due to the lead content still added to some gasoline), rubber particles and heavy metal containing abrasives

from brake pads, and liquids such as fuels, oil and lubricants containing aliphatic and aromatic hydrocarbons, PAH (polycyclic aromatic hydrocarbons) and phenols.

During intensive run off during heavy rainfall which normally occurs in the period March to June accumulated dust may become mobilized and contaminate runoff water and subsequent recipients. Calculations of maximum water flow were carried out in accordance with the recommendations of "Handbook to determine the hydrological characteristics of the settlement" and SNIP 2.01.14-83.

Contamination of Groundwater Resources Conclusion: Construction and Operation Period

Based on the groundwater levels within Section 1 and the design characteristics of Section 2 where cuttings only occur at certain locations it is concluded that pollution of Groundwater Resources during the construction period will not occur. There will be no substantive subsoil works such as major cuts or deep excavations. Water for the construction activities as well as the camps will be extracted in relatively small quantities from existing wells or the public supply system. Generally water availability is unconstrained in the project area. There will be spill prevention measures in place. Also, only the uppermost aquifer, which is commonly not used for drinking water extraction, could at all be impacted by the project activities.

Also during the operation period pollution of groundwater will not occur provided that the provisions of good practice are reflected by the design and properly implemented. Examples of key design features to be implemented for groundwater protection can be effective drainage systems that convey storm water quickly towards the surface drainage network and avoid stagnant ponds that may infiltrate. Also, although the total pollutant loads over the section are significant, the concentrations expected during runoff will be relatively small.

Contamination of Surface Water During Operation Period

The road drainage system, designed as part of the project consists of several drainage and structural measures designed to prevent water logging and flooding of the roadbed and to intercept and divert water flowing to the sub grade. For surface water diversion the project design provides for side drainage ditches, pipes for the passage of watercourses and water under the roadbed to prevent any possibility of stagnation, which can lead to water logging of the land adjacent to the road.

Culverts are arranged at the intersections of roads with streams, dry valleys, irrigation channels and waste channels. Pipe and box culverts have been included in the project. A description of the designed structures for watercourses, channels and ditches, culverts and sewers are shown in Appendix 2.3.

Although the design of the drainage system has been carried out in accordance with best engineering design practice in exceptional circumstance some local drainage problems and deficiencies may become apparent during or on completion of construction. Any deficiencies should be overcome at the earliest opportunity and monitoring of the drainage will be a long term operational activity.

Road Surface run-off Pollutant Emissions

To assess pollution runoff from roads and identify the need to mitigate any pollution it is necessary to calculate the maximum permissible discharge of substances into water bodies. Under the maximum permissible discharge (MPD) of substances in the water body defines the mass of matter in the wastewater, the maximum allowable abstraction from source the established regime in the provision of water volume per unit time in order to ensure water quality control point.

Maximum permissible discharge (MPD) from bridges, located at the sections of the designed road, through rivers, which have permanent runoff have been calculated for this project. The calculation of the MPD is in accordance with "Recommendations on accounting requirements for the protection of the environment when designing roads and bridges" (Moscow, 1995).

Estimated flow of surface wastewater is defined as the hourly flow rate of the actual period of rainfall runoff (storm) water. Calculations of the level of water pollution runoff from the road has been proposed for rivers Shelek, Turgenev, and Issyk. The data is included in Appendix 2.3. Detailed

calculation show that the calculated discharge of pollutants are all within the regulated maximum permissible discharge rates.

The calculations are performed on a computer program «CREDO», according to the recommendations of PDD Ministry of Transportation, the method of Main Geophysical Observatory.

Contamination of Surface Water Conclusion: Operation Period

The investigation outlined above indicates that the calculated discharge of pollutants are all within the regulated maximum permissible discharge rates and that provided all regulations and legal procedures are carried out will be no impact on water resources from pollution during the operation period.

Borrow Pits

Possible borrow pits have been defined by the design engineers but these are not part of the approved design since the contractor will make the final decision on the selection of borrow pits. (See paragraph 2.6) The existing borrow pits have received EIA approval from the Rayon and it thus may be assumed that they will not be interfering with sensitive aquifers that have any significance as drinking water resource. Moreover, aside from accidental spills (by themselves unlikely) the operation of borrow pits has little contamination potential. The main risk is the failure to properly close and recultivate the pits, which may lead to their conversion into illegal waste deposit sites, which would have a substantial contamination potential. An important part of closure will thus be to dismantle and / or block all access roads.

The environmental impacts from river bed extraction are likely to be acceptably low where such operations are carried out under valid licensing and supervision by the authorities. Generally the high dynamics of the rivers in the project area, especially the very high sediment loads due to the proximity of the mountains, and the floods in spring that carry these loads down the river beds, speak for a low environmental sensitivity of these rivers towards gravel extraction. This potential source of construction materials, especially aggregates, thus need not a priori be excluded due to environmental considerations.

Irrigation

Section 2 passes through some irrigated agricultural land. Any loss of water for even short periods can adversely impact on the growing crops and can be critical during the spring and summer growing season. In some cases the road permanently disrupts and disconnects the irrigation channels though this is not common. However in most cases disruption to the irrigation channels will only be temporary and realigned channels and culverts under the road alignment will ensure that irrigation water will not be disrupted for any long period and water will still be provided to the agricultural land.

Construction Camps

Construction camps will generate significant sanitary waste from workers and staff who work and will live close to the alignment. In view of the scale of the construction activity the number of workers at any one time will be many hundreds and possibly more. For Section 2 it is estimated that there will be 600 workers employed on the site. At this stage it has not been possible to define the locations of the construction camps. Since this is an agricultural area it will be necessary to ensure that no contamination of the soil and groundwater and existing agricultural produce takes place. It will therefore be essential to ensure appropriate offsite disposal facilities are incorporated into the design of any construction camps.

Hydrology Conclusion

Overall the impact on groundwater and surface water is expected to be low. No cuts of tunnels are planned that might affect the groundwater regime and change the water table. Streams and rivers will be crossed by appropriately dimensioned bridges, and embankments will have sufficient culverts to prevent damming of surface runoff and subsequent water logging.

5.2.5 SOIL AND LAND IMPACT

Soil Damage

The site clearance, the cut and fill activities, and the construction of the sub grade usually causes the most damage to the soil and the sub soil environment. A significant volume of topsoil will be required to be removed for the alignment itself and for diversion roads, borrow pits, construction camps and other construction activities. In these areas there will be potential for contamination, disturbance and damage to the soil cover. In particular soil can become compacted and damaged along temporary access routes and in construction work areas. Disturbance and damage is inevitable and this will be more critical in the areas defined as Group 2 soils but this can be minimized with correct construction procedures.

Soil Contamination

Of equal importance is the potential for pollution and contamination of the soil and sub soil on the alignment itself and sites immediately adjacent. This pollution can have an impact on the surface and groundwater resources in the area and on the agricultural activities in the areas adjacent to the alignment. Some contamination can occur during normal construction activities, but the most serious contamination can occur from accidental fuel spills and storage of materials for long periods of time without any precautions.

Soil contamination is mainly from atmospheric deposition on the surface of solid and fine silt fractions of particles brought by the wheels of vehicles from roads and driveways with unimproved surface, partial loss of transported bulk goods, products, abrasion of tires, and coatings, as well as the toxic components of exhaust gases of automobiles. About 80% of lead contained in the exhaust can get into the soil.

During the construction phase the most important potential for contamination will be on the sub soil. This is the subsurface crust, below the soil layer. This will be exposed during the construction of the road sub grade and materials used in the construction of the sub grade could cause contamination. Provided common natural resources (sand and gravel, sand, soil, rubble) are used from local quarries for the construction contamination is unlikely to occur to the road sub base.

Contamination may also occur during the operation period. The main criterion for evaluating the risk of soil contamination by chemicals is maximum permissible concentration (MPC) - the maximum amount of substance in mg / kg oven-dry soil, which guarantees the absence of a negative direct impact on human health. Lead is considered the most frequent and toxic transport pollutant due to its continued presence in fuels in Kazakhstan and is used as an indicator of contamination. . maximum permissible concentration of lead in soil (MPC) in the Republic of Kazakhstan is calculated according to the "standards of maximum permissible concentrations of harmful substances, harmful microorganisms and other biological contaminants soil", approved by joint order of the Minister of Health from 30.01.2004 № 99 and the Minister Environmental Protection from 27.01.2004 № 21-p, and is set at 32 mg / kg.

According to the calculations lead levels at a distance of 20 meters from the roadway from 14 to 47 mg / kg. MAC of lead in soil is 32 mg / kg. Consequently, at a distance of 20 meters measured lead in soil in some areas is slightly higher than the MPC. Where there is debris, broken pavements and tires, broken engine exhaust of cars, leaking fuel and lubricants, or negligent acts of drivers and maintenance personnel, and other poor management and maintenance additional pollution and lead levels may occur.

De-icing materials, especially salts, are also toxic. Because of the limit of permissible concentration of CL (chlorides) when exposed to anti-icing agents on the ground in the roadside of the zone approved level - 0.04%. With a significant accumulation, they can change the biological composition of roadside soils.

Soil Erosion

Although the general area through which the alignment passes is surrounded by mountain areas particularly to the north and south the selected road alignment passes through a generally flat or undulating terrain. Based on a review of the design by PMC it is noted that Section 2 lies between 500 and 625 meters elevation. The first 85 km of this alignment runs through predominantly flat land with embankments 2-4 meters high and only 5 short cuttings of 2-3 meters deep, with one cutting of 6 meters . Beyond 85 km the terrain becomes

more undulating but not hilly or mountainous. Some cuttings, approximately 15 in all occur at local changes in height at rivers and small valleys. Most cuttings are below 5 meters, with only 6 short cuttings over 6 meters deep. With these characteristics, even in extreme dry or extreme wet conditions, erosion or landslides will not take place

Soil Impact Conclusions: Construction and Operation Periods

Based on the investigations and the characteristics of the area provided appropriate construction techniques and management are followed there will be no adverse impact on soils and sub soils during the construction and operation period through contamination. Erosion and landslides will also not occur. For the operation period contamination of the soil and sub soil with not be a significant impact.

5.2.6 FLORA AND FAUNA IMPACT

One of the key environmental objectives of the construction and operation of this road should be to protect the natural ecological system including vegetation, wildlife, and natural landscapes. Additional special protection is necessary where rare or endangered plant and animal species may be present.

Road construction and operation may have impact on flora and fauna either 1) during construction through loss of habitat and destruction, or 2) during the operation through the impact of vehicle traffic and various pollutants on the flora or fauna. Road traffic emissions can cause the destruction of the pigments, the suppression of the synthesis of proteins, enzymes and other functions of plants. The road can also cause impact on individual animals that pass along or live close to the road alignment and fragment some animal populations into unsustainable small groups

For flora pollution can lead to disruption of growth and development, and can accelerate the aging process, especially in perennial plants. In designing interventions to reduce harmful impacts on the flora it should be noted that broad leafed plants survive better than conifers in tolerating air pollution, because the processes of transpiration occurs quicker. Pollution of the ground and vegetation from traffic emissions occurs gradually and is directly dependent on the distance from the carriageway of the road. Some plants are more sensitive to pollution from exhaust gases of vehicles than that of humans and of many animals. Of the inorganic pollutants that have a significant impact on plants, de-icing chemicals, mainly salt are the most relevant and significant. Salts used for de-icing have a negative effect on the surrounding area to the road, including VECs such as soils, plants, insects, animals and birds. Additionally, under the influence of these salts, the structure and physico-chemical properties of soils deteriorate which will have an adverse impact on all plants.

Adverse effects of salts on plants result from direct contact with the pollutants, and from adsorption through the root system. Direct contact with the salts leads to the destruction of plant tissues, especially the leaves. . Sodium ions, concentrated in the soil, inhibit the absorption of nutrients by the root system so slowing growth and accelerating death of the plants.

Generally, the construction of any road can have major short-term impacts on habitats of animals, on short and long distance travel and migration routes, and contribute to the fragmentation of populations. Disturbances start occurring during the clearance of vegetation for construction and continue into the operation of the project. However, operational impacts can be mitigated effectively once the construction is completed, by planting and landscaping, as well as under and overpasses for migrating animals, including "green bridges".

During the operation stage as a result of roadside pollution by heavy metals, salts, oils and other harmful substances, animals and birds may be poisoned though direct contact or through eating vegetation in the vicinity of the road. However the new planting and landscaping may minimize air pollution impacts in the immediate vicinity of the road.

Additionally larger and slower moving mammals crossing the road may be killed. Hedgehogs are frequently affected, but also foxes and mice, rats etc can be regularly killed. Though these individual events are unfortunate the total number of animals killed in this way is commonly not high. In this section the absence of vegetation over large stretches of road alignment, and the good resulting visibility, will significantly reduce the risk of roadkills especially for larger mammals and domestic animals.

Flora and Fauna Impact Conclusion: Construction and Operation Periods

In conclusion there is a potential that the natural flora growing close to the road may be adversely impacted by the construction and operation activities. This is, however, unlikely to be significant, but appropriate mitigation, management and monitoring should be planned for the construction period and included into tender and contract documents.

The Design Engineers have calculated that the following trees will be felled for the road alignment: up to 24 cm diameter, 36 trees: 24-32 cm diameter 108 trees: over 32 cm diameter 25 trees. No information is available on species and other flora required. A large part of the area through which the alignment passes is semi arid with few significant trees.

For the Nurly wet area the construction of the road in the proposed alignment that crosses the water logged area will assist in the drainage of the area. The road will be on an embankment (3.0 -3.5 m high) and culverts will allow the flow of water downhill to the north.

The area, though acting as a communication route is still in many respects a sensitive area, particular in terms of ensuring all wildlife can pass through the area without disturbance and physical deterrents. The conclusions from the Directors of the National Parks and the Rayon Forestry Departments is that with the provision of suitable crossing points the there will not be a significant impact on wildlife in the area and the sustainability of the vulnerable Goittered Gazelle will not be affected.

The improved accessibility and increased number of people in the area both during the construction stage and operation stage will increase the opportunities for illegal hunting within the area. The larger mammals including the vulnerable Gazelles referred to in Paragraph 5.1.7 may come under threat and controls must be imposed and enforced to prohibit all illegal hunting within the vicinity of section 2.

5.2.7 SOCIAL AND ECONOMIC IMPACT

Social impacts during the construction and operation stages of the project are likely to be significant and of a long duration. These impacts will largely be positive, but some less significant adverse impacts may also occur.

During construction and operation noise, air pollution and water pollution may affect the nearby residents and in extreme conditions could impact on people's health, particularly amongst the more vulnerable groups; the old, those already sick, and children. However, as referred to above, noise, air pollution and water pollution are not predicted to be a significant impact for this road project.

The road development will also require the acquisition of some land and buildings which may affect people's income and livelihoods particularly in the short term. In the case of this road the number of buildings required for the road is not significant and within Section 2 no buildings are directly impacted and there are none close to the alignment. This matter is described in detail in the Resettlement Implementation report (RIR).

A more important impact will be on those families; exclusively farmers, who will have had some of their land acquired for the development of the road. Though generally the amount of land lost by each farmer is not significant the most import impact will be that a farmer's land holding may now be located on two sides of the road, separated by the road. This will create difficulties on operation and could make the operation of the farm inefficient and in extreme cases in operative. In order that the farmer can still operate his farm in an efficient manner it will be essential that regular crossing points are provided for the farmer.

The road development may have some impact on the economic activities of the local communities on the present road. Alongside the present road there are various permanent and temporary commercial activities including restaurants, convenience stores, car repair establishments, and temporary stalls selling local fruit, vegetables and other local produce. These businesses rely predominantly on passing traffic for their customers. This is particularly strong in the western part of the road, closer to Almaty. With the construction of the new alignment some of the business will lose some, though clearly not all the passing trade. It is likely that much of the existing trade will not be lost when the new road is constructed though it is impossible to make any definite predictions. For a distance of 300 kilometers long distance traffic (buses and tracks) will possibly only stop at the International border at Khorgos and within the Almaty area. Nevertheless it will be important for the Roads Department to consider the establishment of one or more service areas on the new road providing facilities for resting, for buying petrol, for buying other goods and for eating and possibly

overnight accommodation. These service areas could accommodate areas for local traders and farmers to sell produce. Signage to existing communities and local services and the provision of temporary spaces for local businesses can offset some of the potential for loss of trade. These matters are outlines in part 6.7 of this report.

Although there may be some local economic adverse impacts overall economically the road will bring significant benefits to the local, regional, and national economy. A fast, safe and all weather road will allow the efficient and rapid movement of goods between China, Kazakhstan, Russia and beyond in Europe and Central Asia. Goods manufactured within all the linked countries will benefit from the fast route. Agricultural produce from the area, which is a major employment sector and a significant part of the local economy can be transported rapidly to a wider market, not just Almaty. Labor will be able to move more freely between the countries, and most important for regional and international economies tourism will be encouraged and the natural and social features of Kazakhstan can be exploited sustainably. On a regional basis the larger communities along the alignment, Zharkent, Shelek and Almaty will benefit from faster travel times between the towns and to other urban centers in the south and south west of Kazakhstan. More opportunities for employment and business will be opened up.

The development of the road will support the increased economic activity at the International Border. There are proposal for an enterprise and development zone on the Kazakhstan side of the border and this development has already commenced and various industrial, service and commercial uses will locate to this area. This will provide significant employment opportunities for the present workforce in Zharkent and the whole of the Rayon. It will also provide opportunities for existing service and other industries to benefit from the development. Additionally the large flow of passengers and goods across the international border will involve an increase in immigration and customs employment. Some of this staff will be recruited locally. In all cases additional housing and associated support facilities will need to be provided within the area so bolstering the overall economic growth of the Rayon.

Social and Economic Impact Conclusion: Construction and Operation Period

There will be some negative social and economic including disturbance during the construction period and some potential loss of trade to businesses on the existing main road, but overall the social and economic impacts of a purpose built fast route within southern Kazakhstan will be beneficial.

5.2.8 PHYSICAL CULTURAL RESOURCES IMPACT

Based on the survey referred to in paragraph 4.1.9 above there are no Physical Cultural resources within or close to Section 3 alignment.

Nevertheless in the event of any PCR that are discovered during the construction works procedures shall apply that are governed by Kazakh legislation and guidelines, specifically by paragraph 2 of Article 39 of the "Law on Protection and Use of Historical and Cultural Heritage in the Republic of Kazakhstan" which stipulates: "*In case of detection of objects of historical, scientific, artistic, and other cultural value, physical and legal persons are obliged to suspend the further conduct of the work and inform the authorized body.* "

Time will be required and scheduled for investigation and carry out salvage excavation at any discovered site.

5.2.9 ROAD SAFETY AND AESTHETICS IMPACT

Road Safety

Road safety and the potential for accidents to pedestrians and all road users is an important issue for all new road development .

On the existing route traffic flows, particularly of long distance trucks and buses, are expected to reduce and correspondingly the incidence of traffic accidents should also be reduced. Correspondingly, hazards to pedestrians and non-motorized traffic along the existing route should also decrease.

For motorized traffic the project road itself will be significantly safer because of its upgraded design (e.g. optimized curve radii), separated carriageways, better visibility and limited access points. Randomly crossing traffic as well as slow moving non motorized traffic will be eliminated.

Nevertheless there will still be a residual element of danger for pedestrians. Farmers, farm workers and herdsmen may need to cross the road at certain points and there will be some pedestrian traffic near settlements. . There is a range of engineering and organizational measures available to slow down motorized traffic and improve traffic safety for pedestrians, animals, animal-powered carriages and cyclists. This includes signposting and speed enforcement with speed cameras; pedestrian crossings, if required with traffic lights; rumble strips and speed bumps to force speed reduction; light signals to warn drivers of crossings or non-motorized traffic participants. The design already foresees a number of these measures, the final scope, layout and locations will be decided in consultation with the affected communities prior to construction.

Aesthetics

The proposed road passes through areas of high aesthetic quality landscape with limited adverse visual impacts. The landscape in Section 3 is important and there are long distance views to the mountains range in the south and in the north. The retention and conservation of the natural landscape is therefore important. The design of the proposed road will ensure that this landscape quality is not negatively impacted by the new road construction and does not in any way detract from the landscape and the long distance mountain views to the north and south.

5.2.10 WASTE GENERATION IMPACT

Estimated Wastes During Construction

During construction and operation of the projected road a number of waste streams will be generated:

Inert mineral materials such as excavated earth, sand and gravel asphalt and concrete rubble, which will be entirely recycled and used as construction materials for filling, grading and landscaping.

Potentially noxious or hazardous materials such as waste from construction camps and workshops, concrete slurries from washing plants, barrels and containers from fuels, lubricants and construction chemicals, scrap metal, and spent welding electrodes. This will be disposed via existing municipal waste management, treatment or recycling facilities in accordance with Kazakh regulations.

Timber from felled trees and other organic matter from the clearing of the alignment will be collected and stored in appropriate locations outside the immediate construction zone and made available for sale to the public as firewood.

The following volumes of waste generation have been calculated for Section 2:

Table 5.9 – Construction waste generation (Prepared by Design Engineers)

№	Name	Unit	Amount	Density t/unit.	Amount, t	Loss norm	Losses, t
1	2	3	5	5	6	7	8
1	Heavy masonry	m^3	130,335	2	260,669	2	5,213
2	Heavy concrete B7,5	m^3	353180,93	2,1	751679,95	2	15833,599
3	Nails and bolts	T	5,660		5,660	1	0,057
5	Painting materials	Kg	23952,921	0,001	23,953	3	0,718
5	Reinforcement	T	1,528		1,528	3	0,053
6	Asphaltic felt	m^2	575,73	0,0017	0,809	3	0,025
	Total:						**15839,655**

Waste Estimates During Operation

Waste generated during operation will mainly be gravel and salt remnants from winter care, sludge / cake from settling ponds for storm-water, and asphalt, concrete and gravel from repair and maintenance works. None of these wastes is very hazardous and disposal pathways will either be existing municipal waste management facilities, landfills for mineral materials (gravel, rubble) or recycling facilities (cement kilns or asphalt plants). The annual quantities will fluctuate depending on weather conditions (length and severity of wintery conditions) and volume of maintenance works. The range is expected to lie between an few 100s to a few 1,000s of m^3 per annum.

In addition there will be waste and litter from users of the road and from the various activities within the planned rest/service areas. This waste was could be quite significant if all 5 service areas area operational, though this is unlikely that all will be operating for many years.

Table 5.10 – Construction and all other waste types for the project Almaty-Khorgos: Section 2

Name	Generation	Standard	Quantities, t/yr	Hazard class	Physical chemical traits, toxicity	Components	Storage, utilization and (or) disposal
1	2	3	4	6	7	8	9
Construction wastes	Construction works		14839,644	IV	Solid non-flammable insoluble.	Concrete debris, bricks, glass, construction waste	Temporary storage at special places. Passed to specialized company for disposal.
Scrap metal (remnants of pipes and metal structures)	Building and construction works	120 kg/t	6,08	IV	Solid non-flammable insoluble	Iron – 95-98%, Iron oxides – 2-1%, carbon – 3%	Temporary storage at special places. Passed to specialized companies which operate along the entire alignment for disposal.[2]
Burnt remainders of welding electrodes	Welding works	0,15 from electrode mass	0,13	IV	Solid, non-flammable.	Iron – 96-97%, Coating – 2-3 %	Storage at metal scrap collection places in construction camps until passed to specialized companies for final disposal.
Solid household wastes	During construction period	0,07 t/yr or 0,006 t/month	131,76	IV	Solid flammable. Non-toxic.	Paper and wood – 60%, Rags – 7%, Food wastes – 10%, glass – 6 - %, Metal – 5,%, Plastic –12%	Temporary storage in containers. Passed to landfills.

[2] Scrap metal is a highly sought after commodity in Central Asia, as the Chinese market lies geographically close. There are numerous collectors that travel considerable distances. In case of the project it will be highly attractive to drive from site to site and collect relatively large quantities of recyclables which are stored in defined locations and ready for pickup.

Total			15620,97				

5.3 ENVIRONMENTAL MANAGEMENT: MITIGATION MEASURES: SECTION 2

5.3.1 AIR QUALITY MITIGATION

Vehicle Exhaust Mitigation

In general the amount and concentration of exhaust emissions of vehicles during the construction and operation periods depends on several factors, most important of which are:

- Design features and technical condition of vehicles, especially emission standards and related technical specifications; traffic volume and traffic composition (mix of motor vehicle types);
- Road conditions: curve radii, longitudinal slope, carriageway width, visibility, type of road, smoothness and roughness of the road surface, the presence of human settlements, intersections and junctions of roads, railway crossings, and other factors that regulate the speed of the traffic flow;
- Driving habits of drivers;
- Meteorological factors, wind speed and direction, air temperature, humidity, solar radiation, temperature inversions ,and air turbulence in the surface layer, etc.

Mitigation During Construction Period

The concentration of pollutants for each source of contamination when working on the construction of the road shall not exceed the maximum allowable limits set by the Kazakh standard SanPiN RK № 3.03.015-97. Various measures to ensure accordance with this requirement and to reduce the intensity and toxicity of emissions during road construction can be summarized as follows;

- Ensuring that all construction vehicles and equipment are maintained in accordance with manufacturers recommendations and that any repairs are carried out immediately again in accordance with manufacturers recommendations. ;
- Systematic monitoring of the technical state of fuel equipment of diesel engines, the exhaust gases of which are prone to contain significant amounts of soot;
- Ensuring the uniform and proper operation of paving machinery, sealing equipment and asphalting machines that will help prevent unacceptable concentrations of pollutants (e.g. aliphatic and aromatic hydrocarbons, including carcinogenic benz-a-pyrene, PAH)the working area and the surrounding areas.
- Since there are no sensitive uses within the vicinity of the road there will not be a pressing need to restrict night time operation or to locate construction depots and camps in locations that will not impact on sensitive uses.
- Regular monitoring of air pollution shall be carried out throughout the construction period to ensure that there are no impacts to the community and construction workers.

Mitigation During Operation Period

- Improving the design of highways. Reduced longitudinal slopes, improved visibility in the horizontal vertical curves, the increase in their radius leads to ensure a higher operating speed of traffic flow and reduce toxic emissions (These requirements are incorporated into the design of this alignment).
- Given that the projected road passes through flat terrain, the longitudinal slope does not exceed 10% of the radii of curves and visibility on the road comply with the technical categories, thus providing the highest operational condition of the road, giving significant reductions in emissions of toxic pollutants. These requirements are incorporated into the design of this alignment.
- To reduce frequent braking and acceleration of vehicles as a means of reducing emissions install appropriate traffic and warning signs and roadway markings. These requirements are incorporated into the design of this alignment.

- A long term perspective for a substantial reduction of toxic components in exhaust gases would be to convert vehicles to pressurized natural gas, reducing NOx emissions by the factor 4-10;
- Recent legislation has established the requirement for every motor vehicle to be inspected and checked once per year for basic technical functionality, including emission standards. The inspection certificate has to stay with the vehicle at all times and is checked by road police during routine traffic controls.
- The use of unleaded gasoline is increasing in Kazakhstan and leaded gasoline will be phased out, which will progressively reduce lead emissions into the environment.
- Regular monitoring of air pollution should be carried out throughout the operation period to ensure that there are no adverse impacts to any members of the community or the construction workforce.

Dust Mitigation During Construction and Operation

Dust can be a major problem during construction and is caused by a range of activities including site preparation where the soil is disturbed, during aggregate and cement handling for concrete production, from the transportation of materials particularly cement, and transport generally on unpaved surfaces.

To reduce dust pollution during construction and repair work on the road during operation the following mitigation should be carried out:

- Maintaining, cleaning and watering of road sections where there is intensive dust formation. When choosing the dusting materials, preference should be given to Calcium Chloride, inhibited by Phosphates (CCP).
- Periodic watering of dirt roads at a rate of 2 l/m^2 per watering cycle;
- Set and enforce speed limit on sections of roads subject to intense dust formation;
- Ensure that the transport of all potentially dusty materials is done in covered trucks or the material is contained in secure bags.

5.3.2 NOISE AND VIBRATION IMPACT MITIGATION

The level of traffic noise at any sensitive point generated by vehicles traveling on the highway, shall not exceed the values set in, SanPiN № 841 from 12.03.2004, Republic of Kazakhstan, at 70 dBA.

Mitigation of Noise During Construction Period

Noise can be caused by a range of equipment and by vehicles transporting goods and equipment. Significant noise can be created by bulldozers, scrapers, pneumatic hammers, vibrators, cutters.

Reducing construction noise is achieved through the following activities:

- Impose a speed limit of traffic during construction to 60km/h. This can reduce noise by 7 dB (as compared to 80 km/h);
- Undertake construction work during the daytime to reduce any potential impact on sensitive uses particularly in construction access roads;
- Effective soundproofing of all vehicles and equipment by the use of foam, rubber and other soundproofing materials, as well as through the use of hoods with multilayer coatings; ensure that Contractors either have modern equipment that fulfill noise reduction norms, or that equipment is retrofitted to meet the required standards;
- Stationary units (e.g. aggregates or compressors) shall be placed in sound-absorbing areas or tents, which can reduce the noise level by up to 70%.
- The definition of road construction zones with high sound levels above 80 dBA must be designated with safety signs, and workers in this area should be provided with personal protective equipment (ear mufflers of plugs).
- All depots, special working areas, batching or mixing plants should be located at a distance from any sensitive areas .

- Since there are no sensitive uses within the vicinity of the road there will not be a pressing need to restrict night time operation or to locate construction depots and camps in locations that will not impact on sensitive uses.
- Regular noise monitoring shall be carried out throughout the construction period to ensure that there are no impacts to the community and construction workers.

Operation Noise Mitigation

The calculation of noise during the operation period indicates that traffic noise does not exceed the maximum permissible standards at any location along the alignment. Regular noise monitoring should be carried out to ensure no potential disturbance.

Vibration Mitigation

Vibration normally occurs when piling takes place. This may only occur at a number of locations mainly at bridge construction. If it does not take place near the sensitive uses the impacts on the community will be small. The most important impact will be the impact on workers on the construction site. All workers exposed to vibration should be given special clothing, earplugs and given regular breaks.

5.3.3 HYDROLOGICAL MITIGATION

Construction

Overall the impact on groundwater and surface water is expected to be low. Groundwater is generally at a depth of 5 meters through out the area. This varies within the alignment and within each Section, but 5 meters remains the average. Pressurized groundwater are normally at 20-25 meter depth.

The majority of the road will be constructed on embankment at average heights of 2-4 meters above present ground level. Significant cuttings over 5 meters (for short distances) only occur between 85 Km and 100 Km in Section 2. Except at bridge construction locations any impact on groundwater levels is likely to be minimal and contamination will be unlikely. Any groundwater resources which will be impacted will only be impacted at isolated locations. Similarly the road construction is unlikely to drain or dam the groundwater. Most of the groundwater used for household use or irrigation at depths of 10 meters or more which will not be impacted by any construction activities.

Streams and rivers will be crossed by appropriately dimensioned bridges, and embankments will have sufficient culverts to prevent damming of surface runoff and subsequent water logging.

During road construction in order to prevent pollution watercourses must be constantly monitored These pollutants risk entering the water and releasing harmful toxic substances and pollution with particulate matter of mineral and organic origin, represented suspended particles of sand, clay, silt and other materials.

The contractor shall be responsible for obtaining all permits required for use of surface and groundwater resources from the Rayon and competent authorities. No water shall be used without those specific permits.

Discharge of Waste Water from Construction Camps

The discharge of wastewater to water courses is only allowed with permission of the sanitary-epidemiological service and fisheries. The composition of the wastewater must comply with SanPiN to protect surface waters from pollution № 3.02.002.04.

For domestic wastewater disposal a pit of precast concrete rings with a diameter of 1.5 meters and a depth of not less than 3 meters should be used. To eliminate the filtration of waste water into the groundwater the floor of the pit should be concreted.

Surface and Groundwater Protection

Defined water protection zones prohibit the establishment of landfills, use as industrial waste sites, as parking, refueling, cleaning and repair of motor vehicles and road equipment. The pollution and contamination of water, during construction without devices to prevent pollution and contamination of water, wasteful use of water, the violation of water protection regime in catchments and other violations, will be banned.

The water protection zones are defined as follows: for small rivers the zone is, 100 meters, and for large rives it is 500 meters. Works within the water protection zone are allowed only by special permission of local water protection authorities, fishery protection and sanitary-epidemiological services.

Irrigation

In some cases the road permanently disrupts and disconnects the irrigation channels though this is not common. In this case it is important that farmers and the community are given advance warning by the contractor to ensure that the farmers can make timely alternative arrangements for their water supply.

However in most cases disruption to the irrigation channels will only be temporary and realigned channels and culverts under the road alignment will ensure that irrigation water will not be disrupted for any long period and water will still be provided to the agricultural land. Where temporary disruption occurs the famers must be notified by the contractor (with the support of the supervision consultants) of the disruption in advance and what temporary arrangements will be put into place. In addition the Contractor must ensure by all appropriate means that irrigation channels are interrupted for the minimal period and that adjacent farmers are not necessarily disturbed during the construction period, especially when coinciding with the main growing period. The supervision engineers should constantly monitor the situation and report to the Contractor and the Rayon administration where farmers have not been given adequate notice and where disruption has been longer than programmed.

Specific Mitigation during Construction should include:

Department of Roads, Committee of Water Resources and Rayon in consultation with Contractors to ensure all water extraction for construction and workers only takes place from sustainable resources from wells (for construction activities) and from piped supply system (for domestic use in camps etc). The contractor shall be responsible for obtaining all permits required for use of surface and groundwater resources from the Rayon and competent authorities. No water shall be used without those specific permits.

- Good management of all areas of the construction site to ensure no short term flooding occurs.
- Good management of all areas of the construction site to ensure contamination from all construction activities does not occur.
- All surface water courses in all construction are to be protected by settling ponds and filters.
- Waste water from construction camps to be treated on site before discharge into surface rivers;
- Septic sludge from toilets to be taken to offsite treatment plants;
- Ensure minimal disruption to irrigation water and maintain dialogue with farmers.

Operation

During operation to prevent contamination, the road will include drainage channels and culverts for removing waste water from the carriageway of the road outside. Drainage from the roadway and bridges shall be treated in settlement ponds where necessary, before reaching natural streams and rivers, or canals.

Water from road bridges passes to the paving blocks and curbs along the borders assigned to drainage cradles at the beginning and end of the bridge, then enters the water receiving wells, where the filtering occurs. To ensure the removal of pollutants from the roadway of the bridge sidewalk concrete curbs are located along the entire length of the bridge.

Rain water on the pedestrian part of the bridge is protected from harmful toxic substances from the roadway of the bridge by a continuous barrier so there is no threat to the ecosystem. On small bridges pollution is also excluded from entering the surface water by a continuous curb railing.

Discharge of water from the carriageway flows by longitudinal trays along the edge of the roadway, and then cross-trays, arranged on the slopes of the embankment height greater than 4 meters, with a longitudinal slope of a slope of 0.03, as well as for concave curves. The end of the trays are arranged along the slope embankment to prevent erosion of the sub grade.

5.3.4 SOIL EROSION AND SOIL CONTAMINATION MITIGATION

Soil Erosion

During the construction phase it will be essential to ensure that all efforts are taken to eliminate soil erosion and the causes of erosion. However as referred to in section 4.1.4 above because of the characteristics of the landscape and of the design even in extreme dry or extreme wet conditions, erosion or landslides will not take place to any extent. Nevertheless all construction activities must be undertaken to eliminate potential erosion.

Soil Reclamation

The Construction of the road will require the use of land for a temporary period for construction activities and it is a legal requirement that all land used for a temporary period for construction must be reclaimed and returned to the original users and owners in a condition suitable for its original agricultural use. Any use of land that involves the removal of any soil creates instability to the local environment and wider environment and it is essential to preserve the natural topography and existing vegetation.

Guided by the Land Code of the Republic of Kazakhstan from 20.06.2003g. and "Guidelines for the assessment of proposed economic and other activities on the environment in developing pre, design and project documentation" Astana 2007. All land used must be returned in a condition suitable for agriculture.

Biological reclamation allows for the planting of grasses to encourage the restoration of fertility. Land reclamation should be done during or after the completion of the construction activities. It is important to reclaim in all place where soil and sub soil has been disturbed by construction and associated activities.

Remediation activities to reduce loss and erosion of soil during construction includes the following:

- Removal of sand and detritus mixture (20 cm) from the surface of the road with a bulldozer moving into piles up to 50m, followed by loading an excavator to dump 0.65 m2 to transport up to 1 km (35,000 x 0.20);
- The preparation of the road surface by bulldozer;
- Deep subsoil loosening by bulldozer;
- Backward sliding of topsoil from the dumps to the prepared surface layer by the bulldozer

Activities on the site after construction should include:

- Use of tillage cultivator;
- Mechanized sowing of perennial grasses as follows: alfalfa - 25% of 18 kg / ha 30% perennial ryegrass - 75% of 35 kg / ha of 30%.
- After sowing, rolling the surface by a ring-roller

The best perennial grasses are wheatgrass and sainfoin. Wheat has a high resistance to drought. The wheat grass grows equally well in early spring and autumn. Sainfoin - a long-standing drought-resistant and extremely valuable winter-hardy legume crop is sown in wide aisles with 30-60cm. It is planted mainly in the early spring period and the green mass is eaten by cattle, and also provides excellent hay.

Immediate and proper reclamation of land reduces the adverse impact of disturbed land on the environment. It will reduce dust and pollution, can have a beneficial impact on human health and eliminates environmental damage.

Soil Contamination

During the construction period it is important that the contractor undertakes all activities in accordance with contract specifications and manages all site activities in an environmentally sustainable manner.

To ensure soil is not polluted it is essential to undertake the following activities:

- Ensure, through proper construction management, that oil and other spills do not occur, and that if they do immediate action is taken to minimize impacts on the soil.
- Storage of construction materials only takes place in properly prepared locations;
- Immediate sorting and removal of construction debris to an offsite landfill;
- Dismantling after use the base of construction sites and access/haul roads
- Apply topsoil on all vacant sites as soon as practical;

Operation

During operation it will be important that all pollution is minimized and managed. All liquid wastes of any kind must be taken from the road and disposed of in an approved landfill. It will be the responsibility of the road agency to ensure speedy and full clearance of all waste from the road and from its vicinity.

5.3.5 FLORA AND FAUNA IMPACT MITIGATION

Flora and fauna will be impacted by the construction and operation of the road. Air pollution, noise and vibration and potential for occasional flooding and wind and water erosion will all have an impact, normally adverse on the local and sometimes wider original ecology.

The mitigation methods referred to above for air pollution and noise and vibration impacts will also benefit the flora and fauna. Specifically to reduce the negative impact on flora and fauna of the road development the following environmental protection measures are proposed:

- Ensuring high quality condition of the road surface throughout the operation period to minimize noise and particularly air pollution which has adverse impacts on fauna and can also impact sensitive flora;
- Some animals will make use of the various drainage culverts and livestock crossing points to cross the road, particularly during night time. For the part of alignment 2 close to National Parks it is essential that sufficient suitable crossing points are constructed to ensure that animals are not deterred from crossing the route and that their normal, or near normal travel and migration routes are not adversely affected ;
- Reduce the use of salt and chemical materials used to disperse snow and ice in winter so that soils, plant tissues, animals and birds are not adversely affected or destroyed. An alternative is to replace salt and other chemicals with friction materials such as sand or gravel;
- Use de-icing materials that are less toxic to the environment including anti-HCF-type materials (calcium chloride, inhibited phosphate) or MRA (potassium-magnesium acetate), which do not lead to irreversible changes in photosynthesis and the subsequent destruction of plant tissues and animal deaths;
- Reduce the incidence of dust pollution by good maintenance of the road, regular cleaning and watering to reduce negative effect on vegetation.

Dust, depending on the chemical composition, has a specific effect on plants, caused by the penetration of harmful compounds into the leaf tissue. At the same time accumulation of compounds in plant tissues causes

a disturbance of metabolic functions of the body, reducing the amount absorbed by the leaves of photo synthetically active energy and results in accelerated aging. Additionally all transport and haulage vehicles using the road, including construction traffic, should use dust protection tarpaulin or other suitable cover.

Temporary or longer term localized flooding and water logging shall be prevented by culverts and drainage systems to ensure flora and fauna are not affected.

The loss of trees as defined in Chapter 5.1.7 will be offset by a tree replacement ratio of at least 1:1 plus a contingency for the portion of saplings that does not grow (typically 25%). This replanting will be undertaken in a separate planting contract.

Specific Fauna Mitigation

As referred to in Paragraph 5.1.7 the road may present a potential to the free movement of wildlife in the area, in particular the larger mammals of Gazelle, Roe Deer and Wild Boar. Based on the consultation with the Directors of Charyn and Altyn-Emel National Parks and the Uigur Rayon Department of Forestry underpasses or routes under the road at river and stream crossing points will be suitable for the animals. The size of the 2.5 high by 4 meters wide should not normally be a deterrent to the wildlife, provided of course no livestock or human presence is in the vicinity. Where there are bridges over small rivers or streams suitable routes should be provided. Within the present design there are the following crossing points (i.e. 2.5 x 4.0 culverts) in Section 2: Distances from the start of Section 2: at 54.9km, 63.9km, 67.9km, 71.0 km and 97.0km. There are also the following locations where the road passes of surface water channels (and the railway) where the opportunity of providing suitable animal routes can be investigated during construction: Distances from the start of Section 2: at 63.0km, 71.3km, 81.4km, 84.0km and 101km.

At the commencement of the construction activity, the Rayon administration, the Directors of both National Parks, the Contractors, the Supervision Engineers and representatives of the Regional department of Roads should discuss and agree if any additional culverts are needed and their approximate locations. If any additional culverts are considered necessary they will be included in SoW of the construction works as variation orders. At this time no changes to the design of the alignment will be necessary.

The Director of the National Park has advised that the ground surface of the culvert should be covered by rubber matting (or other suitable material) to ensure that the concrete does not act as a deterrent to the animals. A softer surface is better for most animals. Sand may be an alternative soft material.

Since the area will become more accessible it will be important that during the construction period there are certain controls introduced that will prohibit all illegal hunting in the area. Hunting by contractor's staff and workers will not be permitted and must be strictly enforced by the Rayon and monitored by the Supervision Consultants. During the operation phase the Rayon Forestry Department must enforce all hunting regulations to ensure that there is no threat or impact to all wildlife in the vicinity of the road and particularly where the road passes close to the National Parks.

The Contractor will be obliged to ensure that no unnecessary disturbance to fauna within or close to the alignment takes place. The Contractor and Supervision Engineers will be obliged to monitor the incidence of any sightings of any larger or unusual fauna within or close to the alignment and to notify the Rayon Administration. Any accidental injury or death of larger fauna to be reported and the Rayon notified.

5.3.6 SOCIAL AND ECONOMIC MITIGATION

Local Businesses

The road development may have some impact on the economic activities of the local communities on the present road alignment. Alongside the present road there are various permanent and temporary commercial activities including restaurants, convenience stores, car repair establishments, and temporary stalls selling local fruit, vegetables and other local produce. These businesses rely predominantly on passing traffic for their customers. This is particularly strong in the western part of the road, closer to Almaty. With the construction of the new alignment some of the businesses may lose some, though clearly not all, of the passing trade. It is likely that much of the existing trade will not be lost when the new road is constructed though it is impossible to make any definite predictions. There are no World Bank or domestic policy

requirements to compensate persons indirectly affected in this manner. During the recent consultation process this matter was not referred to by any members of the community or the Rayon administrations.

There are however a number of approaches that would provide opportunities for the local community adversely impacted by the road development. Three approaches would be:

- Providing sites for local businesses and farmers to sell their produce to travelers using the new road. Information obtained from Regional Department of Roads, Almaty is that there will be 5 Rest/Service areas along the alignment. These sites are not part of the present design and land will be purchased on a willing buyer-willing seller basis and design and development will take place at a later date. They are the responsibility of the ministry of Tourism. It is recommended the design should included sites for local farmers and business as a means to ensure that the local community can benefit from the new road and as a means of offsetting potential losses to existing businesses on the present road.
- Good signage on the new road and at junctions to show the location of the nearest petrol station, shops, market, restaurants etc. located on the original road. This will enable users of the new road to make easy access to the local commercial uses on the original road. A good example would be to include signs at junction at km 126 in Section 2 informing travelers on the new road of the restaurant and market facilities at Baiseit
- After the construction of the road and prior to opening of the Service/rest areas to allow small traders to set up at vacant sites at some interchanges. This would need to be in accordance with road safety regulations and should only occur at specific approved sites where space is available of the road for parking and visibility is good. Signs informing roads users of these locations should be incorporated into the proposed road signage.

Livestock Crossing Points

During the first consultation many farmers were concerned about ensuring that sufficient livestock and farm equipment crossing points were included in the design. This is particularly important where a farmer's land is along both sides of the road alignment. But it is also an issue where the road blocks traditional routes for farmers moving livestock and machinery e.g. from the villages to fields and pastures. The design has included 36 under road crossing points for livestock and farm machinery. In addition there are local road overpasses. The Regional Department of Roads, Almaty has agreed that additional crossing points can be provided if the community shows that a route is necessary for the famers or other land users in the area, and that it is possible in engineering terms

At the commencement of the construction activity, the Rayon administration, the Contractors, the Supervision Engineers and representatives of the Regional Department of Roads should discuss and agree if any additional culverts are needed and their approximate locations. If any additional culverts are considered necessary they will be included in the SoW of the construction works via variation orders. At this time no changes to the design of the alignment will be necessary.

Outstanding Acquisition

Land acquisition mitigation aspects are covered in the Resettlement Implementation Report but it is important to stress that the outstanding acquisition is to be completed as soon as possible in accordance with Government procedures and the Resettlement Implementation Report. Any objections and complaints should be in accordance with the Grievance Mechanism included in the RIR for the completion of the acquisition and for the construction period. The issue of crossing points for livestock and farm vehicles and equipment is also covered in the RIR.

5.3.7 HISTORICAL AND ARCHEOLOGICAL MITIGATION

Since there are no Physical Cultural resources within or close to Section 3 alignment special mitigation will not be required.

Nevertheless in the event of any PCR that are discovered during the construction works procedures shall apply that are governed by Kazakh legislation and guidelines, specifically by paragraph 2 of Article 39 of the "Law on Protection and Use of Historical and Cultural Heritage in the Republic of Kazakhstan" which stipulates: "*In case of detection of objects of historical, scientific, artistic, and other cultural value, physical and legal persons are obliged to suspend the further conduct of the work and inform the authorized body*. "

Time will be required for investigation and salvage dig at any discovered site.

5.3.8 ROAD SAFETY AND AESTHETICS MITIGATION

Road Safety

The provision of a new well designed restricted access divided highway ensures many inbuilt safety features not provided in an existing traditional road. Specifically the design of the proposed road will incorporate the following:

- Divided carriageways;
- Limited access and exit;
- Multi level interchanges at busy junctions;
- Good horizontal and vertical sight lines and visibility;
- Clear and consistent road markings;
- Absence of pedestrians and non motorized vehicles;
- Emergency lanes and emergency parking areas;
- High intensity lighting at key intersections and other locations;
- Clear warning and information signs;
- Safety barriers in accordance with international standards, at junctions, embankments and cuttings.

At junctions and access roads to the proposed road it will be necessary to ensure appropriate warning and information signs, street lighting where necessary, and safe facilities for pedestrians and non motorized traffic. Specifically the design has included speed cameras at intersections connected to a central control area. Rumble strips prior to junctions and at other locations have been also included in the design to warn drivers of junctions and slow traffic.

Pedestrian Crossing Points

No specific pedestrian crossing points have been included in the design. Consideration must be given to the provision of pedestrian crossing points where there may be pedestrian movement in Section 2. At grade pedestrian crossing points should include white (zebra) strips on the carriageway, signs and advance warning signs.

At junctions and access roads to the proposed road it will be necessary to ensure appropriate warning and information signs, street lighting where necessary, and safe facilities for pedestrians and non motorized traffic. Specifically the design has included speed cameras at intersections connected to a central control area. Rumble strips prior to junctions and at other locations have been also included in the design to warn drivers of junctions and slow traffic.

Aesthetics

The objective of good aesthetics is to ensure a high quality of deign, construction and operation to ensure that the road and its associated structures enhance and improve the landscape and esthetic quality of the area. This can be done through the following design and operation requirements:

- The design of the road and its associated development is of the highest quality, in keeping with the local landscape characteristics and features, and visually pleasing to the eye;

- Wherever possible for the road to be designed to follow existing contours so reducing the need for visually obtrusive deep cuttings and embankments:

The above two requirements have already been incorporated into the design of the road.

- Ensure that all non operational land is planted and landscaped to the highest level with trees and vegetation that are endemic and suitable for the severe Kazakhstan climatic conditions
- Ensuring the all warning signs, kilometers signs and all other road furniture is designed as a whole and are compatible with the landscape features of the area.

The above two requirements will be incorporated into the detailed design of the road.

- Ensuring that all elements of the road are well maintained, particularly the adjacent landscaped areas and any embankments and cuttings;

This will be an operational requirements of the road operators.

5.3.9 WASTE MITIGATION

Waste During Construction Period

The project preparatory work should provide special site provision for temporary storage of waste, indicating methods of removal to a place of disposal, processing or marketing. Disposal of wood and waste from tree and plant trimming should be carried out during the season of felling (preferably in winter).

Contractors must provide containers for all construction waste and should be separated; metals, plastics and construction materials. Any waste and scrap that can be recycled or reused must be separated and stored or taken off site as necessary. Waste materials for recycling and reusing within the construction site should be clearly marked and separated. In all cases storage must take place in clearly marked areas and taken off site as soon as practical. The Waste Management Authority and Rayon Akimat should be consulted in all waste maters. It must be the responsibility of the Contractor to dispose of all waste and to do so in accordance with local and national regulations. Any hazardous waste must be disposed of in accordance with local and national regulations. Disposal of any waste on adjacent sites with or without the land owner's permission, outside the construction site perimeter is not permitted unless the sites are approved waste disposal sites. Prevention of construction waste incineration: burning or incineration of any waste should not normally be permitted Unless specifically approved by the waste disposal authority and environmental authority.

All general waste from the workers camps and office locations will be regularly taken by the contractor to the nearest approved waste disposal site. Disposal and incineration at the construction site will not be allowed. Temporary collection points will be provided within the site for all general waste and these will be clearly signed and will be collected regularly. Any medical waste will be disposed of separately to approved medical waste sites.

At the completion of the contract all waste including all temporary site buildings and installations and all unused materials shall be taken off site by the contractor. No waste should be left on any part of the construction site.

Waste During Operation Period

Waste generated during operation will mainly be gravel and salt remnants from winter care, sludge / cake from settling ponds for storm-water, and asphalt, concrete and gravel from repair and maintenance works. None of these wastes is very hazardous and disposal pathways will either be existing municipal waste management facilities, landfills for mineral materials (gravel, rubble) or recycling facilities (cement kilns or asphalt plants). The annual quantities will fluctuate depending on weather conditions (length and severity of wintery conditions) and volume of maintenance works. The range is expected to lie between a few 100s to a few 1,000s of m^3 per annum.

Existing waste management disposal facilities within the area are the responsibility of the Rayon. The operator will agree prior to operation on what waste will be delivered to the publicly operated waste

management sites. Other waste disposal will be agreed with the Rayon prior to any disposal. Only Rayon approved disposal sites will be used. Any hazardous or medical waste will be disposed of at separate approved disposal sites. The operator will be responsible for all collection within the road and service areas and disposal to the approved and agreed sites. No disposal will take place on the alignment or at the service/rest areas. No incineration will take place on the alignment or service rest areas unless it is in accordance with local and national incineration regulations.

6. SECTION 3

6.1 BASELINE DATA: SECTION 3

6.1.1 GENERAL DESCRIPTION

The road "Almaty-Kokpek-Chundzha-Koktal-Khorgos" is part of the international transit corridor "Western Europe - Western China", which connects Central Asia with China under the "Program of development of road sector of RK for 2006-2012" approved by Government Resolution № 1227 from 09.12.2005g.

Section 3 (268-360 km) runs through a variety of landscapes and land use types: 5 km after its start river Ili is crossed via a ca. 700 m long bridge. River Ili is the largest river of the entire project area and the main tributary to Lake Balkash. Several km before and after the crossing of Ili River the project alignment would follow the existing route A351, and a new bridge would be built parallel to the existing one to accommodate 2 additional lanes. A few km after the river crossing the projected road would again turn off the existing route A351 and run on a new alignment for the rest of the project. The bulk of the section would run through dunes, marshes and rangeland, with some sand dunes and occasional small, seasonal watercourses. At about 290-320 km there is a stretch of land used for irrigated agriculture with a few small settlements. The closest is bypassed at a distance of ca. 4 km. The last section of the road (ca. 320-355 km) runs parallel to and through a large field of sand dunes with sparse vegetation. The last 5 km cross the broad flood plain of Khorgos River to the Chinese border, where a new border-crossing is planned. On the Chinese border a new border-crossing is planned. This development has been started some years ago and has advanced considerably on the Chinese side of the border. The development will serve as dry port for both road and railroad and is in itself a project considerable size. The two projects are not functionally linked in Bank policy terms, as the crossing, which includes a dry port facility, was planned mainly in the context of the new railway line and is neither dependent upon the roads project nor required for the successful achievement of the objectives of the roads project.

Most of the Section is under sporadic, open-access use for animal husbandry (mainly sheep, goats and cows). The district centre, Zharkent, lies at a distance of about 5 km north of the alignment. In the vicinity of the border the development of a free trade zone has started some years ago, involving the regulation of Khorgos river and the construction of a dry port facility on the Kazakh side of the border.

Overall, about 80% of the road would be constructed on a new alignment, the remainder following the existing route A351.

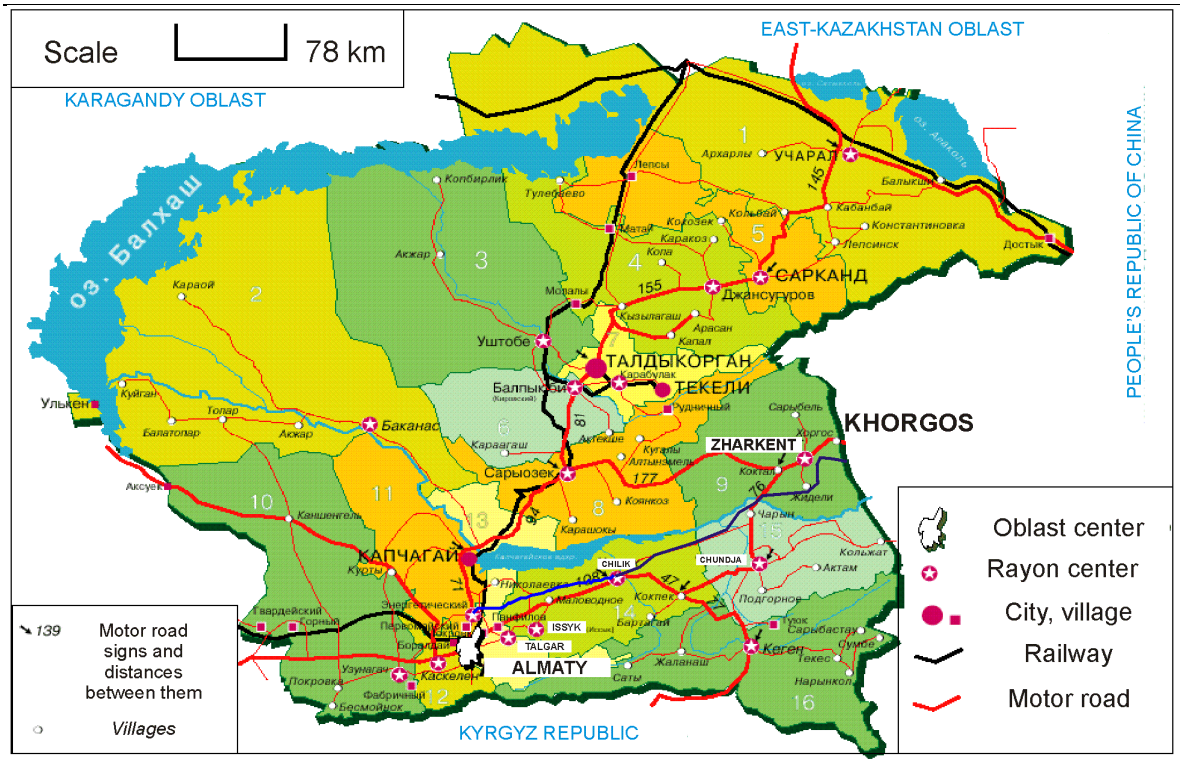


Figure 6.1. – Location map of Almaty region

The total area of Almaty Oblast is 428,000 square kilometers. The administrative centre is Taldykorgan. The Oblast includes 16 rural districts, 10 towns, 15 townships, 759 villages (villages).

The population of the area was 1, 631, 400 (Excluding Almaty city).

The total length of the project section is 90.026 km (Figure 6.1).

1. Uigur rayon – The length of the section within Uigur Rayon is 18.4 km.

2. Panfilov rayon –The length of the section within Panfilov Rayon is 74.1 km.

6.1.2 CLIMATE

The climatic characteristics of key towns on the alignment corridor are shown in Table 1 The key climate factors are:

- Continental climate of cold winters and hot summers. Coldest winter months are approximately -8ºC to -11ºC, warmest summer months are +40ºC;
- Rainfall varies between 150 mm and 400 mm per year, with most rain in the spring and little rain during the summer;
- Snow cover starts in November and lasts on average 80-100 days with a depth of 21-38 cm;
- Snow depths protect the soil from continuous freezing;
- Winds are normally from the North East and North West;
- Dust storms occur during summer and soil erosion can occur.

The main climatic characteristics of the projected road are shown in the nearest weather stations at Almaty and Shelek in Table 6.1.

Table 6.1 - Key indicators of climatic long-term data MC "Almaty", "Shelek"

№	Climatic Indicators	Name of weather stations				
		Almaty	Kaskelen	Issyk	Shelek	Zharkent
1	2	3	4	5	6	7
1	Average annual temperature C	+ 8,9	+ 7,8	+8,0	+8,9	+8,5
2	The average temperature in the coldest month (January) ^{0}C	- 6,5	- 5,8	-6,0	-9,2	-11,1
3	The average temperature for the warmest month (July) ^{0}C	+ 20,7	+ 21,3	+21,7	+23,9	+24,1
4	The absolute minimum temperature ^{0}C	- 38,0	- 34,0	-35,0	-39,0	-42,0
5	The absolute maximum temperature ^{0}C	+ 42,0	+ 40,0	+41,0	+42,0	+42,0
6	Average rainfall in mm including the winter period	491	546	599	233	164
7	The snow cover with a 5% probability of exceeding cm	50	49	-	-	24
8	Number of days per year:					
	sleet	12	12	-	2.0	-
	hail	7	1,4	-	2.0	2,0
	blizzard	5	-	-	25	-
	Wind> 15 m / sec	21	24	5	25	27
9	Typical periods of air temperature					
	More than 0 C start	13/03	13/03	12/03	7/03	7/03
	end	11/11	19/11	18/10	18/11	14/11
	duration	242	250	212	255	251
	More than 5 C start	27/03	31/03	28/3	21/03	20/03
	end	25/10	27/10	27/10	31/10	30/10
	duration	211	209	212	223	223
	More than 10 C start	13/04	21/04	18/04	6/04	5/04
	end	9/10	8/10	8/10	15/10	14/10
	duration	178	169	172	191	191
10	The average annual wind speed m / s	1,7	-	1,8	3,8	2,4

6.1.3 GEOMORPHOLOGY AND GEOLOGY

The project area has a complex geomorphology and varied terrain due to its location between the high ridges of the Northern Tien Shan to the south, and the planes of the foreland with Lake Balkhash to the north-west and the Ili River to the north-east.

The Almaty region is a sub mountain foreland of the south-western range of Karatau. A significant part of the region is occupied by the Balkhash-Alakol and Ileyskaya valleys (fig 6.2).

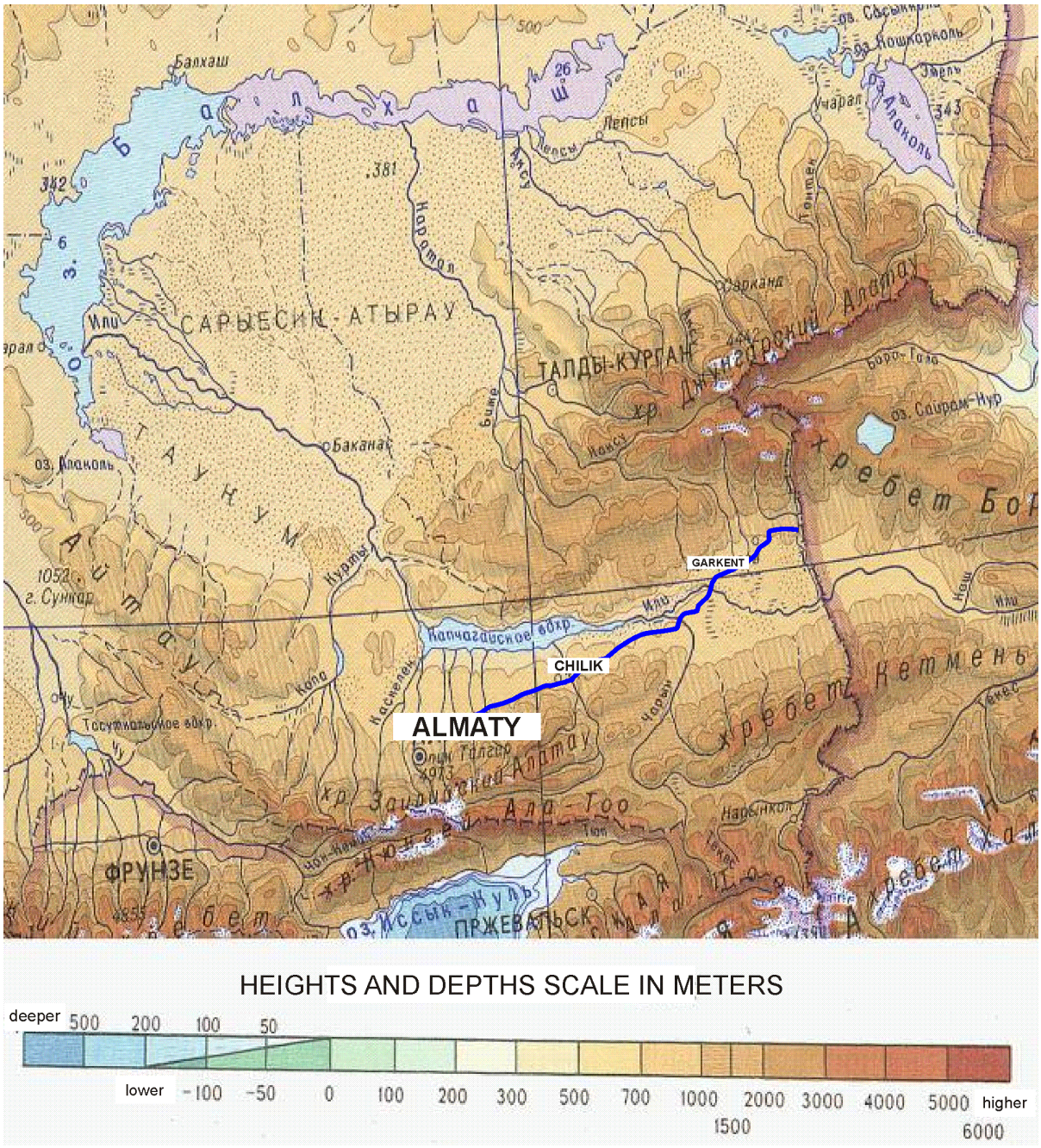


Fig. 6.2. Contour Map

Geographically, the area of the projected road is an extensive mountain valley, which extends between the Junggar Alatau mountain ranges in the north and Ketmen Zailiyskiy and Tau in the south. Around the middle of this basin is a sharp narrowing of the valley passing almost to the river and hills Katu and Kalkan on the right side and mountains on the left bank known as Boguty. Local morphological conditions in the Ili Valley

location determine the specific conditions of formation of runoff streams of northern exposure. The mountains here block the north -westerly direction air masses, so there is precipitation and streams.

Along the foothills bordering to the north and south of the mountains, Ili basin delineates technological faults that define its high seismicity. The area through which the alignment passes is classified as a 9 out of 12 in the Modified Mercalli Intensity Scale (MMI) Destructive to Violent. The valley is composed of a thick layer of red sandstone , sandy clays and sands with some gravel and conglomerates. In some sandy alluvial riverbeds in the valleys wind action has formed sand dunes particularly at the eastern end of the alignment.

6.1.4 SOILS AND SOIL FORMING ROCKS

Almaty Oblast has complex soil conditions. Soil characteristics and formation are affected by climate, hydrological conditions, geological structure, vegetation and other factors.

The project area is within a semi-desert and desert area. An examination and classification of soils was carried out according to the "Systematic list and the main diagnostic indicators of soil of Kazakhstan." and included both a consultation of existing soil maps and atlases for Kazakhstan, as well as soil sampling and classification during the geotechnical investigations done during preparatory works The soil cover includes heterogeneous light gray soils, underdeveloped, gray-brown, sand ridges and hilly areas in conjunction with clay saline soils. Soils are mostly saline. Mechanical composition differs from sands to clay loams and light clay. Soil-forming rocks are mostly saline alluvial-talus deposits, represented by loam, sandy loam and sand.

Full details of the soil Characteristics of each of the 3 Rayons can be found in Appendix 3.1.

The most important aspect of the soil characteristics is its suitability for removal, retention and subsequent use. In accordance with GOST 17.5.3.06-85 (Definition requirements for removal of topsoil and excavation) Standard 15.5.1.03-86 (Classification of overburden and host rock for biological reclamation of land) all soils were investigated for fitness for removal and subsequent use for bioremediation are divided into two groups:

Group 1: Soils with limited agricultural value

Light-chestnut medium depth general, light chestnut slightly saline ferrous mixed with medium saline ferrous 10-30%, meadow-light chestnut general medium depth general, mixed with meadow boggy soil meadow gray general soil with slightly saliniferous 10-30 %

These soils have humus depth level from 20 to 47 cm. Humus content ranges from 1,65 to 3,31%. Mechanical makeup comprises medium-hard sand-loam. Recommended depth to remove from 20-40 cm

Group 2 . Soils with significant agricultural value

The second group comprises: meadow light chestnut medium saline with meadow-boggy medium saline 10-30%, light chestnut slightly truncated (eroded) with flood meadow 10-30%, light chestnut heavily saline mixed with hydromorph 10-30%, grey common medium eroded oil, grey general heavily saline, grey common heavily saline medium eroded mixed with meadow boggy 10-30%.

Normally this soil is not recommended for removal but since it is common within river valleys in the area it is not possible to avoid. As this soil type is considered more valuable for agricultural purposes any activities disturbing or negatively affecting it shall be minimized to the extent possible, e.g. the soil type shall be considered for temporary works such as haul roads, laydown areas and camp-sites, to minimize impacts and ensure that restoration is diligently carried out.

6.1.5 LAND RESOURCES

Most of the land within Section 1 is irrigated agricultural land and pastures. Land will be required on a permanent basis for the road alignment and access roads and junctions: this includes in addition to the agricultural uses a limited number of commercial and industrial buildings. No residential uses will be required. Acquisition has now largely been completed and this is reported in full in the Resettlement Investigation report (RIR). Some acquisition (86 separate land plots) has not yet been completed within all three Sections. No commercial buildings or houses will be required in Section 3.

The definition of land required for the construction was made during the field survey by the land management agencies and environment protection agencies. The total private land required within each Rayon is shown below. Most of this land has already been acquired and compensated.

Table 6.2 Total private land acquired

Rayon	No. of Owners	Area of Land (ha)	Note
Uigur	2	3.38	Part also within Section 2 of the alignment.
Panfilov	162	465.13	

Additional land will be required for borrow pits for construction material, and for temporary construction access and for construction depots, workshops and workers accommodation. Contractors will obtain access to all land required for temporary use solely through negotiation with the owner or user; there will be no temporary land acquisition through application of government acquisition taking powers. In all cases most of the land required permanently and temporary is agricultural crop and pasture land or unconverted land. In accordance with the requirements of Government land legislation it is necessary to ensure that all land used temporary for construction are returned to their original condition through a reclamation program. The technology, procedures and materials are specified in the relevant section of the design.

6.1.6 HYDROLOGICAL CHARACTERISTICS

Surface water

Although rainfall is comparatively low as indicated in section 4.2 the Almaty region is fairly rich in water resources due to the proximity of the mountains, where precipitation is higher and snow-melt and glaciers provides a perennial runoff. The region is drained by a number of large rivers and lakes which flow into the internally closed (Endorheic) Balkhash Basin at Alakul. The most significant waterway is the Ili River. Other rivers include the rivers Karatal, Aksu, Tnetek, Yrgayty, Kaskelen Talgar, Large and Small Almatinka, Shyryn, Turgen, Sholak, Lepse, Issyk, Shelek, Charyn, Horgos, etc.

Since all major rivers originate in the high mountains where snow melt, glaciers and significant all year rain they are perennial but some of the smaller rivers become dry during the dry season. Short duration flooding may occur during the period March to June when river flows and rainfall levels are higher. Within the immediate vicinity of Section 1 rainfall varies between 400 – 300 mm per year with higher levels in the west.

The River Khorgos is 170 km long, the water quality of the river corresponds to class 3, "moderately polluted" (WPI-1, 21.2,1), with higher levels of copper (up to 3 MAC) and chromium (2 +) - 8 MPC. The River Khorgo is a right-bank tributary of the Ili River, and originates on the southern spur of the spine Bedzhintau (altitude 4000-4200 m). The general direction of flow of the river is from north to south.

For River Khorgo and the River Ili water level rise and increased water content usually starts in March and ends in May - June. The potential for flooding may range from 40 to 100 days. The rise of the spring flood usually goes quickly. The average duration is 8-12 days. Longest rise floods may reach 25-50 days and lowest in very dry years - a day. Duration of flood recession is usually 2-3 times more than the duration of the rising waters. The highest monthly runoff usually occurs in July, the lowest in March.

Table 6.3 - Characteristics of catchment areas of rivers Usek and Khorgos

No.	The name of the river	The distance from the sourc	Average slope of the river ‰	Area of water catchment km ^{2}	Average elevation of catchment, m	Average catchment slope ‰	Forested area %

		e, km					
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	Usek - 1.7 km above the confluence Small Usek	45	47	724	2980	456	5
2	Small Usek - 0.2 km above confluence with Usek	41	48	407	2880	374	5
3	Horgos – Baskunchi village	72	34	1080	2820	434	10
4	Horgos - Away Bridge	110	18	1200	2820		
5	Usek - Taldy	111	20	1220	2850		

Table 6.4 - Maximum water flow of rivers adjacent to Section 3

№ n / n	**Characteristics watercourses**	**Estimated flow m³ per second**
1	**2**	**4**
1	Ili River	2300
2	The right bank of the River Usek	(380) 201
3	River Tyshkan	68.4 m³ plus 47m³ River Chizhin 1
4	River Chizhin-1	47.0
5	River Chizhin-2	47.0
6	The left channel of the River Chizhin	15.5
7	River Khorgos	380

Ground water

The Design Engineers supplemented the existing data and literature in the area by a series of boreholes along the alignment at approximately 500 meter intervals in relatively flat land and more frequent where there are gradients.

The groundwater characteristics of the area are shown in Fig. 6.3.

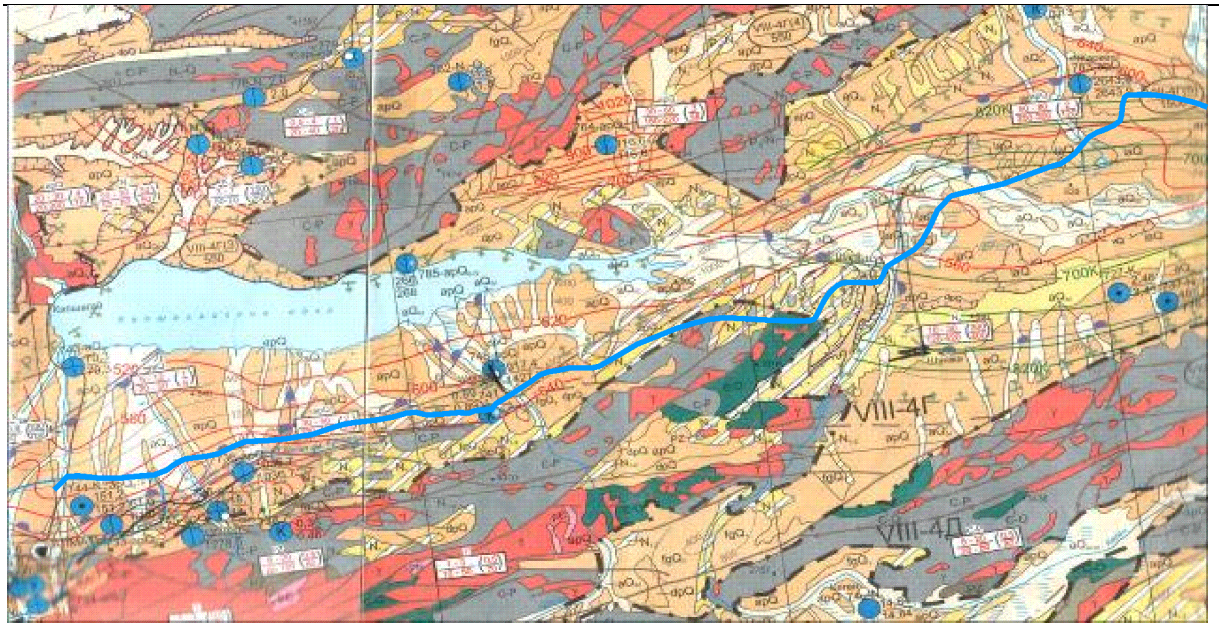


Fig. 6.3 - Hydro geological map of the projected road

УСЛОВНЫЕ ОБОЗНАЧЕНИЯ

1.ПЛОЩАДНОЕ РАСПРОСТРАНЕНИЕ ГИДРОГЕОЛОГИЧЕСКИХ ПОДРАЗДЕЛЕНИЙ
AREAL DISTRIBUTION OF THE HYDROGEOLOGICAL UNITS

aQ_{IV} — Водоносный горизонт современных аллювиальных отложений.
Пески, супеси, суглинки, галечники, гравийно-галечники
Recent alluvial aquifer.
Sand, sandy loam, loam, shingle, gravel-shingle

apQ — Водоносные комплексы четвертичных отложений различного генезиса (apQ, lQ, laQ, dpQ, mQ, mQ+vQ).
Валунно-и гравийно-галечники, пески, прослои суглинков и глин, дресвяно-щебенистые отложения с песчаным заполнителем, супеси, илы
Various in genesis Quaternary aquifer.
Boulder and gravel shingle, sand, loam and clay interbed, gruss-debri sediments with sand filling, sandy loam, silt

N_2 — Водоносный комплекс плиоценовых отложений.
Гравийно-галечники, реже валунно-галечники, пески разнозернистые, супеси, суглинки
Aquiferous Pliocene complex
Gravel-shingle, rare boulder-shingle, sand inequigranular, sandy loam, loam

3. РАЗВЕДАННЫЕ МЕСТОРОЖДЕНИЯ ПОДЗЕМНЫХ ВОД
EXPLORED DEPOSITS OF UNDERGROUND WATER

Месторождение подземных вод. Цифры: сверху- номер по каталогу и геологический возраст водовмещающих пород; справа - количество утвержденных эксплуатационных запасов, тыс.м ^{3}/сут: в числителе- по категориям $A+B+C_1$, в знаменателе - по категориям по $A+B+C_1+C_2$
Знаки внутри кружка соответствуют типу месторождения:
Underground water deposit. Figures: above- number in catalog and geological age of host rocks; on the right - amount of approved explotation resources (1000 cub.m/day,) in numerator - $A+B+C_1$ categories, in denominator $A+B+C_1+C_2$, categories
Signs in the circle corresponde to deposit type

Генетические типы месторождений:
Genetic types of deposits:

В пределах современных и погребенных речных долин
In frames of present and buried river valley

В конусах выноса предгорных шлейфов и межгорных впадин
In detrital cones of piedmont fans and mountain basins

В артезианских бассейнах
In artesian basins.

The general movement of groundwater is from the slopes of the mountain ranges in the south of the project area downwards into the plains in the north. In terms of groundwater flow four hydrological regions have been defined: mountain slope, foothill stage, piedmont and alluvial proluvial plain. Regarding the typical

aquifers, on the mountain slopes groundwater is mainly stored in the fractured rocks, with the most intensive water recharge in the weathering zone and in tectonic fracture zones. Due to strongly dissected relief, only part of the flow goes into the valley by underground routes. In quantitative terms, the flow to the lowland area is at an average of 6.5 liter / sec per square km. The remaining flow, going into the valley by underground ways, according to data of the Institute of Hydrogeology, is estimated at 1.7 liter / sec per square km.

Generally underground waters occur between 1.0-20.0 m deep. In irrigated land underground water level occurs at 0,8-1,0 m depth. Chemical properties vary greatly. Slightly salty and salty waters dominate, with salt content from 1.5 to 5.0 g/l. Excessive mineralization occurs because of stagnant conditions and sandy salty soil.

Using data from the Almaty Hydro Geological Station, it is possible calculate the ratio of the quantities of water, coming from different sources. The figures are, filtration of water from the river beds (50-60%) and inter-farm network of irrigation (10-16%), underground drainage from the mountain range (8-14%), infiltration of rainfall (9%), filtering of irrigation water (9%) and condensation of water (2%), are involved in groundwater recharge of the alluvial fans.

The total groundwater flow from the foothills is estimated at 27.2 liter / sec per square km.

A proluvial-alluvial plain occupies the bottom of the valley. The deposits, forming the plain, are represented by sands, gravels, sandy loam and loam interbedded clays. Movement of groundwater from the wide part of the valley and alluvial fan to the valley of the base river, creates an irregular flow. At a distance of 16-20 km from the mountains a single powerful stream, formed in the cones, is divided by layers of impermeable rock into several aquifers. In these areas groundwater flow is reduced as a result of impermeable layers, debris material, and in some areas is due to tectonic movements. The flow of groundwater divides and part of it flows and feeds the numerous rivers. The final discharge of groundwater flow occurs in three ways: passing out into the Ili River, the outflow of the alluvium of the valley and the vertical flow into upper aquifers. The main discharge of groundwater for the foothill plain occurs on the valley itself and the main loss is the evaporation.

Aquifers:

An aquifer system of coarse boulder-pebble deposits of alluvial fans is located in the foothills. The deposits are characterized by high water abundance. Near the riverbeds the water is fresh, characterized by bicarbonate calcium, with dry weight of 0.2-0.3 g / l, the remaining area is dominated by sodium sulfate saline water (1.4-2.8 g / l).

The aquifer system is of sandy-clayey Quaternary piedmont plains. This complex contains the ground and artesian water. The ground water is at the depth of 3-9 m in the valley of the Ili River, and up to 15-20 m in interfluvial spaces. Water below the local base is fresh, calcium bicarbonate, with solids up to 1 g / l, in the upper aquifers it is brackish, sulphate-sodium, with a dry residue of 1-3 g / liter. Artesian water on the plains is wide spread. Typically, the thickness of alluvial deposits, proluvial piedmont plains contain some confined aquifer, whose thickness varies from 1 to 18 m. Artesian water is fresh hydro-carbonate-calcium and calcium-sodium.

At present, about 50 locations of ground water in the Almaty region(which covers all three sections) have been exploited. The locations of wells, sources and extraction points of groundwater and thermal waters are shown in Figure 6.4.

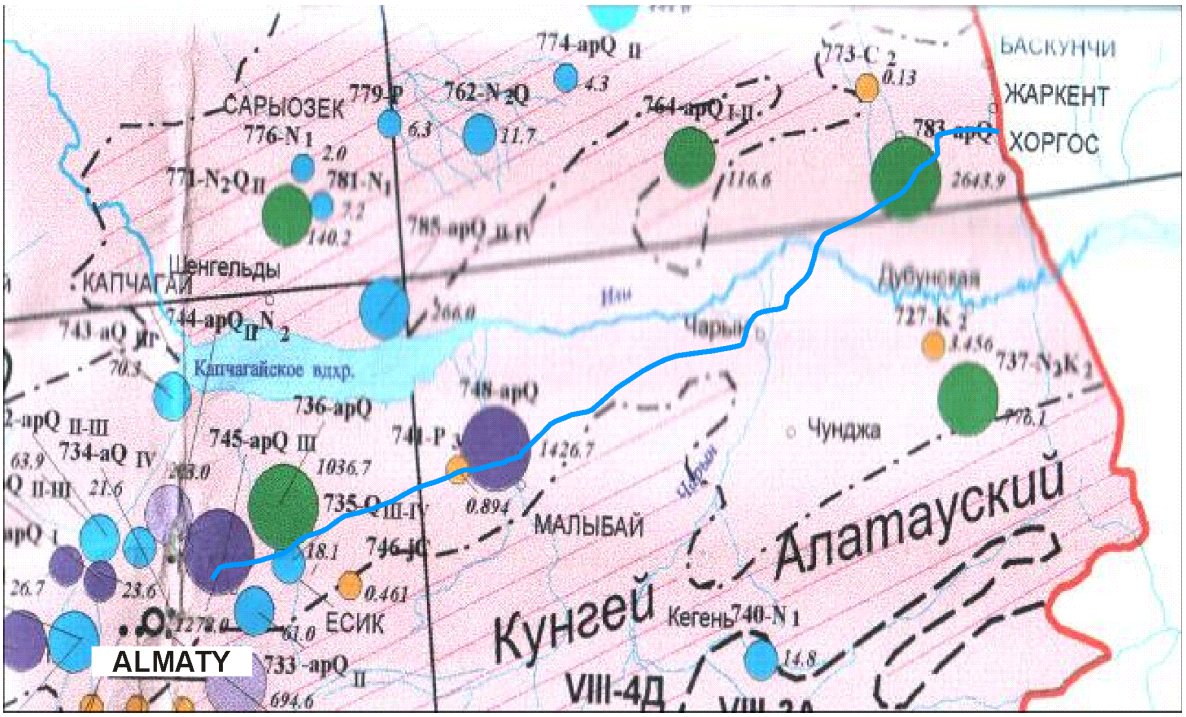


Fig. 6.4 – Deposits groundwater area of the projected road

LEGEND

I. GROUND WATER DEPOSITS

748-apQ a) 783-apQ b) 764-apQ I-II c) 641-D3-C1 d) 740-N 1 e) 727-K 2 f)

Deposits with confirmed ground water reserves, thousand cubic meters/day
a) more than 1000; b) 500-1000;
c) 100-500; d) 50-100; e) 10-50;
f) less than 10.

Note:
numbers over symbol - index number of deposit;
after hyphen - geological age of aquiferous rocks.
To right - explored reserves, thousand cubic meters/day.

USE OF GROUND WATER

- Household-drinking water supply
- Production-technical water supply
- Household-drinking and production-technical water supply
- Household-drinking water supply and agricultural irrigation
- Household-drinking, production-technical and agricultural irrigation
- Agricultural irrigation
- Mineral

VIII Djungar Tyan-Shan region

1st order pools:

VIII-2 Central-Tyanshan
VIII-3 North Tyanshan
VIII-4 Djungar-Balkhash

6.1.7 FLORA AND FAUNA

Flora

The study area belongs to the Asian desert region, the Irano-Turanian sub region Terskey-Ketmen province (which is characterized by a specific range of zonal types of communities), and Ili and South Djungar sub province (part of the botanical and geographical region, characterized by a certain set of structures and zones of vegetation), Foothills and mountains (desert community, formed under the influence of the mountains, which include synusiae ephemeroids and ephemera, sometimes cereals. Specifically, the vegetation is represented by:

- Black Sagebrush-Saxaul and Black Ferula-Saxaul.
- Aggregate series sedge communities of sagebrush mixed saxaul on hilly and hilly loose-ridge sands.
- Aggregate series sedge communities and psammophyt-shrubs on hilly and hilly loose-ridge sands.
- Echinochba and Alakol.
- Feather-grass vitex wormwood.
- Communities of reeds, halophytes and tamariske
- Communities of forb-grass, ceratoides and black saxaul
- Forb-grass and ceratoides with sparse sedge and sagebrush scrub.

Fauna

- A thorough, internet based and literature search was carried out on fauna inventory and characteristics in the Almaty Oblast. The Fauna throughout Almaty Oblast is rich and diverse due to the extensive areas of deserts and mountains. The richest areas are the extensive mountain areas in the south of the Oblast bordering with Kirgizstan. Wolves, snow leopard, lynx bear can be found in these areas. Further north in the transition between mountain and desert the wildlife is less diverse and many of the larger mammals are not generally found. The diversity of species is further reduced because of the significant amount of agricultural and grazing land in the western part of Section 3.
- Nevertheless there are significant populations of rodents, badgers, rabbits, gerbils and others. Marmot are also found. Bird populations in the Oblast are extensive and various species of eagles, kites, harriers are recorded in the Oblast generally. The Great Bustard, Quail, Gray Crane, Sand Grouse, Jays and Sparrows are to be found as well as Pheasants . Since there are no large areas of water within section 1 there are no significant resident populations of ducks, geese, swans etc.
- Throughout Almaty Oblast there is a population of rodents: ground squirrels, jerboa, field mouse and other rodents. Specifically in Section 3, fox, wildcat, antelope and wild ram are reported. Representatives of insectivores found include hedgehogs, shrews, reptiles include various lizards and snakes. Domesticated sheep, goats and cattle are common. Horses are used in farm activities. Dogs are also extensively used in herding animals and may already adversely impact on many mammals.
- Although there are some of wild or natural habitats including forest areas in the vicinity of, and sometimes close to the alignment for small areas to be affected (e.g. Ili river and its floodplain and a sand dunes area, the area) Section 3 is not characterized by a high diversity of species and sub species. There is no record of rare, endangered or vulnerable species of animals and birds in the area. There is no record of any populations of Kazakhstan red list animals such as Saiga, Marmot or Gazelle. Except along the Ili River and its floodplain (which will be affected only in a very short section of max. 500 m length at the bridge crossing) there are no large areas of water or wetlands. There are no sensitive areas or areas of high landscape value close to the alignment and there are no known proposals to include any part of the area as a legal protected area. Based on the Consultant's field work within the alignment and the knowledge and fieldwork of the Design Engineers (see below for description of research methodology) there is no evidence to show that the alignment has any sensitive fauna or flora.

- During the consultation meetings in October the subject of fauna within Section 1 was not discussed or mentioned by the community or by Rayon representatives. At a meeting with The Ecological Society: Green Salvation, an Almaty Based NGO, the issue of wildlife in Section 3 and any impact that the road may have was not defined as an issue or a point of concern.

Flora and Fauna: Methodology for gathering of evidence

Based on the Consultant field work within the alignment and the knowledge and fieldwork of the Design Engineers there is no evidence to show that the alignment has any sensitive fauna or flora. During the consultation meetings in October the subject of fauna within Section 1 was not discussed or mentioned by the community or by Rayon representatives. At a meeting with The Ecological Society: Green Salvation, an Almaty Based NGO, the issue of wildlife in Section 1 and any impact that the road may have was not defined as an issue or a point of concern. The potential fauna issues in Section 2 were however discussed.

The Environmental team of PMC undertook a number of site visits to the alignment accompanied by the design engineers and other experts. They met with experts and others whilst on site, at consultation meetings, and at other meetings in Almaty,. Telephone interviews were conducted with officials and other experts, including the Directors of both Charyn and Altyn-Emel National Parks. The team also researched a number of Russian language and English language websites to determine and understand the Fauna resources and issues in the Almaty-Khorgos areas.
Site visits: The Environmental team of the PMC who were responsible for refining the previously prepared EIA undertook the following site visits:

- 23 September: Site visit with Design Engineers and representative of Regional director of roads to Sections, 1, 2 and 3. This was an initial general site visit, which focused on the general alignment and the immediate impacts of the road.

- 3 October: site visit focusing specially on Section 2 and Section 3: Site visit with Design engineers, including Hydrologist , to wet area and area between two National Parks and agricultural area near alignment.

Discussions with the following people on Fauna and potential issues connected with road alignment.

- Kamiljan Yuluashev, Department of Forestry of Uigur rayon, Zoology and hunting group (met on public consultations, phonecall, received fax letters on population characteristics)
- Shayakhmet Zamanov, Charyn National Park, Director (phone calls)
- Tohtem Bektemisov, Charyn National Park, Deputy Director (phone calls)
- Halyk Abedarovich, Altyn-Emel National Park, General Director (phone calls)
- Temirhan Kadyrbayev, Shelek Department of Forestry, Director (phone calls, discussed Nurly section wetland fauna)

Obviously the National Park sources of information and responses are considered to be both credible and reliable.

Design consultants met:

- Aigul Munaidarova, JSC "Kazakhstan Joldary", Executive director, Chief engineer of the project sections 1 & 3 (Accompanied on site visit and consultation meetings)
- Sergey Efimov, JSC "Kazakhstan Joldary", Head of Hydrology and Geology surveys group (site visit, meeting in WB Office)
- Yurii Sorokoletov, JSC "Kazakhstan Joldary", hydrologist
- Sultanbek Karimov, "Kazdorproject" Ltd., Executive director, Chief engineer of the project section 2 (Accompanied on site visit and consultation meetings: phonecalls, elaborated on wetland section)

An NGO meeting was arranged with Svetlana Spatar from NGO "Green Salvation", who is the coordinator of work with IFIs.

Websites reviewed and referred to:

11. ru.wikipedia.org
12. redbookkz.info
13. caspionet.kz
14. greensalvation.org
15. unesco.org/en/tentativelists
16. birdlife.org/datazone/sitefactsheet.
17. egov.kz/wps/portal/
18. en.wikipedia.org/wiki/Endangered_species
19. iucnredlist.org
20. wwf.panda.org

Additionally a number of travel and tourism websites provided useful indications of wildlife and likelihood of viewing these animals.

Conclusion: The PMC Environmental team obtained data from a range of sources and people who are familiar with the area and the alignment. It was particularly important that the team were able to directly discuss the fauna within the National Parks Directors and how some of the larger species would be impacted by the road proposal. Since the alignment passes through a corridor already impacted by development and the new road alignment will incrementally add to this anthropogenic impact, but not create substantial new impacts. Both National Park Directors considered that though the road may be a deterrent to the free movement of various mammals, with appropriate management and the use of underpasses and, if required, overpasses such as "green bridges", most fauna should continue to move through the area unimpeded. Continued monitoring will be necessary. The proposed alignment will take most traffic away from the present route that passes through Charyn National Park, which is a distinct advantage to the fauna within that area.

6.1.8 SOCIAL AND ECONOMIC CHARACTERISTICS

The road passes through a rural area with low population densities. The total populations of the 2 Rayon through which this Section of the road passes are as follows:

Table 6.5 Population of Rayons in Section 3

Rayon	Population (Year 2010 Estimates)
Uygur	64,762
Panilov	120,646

Panfilov Rayon

The regional center is at Zharkent. Panfilov Rayon of Almaty Oblast was formed in 1928, and covers 10.6 thousand sq. km. It is bounded on the eastern side by the river Khorgos which forms the international border with China, in the south by the Ili River, and in the east by the Uighur Rayon. The area has one urban and 12 rural districts. The population of the district is 115.1 thousand people, there are representatives of 35 nationalities.

Agriculture is the priority sector of the economy. The total area of agricultural land is 658.4 hectares, including arable lands - 40.4 thousand hectares, pastures - 407.7 thousand ha, hayfields - 13.7 thousand hectares. In the recent past the agriculture sector comprised 32 cooperatives and associations, 4146 farms, which employs 11 459 people. The main crop is corn but the area is also now strong in horticulture and viticulture. Grazing continues to be important and cows milk and wool production from sheep are significant. There are also large herd of goats, camels and horses. Agricultural by production is important in the rayon with starch and syrup being produced locally. There are other industrial activities in the Rayon.

The service industry is important with a number of small businesses focusing on tourism activities. In Zharkent there are hotels, cafes, restaurants and other recreational facilities with a wide range of services. In

the area there are 3 known sanatorium "Zharkent Arasan", "Arasan Koktal", "Kerim Agash." There is a growing tourism industry for short stay tourists from China.

In the area there are 9 pre-schools, 51 secondary school, a physical-mathematical lyceum, Teachers College, branches of medical and legal colleges, and a vocational school. There are 22 houses of culture, 10 clubs, 2 libraries. There are 46 medical institutions. .

Uygur Rayon

The Uighur district was formed in 1934 and is located in the foothills of the Trans-Ili Alatau ranges between Ketmenskim ridge and the plains of the Ili basin.

The district's area is 8.7 sq. km with a population of 63.8 thousand people. There are 25 settlements and 14 rural districts. The centre of the Rayon lies 243 km from Almaty. The population density is 7.3 persons. per sq. km. Uighur Rayon produces a large variety of herbs, apricot, apple, grape and berry crops. The Rayon has coal deposits and has some gold deposits at Altynkentskoe.

The Rayon has irrigated agriculture and sheep and beef cattle. In the recent past the district had 42.2 thousand head of cattle, 202.6 thousand head of sheep and goats, 12.1 thousand head of horses, 85.8 thousand head of poultry. The main production is grain, vegetables, various fruit, grapes, beef, milk, eggs and wool.

Also some 10 years ago the district had 195 economic entities, including 57 small businesses and 1520 farms. There are approximately 30,000 economically active people in the Rayon.

6.1.9 PHYSICAL CULTURAL RESOURCES

One of the issues that must be considered during the construction of the road is the preservation of historic and cultural monuments which includes structures, memorials and other objects associated with historical events in the life of the community. This includes materials of historical, scientific, artistic value (old buildings, graves, archaeological sites), as well as unique natural reserves, national parks etc.

An archaeological survey of the proposed alignment was conducted by State Enterprise "Institute of Archaeology AH Margulan KH MES. The regulation states that "the economic development of the area through the construction of roads in the specified area is allowed subject to the conditions stipulated in Article 39 of the Law of the Republic of Kazakhstan On protection and use of historical and cultural heritage. " This includes a full archaeological investigation of monuments located in the area of road construction and recording and removing them as necessary. The requirements are:

- In the development areas research must be carried out on the identification of sites of historical and cultural heritage.
- In the case of objects of historical, scientific, artistic and other values, all persons are obliged to suspend the further construction conduct of the work and notify the authority.
- Prohibition from conducting activities that may pose a threat to the existence of historical and cultural heritage.

Based on the above law, studies were carried out at the following archaeological sites in the Almaty catchment area. In the Almaty Oblast there are numerous mounds and remains. However based on the survey carried out for this Section 3 of the alignment there were no cultural or archeological sites or remains found directly on or immediately adjacent to the alignment.

6.2 ENVIRONMENTAL IMPACT ASSESSMENT: SECTION 3

6.2.1 INTRODUCTION

During the construction of roads the main types of environmental impacts normally are:

- Air pollution caused by exhaust gases of various construction vehicles and various moving and stationary equipment;
- Noise caused by machines and equipment and various other construction activities;
- Contamination by dust from wear of road surface, from construction materials and from the transportation of construction materials;
-
- Possible contamination of agricultural food production activities during the extraction of road building materials, dredging, and new construction activities;
- Potential contamination of top soil, surface water sources, ground water resources, and vegetation adjacent to the road;
- Disturbance of nesting birds and the habitats of animals;

During operation phase impacts such as air, noise etc are dependent on the distance from the carriageway.

- Air pollution and noise from all vehicles passing along the new route;
- Contamination by dust from, wear of road surface and erosion of adjacent soils;
- Pollution of road by dumping of industrial and household waste;
- Potential pollution of surface runoff from the roadway;
- Potential pollution of groundwater from run off and other contamination;

Zones of Impact: The following corridors adjacent to the carriageway have been defined:

- Zone of Impact: A corridor of up to 3,000 meters where some impact of the road may occur or be measurable;
- Protection Strip: A strip adjacent to the right of way where some impacts will occur. In some cases the impact may be significant; noise and air quality, drainage impacts, soil contamination etc.
- Reserve strip: A strip within the right of way that is required for emergencies, potential long term use for the road, for road services and cuttings, and embankments. Significant impacts will occur and changes to the local environment will already have been carried out during the construction of the road.

Approximate dimensions of the zone of impact, protection strip, and reserve strip are shown in Table 6.6.

Table 6.6 - Estimated size of the zone of impact, the protection strip and reserve strip

Impacted zones	Distance from road, m, For environmental class of road		
	I	II	III
Zone of Impact	3000/1500	2000/1000	600
Protection strip	250/150	150/90	60/30
Reserve strip	30	12	-

6.2.2 AIR IMPACT

Construction and Operation Period

The proposed construction and operation of the road will be accompanied by emissions of pollutants during the construction period (emissions from construction activities and operation of motor vehicles and machinery), and emissions from vehicles traveling on highways during the operation period.

Table 6.7 lists the typical emission sources during the construction and operation of a major highway.

Table 6.7 Emission source characteristics

Works type	Name and characteristics of emission sources	Name of potential air emissions
1	2	3
Construction	Dust generation during works	Inorganic dust
	Exhaust gases from internal combustion engines	Nitrogen dioxide, soot, carbon monoxide, benz(a)pyrene, carbohydrates
	Welding	Iron oxide, manganese and its compounds, hydrogen fluoride
	Paint works	White spirit, xylol
Operation	Exhaust gases from internal combustion engines	Nitrogen dioxide, soot, sulfur dioxide, Carbon monoxide, carbohydrates C12-C19, lead compounds

The composition of engine emissions: carbon monoxide, hydrocarbons, nitrogen dioxide, lead, sulfur dioxide and particulate matter (soot).

The assessment of the level of air pollution caused by exhaust gases is based on a computer program. The predicted amount of pollutants emitted into the atmosphere during the construction and operation of the facility is presented in Table 6.8. The values of maximum permissible concentration (MPC) of pollutants obtained from the sanitary-epidemiological regulations and guidelines "Sanitary-epidemiological requirements to the atmospheric air." № 629 of the Republic of Kazakhstan of 18 August 2004. The data listed in the table are obtained by summing the emissions for each component using the methods agreed upon by the Ministry of Environment of the Republic of Kazakhstan. Assessing the impact on the air during the operation period is based on traffic forecasts up to 2028 prepared for the Feasibility Study.

The calculated value of acceptable concentration of harmful substances contained in exhaust gases from the various types of cars in mixed-flow traffic is shown. The impact on the atmosphere is considered acceptable if the content of harmful substances in atmospheric air of populated areas does not exceed the maximum permissible concentration laid down in SanPiN "Sanitary-epidemiological requirements to the atmospheric air" dated August 18, 2004 N 629.

Table 6.8 – Section 3: Calculated air emission pollutants (maximum permissible concentrations: MPC)

Pollutant Code	Name of pollutant	MPC mg / m ^{3}	MPC mg / m^3	TSEL mg / m^3	Hazard Class	Predicted Emissions Tons
1	2	3	4	5	6	7
Air emissions during construction						
0123	Iron oxide		0.04		3	0.0066
0143	Manganese oxide	0.01	0.001		2	0.0007
0301	Nitrogen dioxide	0.085	0.04		2	62.7608
0328	Soot	0.15	0.05		2	11.1645
0330	Sulfur Dioxide	0.5	0.05		3	12.9278
0337	Carbon monoxide	5.0	3.0		4	465.3043

0342	Fluoride	0.020	0.005		2	0.0003
0703	Benzo (a) pyrene		$1 * 10^{-5}$		1	0.0001
0616	Xylol	0.2			3	0.1442
2752	White Spirit			1.0		0.1442
2754	Hydrocarbons	1			4	66.1404
1310	Aldehydes	0.015	0.075		3	4.9079
2907	Inorganic dust (SiO_2 above 70%)	0.150	0.05		3	1326.7268
2908	Inorganic dust (SiO_2 70-20%)	0.300	0.100		3	974.8887
	Total:					**2925.1173**
Air emissions during operation						
0328	Particulate matter (soot)	0.15	0.05		2	15
0337	Carbon monoxide	5	3		4	55 706
0301	Nitrogen dioxide	0.085	0.04		2	1048
0330	Sulfur Dioxide	0.5	0.05		3	76
2754	Hydrocarbons			50		312
0184	Lead and its inorganic compounds	0.001	0.0003	0.005	1	128
	Total:					**57 285**

Assessing the level of impact on adjacent residential areas and sensitive uses is based on modeling of emissions in the atmosphere, according to "Methods of calculating concentrations of air pollutants contained in the emissions of businesses. RND 211.2.01.01-97" In calculating the dispersal of emissions from vehicles and to determine the concentration of toxic substances at a distance of 20 meters from the road the model used a Gaussian model distribution of pollutants in the atmosphere at low altitudes. The results of calculations of air pollution.

Calculations have been made for a single concentration (MPC) in accordance with SanPiN "Requirements for atmospheric air of populated areas» № 3076 from 841 from 18.09.2004g 3.12.2004g. Approved by the Ministry of Health of the Republic of Kazakhstan. Calculations have been prepared and are shown in Table 5.4.

Table 6.9 – Motor vehicle emissions dispersion calculation

Emission type	Calculated at 20 meters from road, mg/m^3	MPC m.s., mg/m^3	Average daily MPC, mg/m^3	Hazard class
1	2	3	3	4
Carbon monoxide	0,056	5,0	3,0	4
Hydrocarbons	0,011	1,0	1,5	3
Nitrogen oxide	0,0056	0,085	0,04	2
Lead compounds	0,000032	0,0010	0,0003	1

Conclusion Construction and Operation Periods:

Construction: The detailed calculations for construction and operation periods yield results that are within the limit values prescribed by Kazakh legislation. Also since the alignment passes through predominantly open rural land with no sensitive uses near the alignment the adverse impact on the community will be minimal. Regular monitoring of air pollution against Kazakh standards (and international, e.g. WHO, for any parameters not covered by local regulations) shall be carried out throughout the construction period. The

party responsible for monitoring will be the Contractor, who will be obliged to report to the Engineer as well as local environmental authorities.

Operation: The results show that the magnitude of the impact of transport on the air quality does not exceed the maximum allowable concentrations to a distance of 20 m from the nearest traffic lane. During the operation phase concentrations of toxic substances contained in exhaust gases within the areas adjacent to the road are within the allowable MAC, and do not adversely impact on the environment or sensitive uses.

6.2.3 NOISE AND VIBRATION IMPACT

Construction Period

The various mechanical processes during the construction of roads are a source of intense noise, which can adversely affect humans. The intensity of the ambient noise of road machinery depends on the type of machinery and equipment and the distance from the workplace to sensitive and residential development. Especially problematic is the noise created by the work of bulldozers, vibrators, compressors, excavators, and Diesel Trucks. The noise produced during construction is temporary and localized but can still create an annoying impact.

According to GOST 12.1.003-83 Section "Noise" standards for noise level have been adopted of 70-80 dBA. Zones with noise level above 80 dBA must be marked with safety signs. To ensure acceptable noise levels construction activities should not take place at night. Soundproofing of the engines of construction road vehicles should be carried out with multilayer insulating coatings of rubber, foam rubber, etc. This action can reduce the noise by up to 5 dBA.

Conclusion: Construction Period

In view of the isolated characteristics of the area through which the road passes it is concluded that there will be no construction noise impact on any housing or sensitive uses. From experience and engineering judgment it is predicted that noise levels will remain below the levels recommended in the regulations referred to above.

Possible existing borrow pit locations have already been indicated by the Design Engineers for Section 2. The sites are approved locations and the selected Contractor will – in consultation with Engineer and local environmental authorities – propose at which locations are most suitable to start exploitation activities.. Whichever sites are used existing local roads will be used as access to the road construction site. On the main road it is unlikely that the construction traffic will have a significant impact on traffic flows and noise disturbance to the existing communities Nevertheless whichever sites are used existing local roads will be used as access to the road construction site. On the main road it is unlikely that the construction traffic will have a significant impact on traffic flows and noise disturbance to the existing communities. Nevertheless this will need to be reviewed and monitored in detail prior to the commencement of the construction period. For the minor roads that cross the new alignment and for any access routes construction traffic will significantly increase traffic flows and potential noise disturbance. A traffic count on all possible access roads to road construction site together with a regular monitoring program will be prepared prior to the commencement of the construction period as part of the environmental due diligence and management measures.

It is recommended that only essential construction traffic passes through Kolkat and Zharkent.

Operation Period

Operation noise levels are influenced by traffic volume, fleet composition, speed, vehicle operating condition, age of vehicle, and condition of the road. Sources of noise on the car are the engine and the tire noise hitting the road surface. The noisiest are heavy trucks and trailers with diesel engines; the most "quiet" are new and more expensive cars.

Maximum allowable noise levels (PDU) of noise - this is the factor level which is in daily work (during the working experience) should not cause annoyance, distress or cause or worsen health of the present or future generations.

Calculated MPL are adopted in accordance with the "Standard Specifications of noise levels in residential and public buildings and housing areas» № 841 dated from December 3, 2004, by the Ministry of Public Health of the Republic of Kazakhstan.

Permissible maximum levels of noise, caused by vehicles, are adopted in accordance with the above standards, it is 70 dBA. Analysis of the results obtained from noise level calculations shows that the distance from the road for the 70 dBA standard is approximately 20 meters without installation of any noise barriers, and 10 meters with the installation of appropriately designed barriers.

Conclusion for the Operation Period:

In conclusion during the operation period the predicted noise impact to any residential or sensitive uses will be minimal and where required further reduced by appropriate engineering measures, such as sound barriers, plantations and landscaping elements. This approach has successfully been implemented in the World Bank financed "South West Roads Project" which has similar objectives, approach, dimensions and issues. During operation regular monitoring of the noise situation and characteristics along the alignment and the access roads will be necessary. If any additional mitigation measures are considered necessary they will be included in the repair and maintenance budget on a running basis and carried out within those activities. At this time no changes to the design of the alignment will be necessary.

During operation regular monitoring of the noise situation and characteristics along the alignment and the access roads will be necessary. Any necessary mitigation will need to be carried out at this time.

6.2.4 HYDROLOGICAL IMPACT

This Section covers 1) the availability of water for the construction and operation of the road and 2) the potential impacts including contamination impacts that the road will have on water resources in the area: surface and groundwater.

Water Needs for Construction Period

The planned construction work on the site of the proposed road will require water for construction activities and for drinking and domestic needs of the construction workers.

Consumption of water for construction for compaction of sub grade and washing of road-building materials is estimated to be 451 733 m3. The required amount of water is based on "Estimated ratios and costs for construction work."

Water consumption for drinking water supply is calculated in accordance with the legislation of the Republic of Kazakhstan. The water consumption for the period of construction of the road is based on and average of 27 l / day per person according to SNIP 2.04. 01-85. Consumption of water for domestic needs (washing, cooking etc), based on the number of employees - 400 people and the projected construction period(12 months) are shown in Table 6.10.

Table 6.10 – Water needs for drinking and household use and generation of wastewaters during construction period

Type of water use	Number of workers	Number of working days	Rate of consumption, m^3 / day	Discharge, m^3/ day	Water consumption		Wastewater	
					m^3 / day	m^3 / year	m^3 / day	m^3 / year

1	2	3	4	5	6	7	8	9
Drinking purposes	400	347	0.002	0.002	0.8	277.6	0.8	277.6
Domestic use	400	347	0.025	0.025	10	3470	10	3470
In total					**10.8**	**3747.6**	**10.8**	**3747.6**

Water take for construction and domestic use will use existing wells located along the projected road. All Rayon administrations have prepared letters authorizing use of water wells in their areas for construction. The source of water for drinking purposes can be transported by water tanker from the public supply systems of the nearest towns. .

Prior to construction all proposals for extraction of water for any purpose must be presented and discussed first with the local or regional organizations and bodies of the Sanitary and Epidemiological Department.

Water Resources Conclusion Construction Period

Based on the water requirements during the construction period and the abundance of estimated reserves of ground and other water resources it is considered that there is adequate water for all construction activities and total resources will not be affected. Ili River has an average summer water flow of 234 m³/sec, and the River Usek has a 2.99 m³sec summer flow with a 95% probability (i.e. these numbers are reached or exceeded in 95% of the observed years). .

Water Needs for Operation Period

A continuous supply of water will be required for routine cleaning and maintenance requirements and for cleaning after accidents. Water will also be required for the various uses within the rest/service areas.

Water Resources Conclusion Operation Period

Based on the potential water requirements during the operation period and the known reserves of surface and groundwater there is adequate water for all operation activities and total resources will not be affected

Contamination of Water Sources

Contamination can impact in the following ways:

- Seepage of contaminated water into groundwater and aquifers
- Contaminated runoff into streams and rivers
- Exposure and contamination of groundwater in borrow pits
- Impacts of wastewater management at construction camps

Sources of contamination are widespread during construction and operation. There is a moderate contamination potential from vehicles used on construction sites, which can contain, use, release or carry a number of hazardous substances: heavy metals, NOx,SOx and soot from the combustion of fuels, particles from wear of tires, oil, lubricants and payloads of fuel, cement, paint, construction chemicals etc.

Within Section 3 the groundwater is generally at a depth of 3 meters but in some locations it is less. The majority of Section 3 road will be constructed on embankment at an average height of 3-5 meters above present ground level. There will be no sub-grade cuts of excavations ar cut slopes in Section 3 except in a few locations in the eastern part between Km 77 and Km 86 in the area of sand dunes. These small sub-grade works will have no negative effect on the groundwater due to their shallow range and the depth of the relevant aquifers. Also there is no known critical groundwater use in this section. Except at bridge construction locations any impact on groundwater levels is likely to be minimal and contamination will be unlikely. It is unlikely that any groundwater resources will be impacted by the construction activities. The

groundwater used for household use or irrigation at depths of 10 meters or more which will not be impacted by any construction activities.

Possible pollution sources during operation may be roadside filling stations, service stations, workshops, points of inspection and locations where vehicles are cleaned. Also a potential pollutant is salt and chemicals used for deicing, which, when washout by rain and melted snow can lead to concentrations of various pollutants in runoff water. Additionally there is the risk of unwanted spills of hazardous or toxic substances due to road accidents.

Among the more serious pollutants would be particulate matter such as soot (which may be enriched by lead due to the lead content still added to some gasoline), rubber particles and heavy metal containing abrasives from brake pads, and liquids such as fuels, oil and lubricants containing aliphatic and aromatic hydrocarbons, PAH (polycyclic aromatic hydrocarbons) and phenols.

During intensive run off during heavy rainfall which normally occurs in the period March to June accumulated dust may become mobilized and contaminate runoff water and subsequent recipients. Calculations of maximum water flow were carried out in accordance with the recommendations of "Handbook to determine the hydrological characteristics of the settlement" and SNIP 2.01.14-83.

Contamination of Groundwater Resources Conclusion: Construction and Operation Period

Based on the groundwater levels within Section 3 and the design characteristics of Section 3 (no cuttings except in the eastern area of sand dunes) it is concluded that pollution of Groundwater Resources during the construction period will not occur. There will be no substantive subsoil works such as major or deep cuts. Water for the construction activities as well as the camps will be extracted in relatively small quantities from existing wells or the public supply system. Generally water availability is unconstrained in the project area. There will be spill prevention measures in place. Also, only the uppermost aquifer, which is commonly not used for drinking water extraction, could at all be impacted by the project activities.

Also during the operation period pollution of groundwater will not occur provided that the provisions of good practice are reflected by the design and properly implemented. Examples of key design features to be implemented for groundwater protection can be effective drainage systems that convey storm water quickly towards the surface drainage network and avoid stagnant ponds that may infiltrate. Also, although the total pollutant loads over the section are significant, the concentrations expected during runoff will be relatively small.

Contamination of surface water during operation period

The road drainage system, designed as part of the project consists of several drainage and structural measures designed to prevent water logging and flooding of the roadbed and to intercept and divert water flowing to the sub grade. For surface water diversion the project design provides for side drainage ditches, pipes for the passage of watercourses and water under the roadbed to prevent any possibility of stagnation, which can lead to water logging of the land adjacent to the road.

Culverts are arranged at the intersections of roads with streams, dry valleys, irrigation channels and waste channels. Pipe and box culverts have been included in the project. A description of the designed structures for watercourses, channels and ditches, culverts and sewers are shown in Appendix 3.2.

Although the design of the drainage system has been carried out in accordance with best engineering design practice in exception circumstance some local drainage problems and deficiencies may become apparent during or on completion of construction. Any deficiencies should be overcome at the earliest opportunity and monitoring of the drainage will be a long term operational activity.

Road surface run-off pollutant emissions

To assess pollution runoff from roads and identify the need to mitigate any pollution it is necessary to calculate the maximum permissible discharge of substances into water bodies. Under the maximum permissible discharge (MPD) of substances in the water body defines the mass of matter in the wastewater,

the maximum allowable abstraction from source the established regime in the provision of water volume per unit time in order to ensure water quality control point.

Maximum permissible discharge (MPD) from bridges, located at the sections of the designed road, through rivers, which have permanent runoff have been calculated for this project. The calculation of the MPD is in accordance with "Recommendations on accounting requirements for the protection of the environment when designing roads and bridges."Moscow, 1995.

Estimated flow of surface wastewater is defined as the hourly flow rate of the actual period of rainfall runoff (storm) water. Calculations of the level of water pollution runoff from the road have been undertaken for all main rivers. . The data are presented in Appendix 3.2. Detailed calculations show that the discharge of pollutants is all within the regulated maximum permissible discharge rates.

The calculations are performed on a computer program «CREDO», according to the recommendations of PDD Ministry of Transportation, the method of Main Geophysical Observatory.

Contamination of Surface Water Conclusion: Operation Period

The investigation outlined above indicates that the calculated discharge of pollutants are all within the regulated maximum permissible discharge rates and that provided all regulations and legal procedures are carried out will be no impact on water resources from pollution during the operation period.

Borrow pits

Possible borrow pits have been defined by the design engineers but these are not part of the approved design since the contractor will make the final decision on the selection of borrow pits. (Paragraph 2.6) The existing borrow pits have received EIA approval from the Rayon and it thus may be assumed that they will not be interfering with sensitive aquifers that have any significance as drinking water resource. Moreover, aside from accidental spills (by themselves unlikely) the operation of borrow pits has little contamination potential. The main risk is the failure to properly close and recultivate the pits, which may lead to their conversion into illegal waste deposit sites, which would have a substantial contamination potential. An important part of closure will thus be to dismantle and / or block all access roads.

The environmental impacts from river bed extraction are likely to be acceptably low where such operations are carried out under valid licensing and supervision by the authorities. Generally the high dynamics of the rivers in the project area, especially the very high sediment loads due to the proximity of the mountains, and the floods in spring that carry these loads down the river beds, speak for a low environmental sensitivity of these rivers towards gravel extraction. This potential source of construction materials, especially aggregates, thus need not a priori be excluded due to environmental considerations.

Irrigation

Section 3 passes through some irrigated agricultural land. Any loss of water for even short periods can adversely impact on the growing crops and can be critical during the spring and summer growing season. In some cases the road permanently disrupts and disconnects the irrigation channels though this is not common. However in most cases disruption to the irrigation channels will only be temporary and realigned channels and culverts under the road alignment will ensure that irrigation water will not be disrupted for any long period and water will still be provided to the agricultural land.

Ili Bridge Construction Activities

The construction of the new Ili Bridge is a major construction activity that will take a total of 33 months and involve a significant number of workers. The construction will be undertaken by a specialist bridge construction contractor. A range of construction activities will be involved including excavation of river bed, piling, construction of piers, contraction of bridge structure, construction of bridge abutments including piling, and construction of road surface.

The construction will involve the establishment of a fenced secure construction depot of approximately 2 ha about 100 meters downstream of the existing bridge adjacent to south side the river bank. Trees and planting

will be uprooted and the top soil removed and stored. The depot will be used for concrete batching, storage of materials and equipment, workshops, testing laboratory, accommodation for workers etc. The depot site will be accessed via a direct temporary road from the existing main road. There will be a much smaller construction depot on the opposite northern bank of the river

All river activities (excavation and piling) will take place during the lowest flow of the river during July to September. Construction of the bridge during low water periods will obviously have construction advantages and will involve less river diversions and less potential environmental implications. The construction activities will include excavation and piling for the bridge supports which will require some temporary diversion of sections of the river where work is taking place. At some locations where temporary diversion of the river is not possible it will be necessary to carry out excavation and piling within an area secured by wood and metal sheets.

Excavation for the bridge abutments at each end of the bridge will involve disturbance to the river banks. Construction of the piers and superstructure will not require any river diversions.

Environmental Impacts of the bridge construction are likely to be related to the following:

- Impacts on the flow of the river. During the construction of the piers there will at times need to be some local diversions around the pillars to enable excavation, piling and construction. These diversions will only involve sections of a few 10s of meters length and a fraction of the river's cross section and the diversion of the whole river will not be required. Some construction can take place without any river diversions. These local diversions will not affect the overall flow regime of the river nor cause any localized flooding. There will be no activities in the river bed during high water levels. It is considered that these temporary diversions of the river will not have any long term impact on the fish and aquatic population in the river.
- Impacts on the water quality of the river; There is the potential for contamination of the river from the construction activities. In particular concrete from the pier construction activities could be dropped into the river and cause contamination. In general with good construction management excessive contamination will not take place. Localized and short term contamination of the river will not have any long term impact on the fish and aquatic population in the river.
- Impacts on surface and groundwater from the activities within the construction depots. All sanitary waste will be taken off site to a site approved by the Rayon administration. All household garbage will be taken off site to a site approved by the Rayon administration.

Due to the isolated characteristics of the location the impact on any communities will be negligible in terms of air pollution and noise. In order to minimize impacts to the river after the completion of the bridge construction activities, it will be essential that all waste and unused materials are cleared from the site including river banks and within the river itself. In conclusion the impacts on the river, its flow and its flora and fauna should not be significant provided good construction management is implemented throughout the construction period.

Construction camps

Construction camps will generate significant sanitary waste from workers and staff who work and will live close to the alignment. In view of the scale of the construction activity the number of workers at any one time will be many hundreds and possibly more. For Section 1 it is estimated that there will be 600 workers employed on the site. At this stage it has not been possible to define the locations of the construction camps. Since this is an agricultural area it will be necessary to ensure that no contamination of the soil, groundwater and existing agricultural produce takes place. It will therefore be essential to ensure appropriate offsite disposal facilities are incorporated into the design of any construction camps.

Hydrology Conclusion

Overall the impact on groundwater and surface water is expected to be low. No cuttings occur on Section 3 except in the sand dune area that might affect the groundwater regime and change the water table. Streams and rivers will be crossed by appropriately dimensioned bridges, and embankments will have sufficient culverts to prevent damming of surface runoff and subsequent water logging.

6.2.5 SOIL AND LAND IMPACT

Soil Damage:

The site clearance, the cut and fill activities, and the construction of the sub grade usually causes the most damage to the soil and the sub soil environment. A significant volume of topsoil will be required to be removed for the alignment itself and for diversion roads, borrow pits, construction camps and other construction activities.. In these areas there will be potential for contamination, disturbance and damage to the soil cover. In particular, soil can become compacted and damaged along temporary access routes and in construction work areas. Disturbance and damage is inevitable and this will be more critical in the areas defined as Group 2 soils but this can be minimized with correct construction procedures.

Soil Contamination:

Of equal importance is the potential for pollution and contamination of the soil and sub soil on the alignment itself and sites immediately adjacent. This pollution can have an impact on the surface and groundwater resources in the area and on the agricultural activities in the areas adjacent to the alignment. Some contamination can occur during normal construction activities, but the most serious contamination can occur from accidental fuel spills and storage of materials for long periods of time without any precautions.

During the construction phase the most important potential for contamination will be on the sub soil. This is the subsurface crust, below the soil layer. This will be exposed during the construction of the road sub grade and materials used in the construction of the sub grade could cause contamination. Provided common natural resources (sand and gravel, sand, soil, rubble) are used from local quarries for the construction contamination is unlikely to occur to the road sub base.

Contamination may also occur during the operation period. The main criterion for evaluating the risk of soil contamination by chemicals is maximum permissible concentration (MPC) - the maximum amount of this substance in mg / kg oven-dry soil, which guarantees the absence of a negative direct impact on human health. Lead is considered the most frequent and toxic transport pollutant due to its continued presence in fuels in Kazakhstan and is used as an indicator of contamination. . maximum permissible concentration of lead in soil (MPC) in the Republic of Kazakhstan is calculated according to the "standards of maximum permissible concentrations of harmful substances, harmful microorganisms and other biological contaminants soil", approved by joint order of the Minister of Health from 30.01.2004 № 99 and the Minister Environmental Protection from 27.01.2004 № 21-p, and is set at 32 mg / kg.

According to the calculations lead levels at a distance of 20 meters from the roadway from 14 to 47 mg / kg. MPC of lead in soil is 32 mg / kg. Consequently, at a distance of 20 meters measured lead in soil in some areas is slightly higher than the MPC. Where there is debris, broken pavements and tires, broken engine exhaust of cars, leaking fuel and lubricants, or negligent acts of drivers and maintenance personnel, and other poor management and maintenance additional pollution and lead levels may occur.

De-icing materials, especially salts are also toxic. Because of the limit of permissible concentration of CL (chlorides) when exposed to anti-icing agents on the ground in the roadside of the zone approved level - 0.04%.

With a significant accumulation, they can potentially change the biological composition of roadside soils in close vicinity to the road.

Soil Erosion

Although the general area through which the alignment passes is surrounded by mountain areas particularly to the north and south the selected road alignment passes through a generally flat or undulating terrain. Based on a review of the design by PMC it is noted that Section 3 lies between 500 and 7205 meters elevation. The only cut slopes of minor height are in the sand dune area between Km 77 and Km 86 and gradients are low. The average embankment height is 3-5 meters above existing ground levels. These characteristics, even in

extreme dry or extreme wet conditions, erosion or landslides will not be triggered or exacerbated by the road, nor will the road be affected significantly by these natural hazards.

Soil Impact Conclusions: Construction and Operation Periods

Based on the investigations and the characteristics of the area provided appropriate construction techniques and management are followed there will be no adverse impact on soils and sub soils during the construction and operation periods. Soil contamination, erosion and landslides will not occur. Similarly during the operation period contamination of the soil and sub soil will not be a significant impact.

6.2.6 FLORA AND FAUNA IMPACT

One of the key environmental objectives of the construction and operation of this road should be to protect the natural ecological system including vegetation, wildlife, and natural landscapes. Additional special protection is necessary where rare or endangered plant and animal species may be present.

Road construction and operation may have impact on flora and fauna either 1) during construction through loss of habitat and destruction, or 2) during the operation through the impact of various pollutants and vehicle traffic itself on the flora or fauna. Road traffic emissions can cause the destruction of the pigments, the suppression of the synthesis of proteins, enzymes and other functions of plants. The road can also cause impact on individual animals that pass along or live close to the road alignment and fragment some animal populations into unsustainable small groups

For flora pollution can lead to disruption of growth and development, and can accelerate the aging process, especially in perennial plants. In designing interventions to reduce harmful impacts on the flora it should be noted that broad leafed plants survive better than conifers in tolerating air pollution, because the processes of transpiration occurs quicker. Pollution of the ground and vegetation from traffic emissions occurs gradually and is directly dependent on the distance from the carriageway of the road. Some plants are more sensitive to pollution from exhaust gases of vehicles than that of humans and of many animals. Of the inorganic pollutants that have a significant impact on plants, de-icing chemicals, mainly salt are the most relevant and significant. Salts have a negative effect on the surrounding area to the road, including VECs such as soils, plants, insects, animals and birds. Additionally, under the influence of these salts, the structure and physico-chemical properties of soils deteriorate which will have an adverse impact on all plants.

Adverse effects of de-icing salts (mainly sodium chloride, but can include calcium chloride and magnesium chloride) on plants result from direct contact with the pollutants, and from adsorption through the root system. Direct contact with the salts leads to the destruction of plant tissues, especially the leaves. . Sodium ions, concentrated in the soil, inhibit the absorption of nutrients by the root system so slowing growth and accelerating death of the plants.

Generally, the construction of any road can have major short-term impacts on habitats of animals, on short and long distance travel and migration routes, and contribute to the fragmentation of populations. Disturbances start occurring during the clearance of vegetation for construction and continue into the operation of the project. However, operational impacts can be mitigated effectively once the construction is completed, by planting and landscaping, as well as under and overpasses for migrating animals, including "green bridges". Moreover, in section 3 the alignment mostly follows existing transport corridors that are already used by infrastructure, specifically the railway and a gas pipeline.

During the operation stage as a result of roadside pollution by heavy metals, salts, oils and other harmful substances, animals and birds may be poisoned though direct contact or through eating vegetation in the vicinity of the road. However the new planting and landscaping may minimize air pollution impacts in the immediate vicinity of the road, and the phasing out of leaded fuel will reduce concentrations of the most important and persistent pollutant associated with roads. .

Additionally larger and slower moving mammals crossing the road may be killed. Hedgehogs are frequently affected, but also foxes and mice, rats etc can be regularly killed. Though these individual events are unfortunate the total number of animals killed in this way is not commonly high. As in the other two sections

visibility along the alignment is generally very good, which reduces the roadkill risk for large mammals and livestock.

Flora and Fauna Impact Conclusion: Construction and Operation Periods

In conclusion there is a potential that the natural flora and agricultural products growing close to the road may be adversely impacted by the construction and operation activities. This is, however, unlikely to be significant, but appropriate mitigation, management and monitoring should be planned for the construction period and included into tender and contract documents.

For the Ili Bridge approximately 24 ha of existing small trees and shrubs will be felled. Data on other trees and planting to be felled is not available. Section 3 alignment largely passes through open agricultural and grazing land and .and not through any forested areas the number of trees is not likely to be large.

Although there are some of wild or natural habitat including forest areas close to the alignment including the Ili River and its floodplain and a sand dunes area, the area through which Section 3 passes is not characterized by a high diversity of species and sub species. There is no record of rare, endangered or vulnerable species of animals and birds in the area. There is no record of any populations of Kazakhstan red list animals such as Saiga, Marmot or Gazelle. Excepting the Ili River and its floodplain there are no large areas of water or wetlands. There are no sensitive areas or areas of high landscape value close to the alignment and there are no known proposals to include any part of the area as a legal protected area. Based on the Consultant field work within the alignment and the knowledge and fieldwork of the Design Engineers there is no evidence to show that the alignment has any sensitive fauna or flora. During the consultation meetings in October the subject of fauna within Section 3 was not discussed or mentioned by the community or by Rayon representatives. At a meeting with The Ecological Society: Green Salvation, an Almaty Based NGO, the issue of wildlife in Section 3 and any impact that the road may have was not defined as an issue or a point of concern. The potential fauna issues in Section 2 were however discussed.

Based on the above review, site examinations, and discussions there is no evidence to indicate that the Section 3 alignment, which is predominantly agricultural, would have a significant impact on the fauna in the area or would impact on any rare, endangered or vulnerable animals.

6.2.7 SOCIAL AND ECONOMIC IMPACT

Social impacts during the construction and operation stages of the project are likely to be significant and of a long duration. These impacts will largely be positive, but some less significant adverse impacts may also occur.

During construction and operation noise, air pollution and water pollution may affect the nearby residents and in extreme conditions could impact on people's health, particularly amongst the more vulnerable groups; the old, those already sick, and children. However, as referred to above, noise, air pollution and water pollution are not predicted to be a significant impact for this road project.

The road development will also require the acquisition of some land and buildings which may affect people's income and livelihoods particularly in the short term. In the case of this road the number of buildings required for the road is not significant and within Section 3 no buildings are directly impacted and there are none close to the alignment. This matter is described in detail in the Resettlement Implementation report (RIR).

A more important impact will be on those families; exclusively farmers, who will have had some of their land acquired for the development of the road. Though generally the amount of land lost by each farmer is not significant the most import impact will be that a farmer's land holding may now be located on two sides of the road, separated by the road. This will create difficulties on operation and could make the operation of the farm inefficient and in extreme cases in operative. In order that the farmer can still operate his farm in an efficient manner it will be essential that regular crossing points are provided for the farmer.

The road development may have some impact on the economic activities of the local communities on the present road. Alongside the present road there are various permanent and temporary commercial activities

including restaurants, convenience stores, car repair establishments, and temporary stalls selling local fruit, vegetables and other local produce. These businesses rely predominantly on passing traffic for their customers. This is particularly strong in the western part of the road, closer to Almaty. With the construction of the new alignment some of the business will lose some, though clearly not all the passing trade. It is likely that much of the existing trade will not be lost when the new road is constructed though it is impossible to make any definite predictions. For a distance of 300 kilometers long distance traffic (buses and tracks) will possibly only stop at the International border at Khorgos and within the Almaty area. Nevertheless it will be important for the Roads Department to consider the establishment of one or more service areas on the new road providing facilities for resting, for buying petrol, for buying other goods and for eating and possibly overnight accommodation. These service areas could accommodate areas for local traders and farmers to sell produce. Signage to existing communities and local services and the provision of temporary spaces for local businesses can offset some of the potential for loss of trade. These matters are outlines in part 6.7 of this report.

Although there may be some local economic adverse impacts overall economically the road will bring significant benefits to the local, regional, and national economy. A fast, safe and all weather road will allow the efficient and rapid movement of goods between China, Kazakhstan, Russia and beyond in Europe and Central Asia. Goods manufactured within all the linked countries will benefit form the fast route. Agricultural produce from the area, which is a major employment sector and a significant part of the local economy can be transported rapidly to a wider market, not just Almaty. Labor will be able to move more freely between the countries, and most important for regional and international economies tourism will be encouraged and the natural and social features of Kazakhstan can be exploited sustainably. On a regional basis the larger communities along the alignment, Zharkent, Shelek and Almaty will benefit from faster travel times between the towns and to other urban centers in the south and south west of Kazakhstan. More opportunities for employment and business will be opened up.

The development of the road will support the increased economic activity at the International Border. There are proposal for an enterprise and development zone on the Kazakhstan side of the border and this development has already commenced and various industrial, service and commercial uses will locate to this area. This will provide significant employment opportunities for the present workforce in Zharken and the whole of the Rayon. It will also provide opportunities for existing service and other industries to benefit from the development. Additionally the large flow of passengers and goods across the international border will involve an increase in immigration and customs employment. Some of this staff will be recruited locally. In all cases additional housing and associated support facilities will need to be provided within the area so bolstering the overall economic growth of the Rayon.

Social and Economic Impact Conclusion: Construction and Operation Period

There will be some negative social and economic including disturbance during the construction period and some potential loss of trade to businesses on the existing main road, but overall the social and economic impacts of a purpose built fast route within southern Kazakhstan will be beneficial.

6.2.8 PHYSICAL CULTURAL RESOURCES IMPACT

Based on the survey referred to in paragraph 4.9 above there are no Physical Cultural resources within or close to Section 3 alignment.

Nevertheless in the event of any PCR that are discovered during the construction works procedures shall apply that are governed by Kazakh legislation and guidelines, specifically by paragraph 2 of Article 39 of the "Law on Protection and Use of Historical and Cultural Heritage in the Republic of Kazakhstan" which stipulates: "*In case of detection of objects of historical, scientific, artistic, and other cultural value, physical and legal persons are obliged to suspend the further conduct of the work and inform the authorized body.* "

Time will be required for investigation and salvage dig at any discovered site.

6.2.9 ROAD SAFETY AND AESTHETICS IMPACT

Road Safety:

Road safety and the potential for accidents to pedestrians and all road users is an important issue for all new road development.

On the existing route traffic flows, particularly of long distance trucks and buses, are expected to reduce and the incidence of traffic accidents should also be reduced. Correspondingly, hazards to pedestrians and non-motorized traffic along the existing route should also decrease.

For motorized traffic the project road itself will be significantly safer because of its upgraded design (e.g. optimized curve radii), separated carriageways, better visibility and limited access points. Randomly crossing traffic as well as slow moving non motorized traffic will be eliminated.

Nevertheless there will still be a residual element of danger for pedestrians. Farmers, farm workers and herdsmen may need to cross the road at certain points and there will be some pedestrian traffic near settlements. There is a range of engineering and organizational measures available to slow down motorized traffic and improve traffic safety for pedestrians, animals, animal-powered carriages and cyclists. This includes signposting and speed enforcement with speed cameras; pedestrian crossings, if required with traffic lights; rumble strips and speed bumps to force speed reduction; light signals to warn drivers of crossings or non-motorized traffic participants. The design already foresees a number of these measures, the final scope, layout and locations will be decided in consultation with the affected communities prior to construction.

Aesthetics:

The proposed road passes through areas of high aesthetic quality landscape with limited adverse visual impacts. The landscape in Section 3 is important and there are long distance views to the mountains range in the south and in the north. The retention and conservation of the natural landscape is therefore important. The design of the proposed road will ensure that this landscape quality is not negatively impacted by the new road construction and does not in any way detract from the landscape and the long distance mountain views to the north and south.

6.2.10 WASTE GENERATION IMPACT

Estimated wastes during construction

During construction and operation of the projected road a number of waste streams will be generated:

Inert mineral materials such as excavated earth, sand and gravel asphalt and concrete rubble, which will be entirely recycled and used as construction materials for filling, grading and landscaping. Potentially noxious or hazardous materials such as waste from construction camps and workshops, concrete slurries from washing plants, barrels and containers from fuels, lubricants and construction chemicals, scrap metal, and spent welding electrodes. This will be disposed via existing municipal waste management facilities, or treatment and recycling plants, in accordance with Kazakh regulations.

Timber from felled trees and other organic matter from the clearing of the alignment will be collected and stored in appropriate locations outside the immediate construction zone and if suitable made available for sale to the public as firewood.

The following volumes of waste generation have been calculated for Section 3:

Table 6.10 – Construction waste generation (Prepared by Design Engineers)

№	Name	Unit	Amount	Density t/unit.	Amount, t	Loss norm	Losses, t
1	2	3	4	5	6	7	8
1	Heavy masonry	m^3	101.914	2	203.828	2	4.077
2	Heavy concrete B7,5	m^3	276,169.18	2,1	579,955.27	2	11599.105
3	Nails and bolts	T	3.644		3.644	1	0.036
4	Painting materials	Kg	18722.123	0,001	18.722	3	0.562
5	Reinforcement	T	1.116		1.116	3	0.033

6	Asphaltic felt	m^2	1140.449	0,0017	1.939	3	0.058
	Total:						**11603.872**

Waste Estimates During Operation

Waste generated during operation will mainly be gravel and salt remnants from winter care, sludge / cake from settling ponds for storm-water, and asphalt, concrete and gravel from repair and maintenance works. None of these wastes is very hazardous and disposal pathways will either be existing municipal waste management facilities, landfills for mineral materials (gravel, rubble) or recycling facilities (cement kilns or asphalt plants). The annual quantities will fluctuate depending on weather conditions (length and severity of wintery conditions) and volume of maintenance works. The range is expected to lie between an few 100s to a few 1,000s of m^3 per annum.

In addition there will be waste and litter from users of the road and from the various activities within the planned rest/service areas. This waste was could be quite significant if all 5 service areas area operational, though this is unlikely that all will be operating for many years.

Table 6.11 – Construction and all other waste types for the project Almaty-Khorgos: Section 3

Name	Generation	Standard	Quantities, t/yr	Hazard class	Physical chemical traits, toxicity	Components	Storage, utilization and (or) disposal
1	2	3	4	6	7	8	9
Construction wastes	Construction works		11603.872	IV	Solid non-flammable insoluble.	Concrete debris, bricks, glass, construction waste	Temporary storage at special places. Passed to specialized company for disposal.
Scrap metal (remnants of pipes and metal structures)	Building and construction works	120 kg/t	4.75	IV	Solid non-flammable insoluble	Iron – 95-98%, Iron oxides – 2-1%, carbon – 3%	Temporary storage at special places. Passed to specialized companies, which operate along the entire alignment, for disposal.[3]
Burnt remainders of welding electrodes	Welding works	0,15 from electrode mass	0.1	IV	Solid, non-flammable.	Iron – 96-97%, Coating – 2-3 %	Storage at scrap metal collection points in the construction area until collected specialized companies for final disposal.
Solid household wastes	During construction period	0,07 t/yr or 0,006 t/month	67.2	IV	Solid flammable. Non-toxic.	Paper and wood – 60%, Rags – 7%, Food wastes – 10%, glass – 6 - %, Metal – 5,%, Plastic –12%	Temporary storage in containers. Passed to landfills.
Total			11675.922				

[3] Scrap metal is a highly sought after commodity in Central Asia, as the Chinese market lies geographically close. There are numerous collectors that travel considerable distances. In case of the project it will be highly attractive to drive from site to site and collect relatively large quantities of recyclables which are stored in defined locations and ready for pickup.

6.3 ENVIRONMENTAL MANAGEMENT: MITIGATION MEASURES: SECTION 3

6.3.1 AIR QUALITY MITIGATION

Vehicle Exhaust Mitigation

In general the amount and concentration of exhaust emissions of vehicles during the construction and operation periods depends on several factors, most important of which are:

- Design features and technical condition of vehicles, especially emission standards and related technical specifications;
- Traffic volume and traffic composition (mix of motor vehicle types);
- Road conditions: curve radii, longitudinal slope, carriageway width, visibility, type of road, smoothness and roughness of the road surface, the presence of human settlements, intersections and junctions of roads, railway crossings, and other factors that regulate the speed of the traffic flow;
- Driving habits of drivers;
- Meteorological factors, wind speed and direction, air temperature, humidity, solar radiation, temperature inversions ,and air turbulence in the surface layer, etc.

Mitigation During Construction Period

The concentration of pollutants for each source of contamination when working on the construction of the road shall not exceed the maximum allowable limits set by the Kazakh standard SanPiN RK № 3.03.015-97. Various measures to ensure accordance with this requirement and to reduce the intensity and toxicity of emissions during road construction can be summarized as follows;

- Ensuring that all construction vehicles and equipment are maintained in accordance with manufacturers recommendations and that any repairs are carried out immediately in accordance with manufacturers recommendations. ;
- Systematic monitoring of the technical state of fuel equipment of diesel engines, the exhaust gases of which are prone to contain significant amounts of soot;
- Ensuring the uniform and proper operation of paving machinery, sealing equipment and asphalting machines that will help prevent unacceptable concentrations of pollutants (e.g. aliphatic and aromatic hydrocarbons, including carcinogenic benz-a-pyrene, PAH)the working area and the surrounding areas.
- Since there are no sensitive uses within the vicinity of the road there will not be a pressing need to restrict night time operation or to locate construction depots and camps in locations that will not impact on sensitive uses.
- Regular monitoring of air pollution shall be carried out throughout the construction period to ensure that there are no impacts to the community and construction workers.

Mitigation During Operation Period

- Improving the design of highways. Reduced longitudinal slopes, improved visibility in the horizontal vertical curves, the increase in their radius leads to ensure a higher operating speed of traffic flow and reduce toxic emissions (These requirements are incorporated into the design of this alignment).
- Given that the projected road passes through flat terrain, the longitudinal slope does not exceed 10% of the radii of curves and visibility on the road comply with the technical categories, thus providing the highest operational condition of the road, giving significant reductions in emissions of toxic pollutants. These requirements are incorporated into the design of this alignment.

- To reduce frequent braking and acceleration of vehicles as a means of reducing emissions install appropriate traffic and warning signs and roadway markings. These requirements are incorporated into the design of this alignment.
- One of the easiest ways to reduce the toxic components in exhaust gases (exhaust) is to convert vehicles to pressurized natural gas, resulting in the reduction of NOx emissions by the factor 4-10;
- Recent legislation has established the requirement for every motor vehicle to be inspected and checked once per year for basic technical functionality, including emission standards. The inspection certificate has to stay with the vehicle at all times and is checked by road police during routine traffic controls.
- The use of unleaded gasoline is increasing in Kazakhstan and leaded gasoline will be phased out, which will progressively reduce lead emissions into the environment.
- Regular monitoring of air pollution should be carried out throughout the operation period to ensure that there are no adverse impacts to any members of the community or the construction workforce.

Dust Mitigation During Construction and Operation

Dust can be a major problem during construction and is caused by a range of activities including site preparation where the soil is disturbed, during aggregate and cement handling for concrete production, from the transportation of materials particularly cement, and transport generally on unpaved surfaces.

To reduce dust pollution during construction and repair work on the road during operation the following mitigation should be carried out:

- Maintaining, cleaning and watering of road sections where there is intensive dust formation. When choosing the dusting materials, preference should be given to Calcium Chloride, inhibited by Phosphates (CCP).
- Periodic watering of dirt roads at a rate of 2 l/m^2 per watering cycle;
- Set and enforce speed limit on sections of roads subject to intense dust formation;
- Ensure that the transport of all potentially dusty materials is done in covered trucks or the material is contained in secure bags.
-

6.3.2 NOISE AND VIBRATION IMPACT MITIGATION

The level of traffic noise at any sensitive point generated by vehicles traveling on the highway, shall not exceed the values set in, SanPiN № 841 from 12.03.2004, Republic of Kazakhstan, at 70 dBA.

Mitigation of Noise During Construction Period

Noise can be caused by a range of equipment and by vehicles transporting goods and equipment. Significant noise can be created by bulldozers, scrapers, pneumatic hammers, vibrators, cutters.

Reducing construction noise is achieved through the following activities:

- Impose a speed limit of traffic during construction to 60km/h This can reduce noise by 7 dB (as compared to 80 km/h);
- Undertake construction work during the daytime to reduce any potential impact on sensitive uses particularly in construction access roads;
- Effective soundproofing of all vehicles and equipment by the use of foam, rubber and other soundproofing materials, as well as through the use of hoods with multilayer coatings; ensure that Contractors either have modern equipment that fulfill noise reduction norms, or that equipment is retrofitted to meet the required standards;
- Stationary units (e.g. aggregates or compressors) shall be placed in sound-absorbing areas or tents, which can reduce the noise level by up to 70%.
- The definition of road construction zones with high sound levels above 80 dBA must be designated with safety signs, and workers in this area should be provided with personal protective equipment (ear mufflers of plugs).

- All depots, special working areas, batching or mixing plants should be located at a distance from any sensitive areas Since there are no sensitive uses within the vicinity of the road there will not be a pressing need to restrict night time operation or to locate construction depots and camps in locations that will not impact on sensitive uses.
- Regular noise monitoring shall be carried out throughout the construction period to ensure that there are no impacts to the community and construction workers.

Operation Noise Mitigation

The calculation of noise during the operation period indicates that traffic noise does not exceed the maximum permissible standards at any location along the alignment. Regular noise monitoring should be carried out to ensure no potential disturbance.

Vibration Mitigation

Vibration normally occurs when piling takes place. This may only occur at a number of locations mainly at bridge construction. If it does not take place near the sensitive uses the impacts on the community will be small. The most important impact will be the impact on workers on the construction site. All workers exposed to vibration should be given special clothing, earplugs and given regular breaks.

6.3.3 HYDROLOGICAL MITIGATION

Construction

Overall the impact on groundwater and surface water is expected to be low. There are no cuttings in Section 3 except in the sand dune area. Except at bridge construction locations any impact on groundwater levels is likely to be minimal and contamination will be unlikely. It is unlikely that any groundwater resources will be impacted by the construction activities.. Streams and rivers will be crossed by appropriately dimensioned bridges, and embankments will have sufficient culverts to prevent damming of surface runoff and subsequent waterlogging.

During road construction in order to prevent pollution watercourses must be constantly monitored These pollutants risk entering the water and releasing harmful toxic substances and pollution with particulate matter of mineral and organic origin, represented suspended particles of sand, clay, silt and other materials.

The contractor shall be responsible for obtaining all permits required for use of surface and groundwater resources from the Rayon and competent authorities. No water shall be used without those specific permits.

Discharge of Waste Water from Construction Camps

The discharge of wastewater to water courses is only allowed with permission of the sanitary-epidemiological service and fisheries. The composition of the wastewater must comply with SanPiN to protect surface waters from pollution № 3.02.002.04.

For domestic wastewater disposal a pit of precast concrete rings with a diameter of 1.5 meters and a depth of not less than 3 meters should be used. To eliminate the filtration of waste water into the groundwater the floor of the pit should be concreted. From this pit waste water and sludge will be regularly pumped and conveyed to wate water treatment plants with tanker vehicles.

Surface and Groundwater Protection:

Defined water protection zones prohibit the establishment of landfills, use as industrial waste sites, as parking, refueling, cleaning and repair of motor vehicles and road equipment. The pollution and contamination of water, during construction without devices to prevent pollution and contamination of water, wasteful use of water, the violation of water protection regime in catchments and other violations, will be banned.

The water protection zones are defined as follows: for small rivers the zone is, 100 meters, and for large rives it is 500 meters. Works within the water protection zone are allowed only by special permission of local water protection authorities, fishery protection and sanitary-epidemiological services.

Irrigation

In some cases the road permanently disrupts and disconnects the irrigation channels though this is not common. In this case it is important that farmers and the community are given advance warning by the contractor to ensure that the farmers can make timely alternative arrangements for their water supply.

However in most cases disruption to the irrigation channels will only be temporary and realigned channels and culverts under the road alignment will ensure that irrigation water will not be disrupted for any long period and water will still be provided to the agricultural land. Where temporary disruption occurs the famers must be notified by the contractor (with the support of the supervision consultants) of the disruption in advance and what temporary arrangements will be put into place. In addition the Contractor must ensure by all appropriate means that irrigation channels are interrupted for the minimal period and that adjacent farmers are not necessarily disturbed during the construction period, especially if construction coincides with the main growing season. The supervision engineers should constantly monitor the situation and report to the Contractor and the Rayon administration where farmers have not been given adequate notice and where disruption has been longer than programmed.

Specific Mitigation during Construction should include

Department of Roads, Committee of Water Resources and Rayon in consultation with Contractors to ensure all water extraction for construction and workers only takes place from sustainable resources from wells (for construction activities) and from piped supply system (for domestic use in camps etc). The contractor shall be responsible for obtaining all permits required for use of surface and groundwater resources from the Rayon and competent authorities. No water shall be used without those specific permits.

- Good management of all areas of the construction site to ensure no short term flooding occurs.
- Good management of all areas of the construction site to ensure contamination from all construction activities does not occur.
- All surface water courses in all construction are to be protected by settling ponds and filters.
- Waste water from construction camps to be treated on site before discharge into surface rivers;
- Septic sludge from toilets to be taken to offsite treatment plants;
- Ensure minimal disruption to irrigation water and maintain dialogue with farmers.

Ili Bridge Construction

Environmental Impacts of the bridge construction are likely to be related to the following:

Impacts on the flow of the river. During the construction of the piers there will at times need to be some local diversions around the pillars to enable excavation, piling and construction. These diversions will only involve part of the river and the diversion of the whole river will not be required. Some construction can take place without any river diversions. These local diversions will not affect the overall flow of the river nor any localized flooding. There will be no activities in the river bed during high water levels. It is considered that these temporary diversions of the river will not have any long term impact on the fish and aquatic population in the river.

Impacts on the water quality of the river; There is the potential for contamination of the river from the construction activities. In particular concrete from the pier construction activities could be dropped into the river and cause contamination. In general with good construction management excessive contamination will not take place. Localized and short term contamination of the river will not have any long term impact on the fish and aquatic population in the river.

Impacts on surface and groundwater from the activities within the construction depots: All sanitary waste will be taken off site to a site approved by the Rayon administration. All household garbage will be taken off site to a site approved by the Rayon administration.

Due to the isolated characteristics of the location the impact on any communities will be negligible in terms of air pollution and noise. In order to minimize impacts to the river after the completion of the bridge construction activities, it will be essential that all waste and unused materials are cleared from the site including river banks and within the river itself.

In conclusion the impacts on the river, its flow and its flora and fauna should not be significant provided good construction management is implemented throughout the construction period.

Operation

During operation to prevent contamination, the road will include drainage channels and culverts for removing waste water from the carriageway of the road outside. Drainage from the roadway and bridges shall be treated in settlement ponds where necessary, before reaching natural streams and rivers, or canals.

Water from road bridges passes to the paving blocks and curbs along the borders assigned to drainage cradles at the beginning and end of the bridge, then enters the water receiving wells, where the filtering occurs. To ensure the removal of pollutants from the roadway of the bridge sidewalk concrete curbs are located along the entire length of the bridge.

Rain water on the pedestrian part of the bridge is protected from harmful toxic substances from the roadway of the bridge by a continuous barrier so there is no threat to the ecosystem. On small bridges pollution is also excluded from entering the surface water by a continuous curb railing.

Discharge of water from the carriageway flows by longitudinal trays along the edge of the roadway, and then cross-trays, arranged on the slopes of the embankment height greater than 4 meters, with a longitudinal slope of a slope of 0.03, as well as for concave curves. The end of the trays are arranged along the slope embankment to prevent erosion of the sub grade.

6.3.4 SOIL EROSION AND SOIL CONTAMINATION MITIGATION

Soil Erosion

During the construction phase it will be essential to ensure that all efforts are taken to eliminate soil erosion and the causes of erosion. However as referred to in section 4.1.4 above because of the characteristics of the landscape and of the design even in extreme dry or extreme wet conditions, erosion or landslides will not take place to any extent. Nevertheless all construction activities must be undertaken to eliminate potential erosion.

Soil Reclamation

The Construction of the road will require the use of land for a temporary period for construction activities and it is a legal requirement that all land used for a temporary period for construction must be reclaimed and returned to the original users and owners in a condition suitable for its original agricultural use. Any use of land that involves the removal of any soil creates instability to the local environment and wider environment and it is essential to preserve the natural topography and existing vegetation.

Guided by the Land Code of the Republic of Kazakhstan from 20.06.2003g. and "Guidelines for the assessment of proposed economic and other activities on the environment in developing pre, design and project documentation" Astana 2007. All land used must be returned in a condition suitable for agriculture.

Biological reclamation allows for the planting of grasses to encourage the restoration of fertility. Land reclamation should be done during or after the completion of the construction activities. It is important to reclaim in all place where soil and sub soil has been disturbed by construction and associated activities.

Remediation activities to reduce loss and erosion of soil during construction includes the following:

- Removal of sand and detritus mixture (20 cm) from the surface of the road with a bulldozer moving into piles up to 50m, followed by loading an excavator to dump 0.65 m2 to transport up to 1 km (35,000 x 0.20);
- The preparation of the road surface by bulldozer;
- Deep subsoil loosening by bulldozer;
- Backward sliding of topsoil from the dumps to the prepared surface layer by the bulldozer

Activities on the site after construction should include:

- Use of tillage cultivator;
- Mechanized sowing of perennial grasses as follows: alfalfa - 25% of 18 kg / ha 30% perennial ryegrass - 75% of 35 kg / ha of 30%.
- After sowing, rolling the surface by a ring-roller

The best perennial grasses are wheatgrass and sainfoin. Wheat has a high resistance to drought. The wheat grass grows equally well in early spring and autumn. Sainfoin - a long-standing drought-resistant and extremely valuable winter-hardy legume crop is sown in wide aisles with 30-60cm. It is planted mainly in the early spring period and the green mass is eaten by cattle, and also provides excellent hay.

Immediate and proper reclamation of land reduces the adverse impact of disturbed land on the environment. It will reduce dust and pollution, can have a beneficial impact on human health and eliminates environmental damage.

Soil Contamination

During the construction period it is important that the contractor undertakes all activities in accordance with contract specifications and manages all site activities in an environmentally sustainable manner.

To ensure soil is not polluted it is essential to undertake the following activities:

- Ensure, through proper construction management, that oil and other spills do not occur, and that if they do immediate action is taken to minimize impacts on the soil.
- Storage of construction materials only takes place in properly prepared locations;
- Immediate sorting and removal of construction debris to an offsite landfill;
- Dismantling after use the base of construction sites and access/haul roads
- Apply topsoil on all vacant sites as soon as practical;

Operation

During operation it will be important that all pollution is minimized and managed. All liquid wastes of any kind must be taken from the road and disposed of in an approved landfill. It will be the responsibility of the road agency to ensure speedy and full clearance of all waste from the road and from its vicinity.

6.3.5 FLORA AND FAUNA IMPACT MITIGATION

Flora and fauna will be impacted by the construction and operation of the road. Air pollution, noise and vibration and potential for occasional flooding and wind and water erosion will all have an impact, normally adverse on the local and sometimes wider original ecology.

The mitigation methods referred to above for air pollution and noise and vibration impacts will also benefit the flora and fauna. Specifically to reduce the negative impact on flora and fauna of the road development the following environmental protection measures are proposed:

- Ensuring high quality condition of the road surface throughout the operation period to minimize noise and particularly air pollution which has adverse impacts on fauna and can also impact sensitive flora;
- Ensure fauna can make use of culvert and other crossing points by special treatment of ground surface;
- Reduce the use of salt and chemical materials used to disperse snow and ice in winter so that soils, plant tissues, animals and birds are not adversely affected or destroyed. An alternative is to replace salt and other chemicals with friction materials such as sand or gravel;
- Use de-icing materials that are less toxic to the environment including anti-HCF-type materials (calcium chloride, inhibited phosphate) or MRA (potassium-magnesium acetate), which do not lead to irreversible changes in photosynthesis and the subsequent destruction of plant tissues and animal deaths;

- Reduce the incidence of dust pollution by good maintenance of the road, regular cleaning and watering to reduce negative effect on vegetation.

Dust, depending on the chemical composition, has a specific effect on plants, caused by the penetration of harmful compounds into the leaf tissue. At the same time accumulation of compounds in plant tissues causes a disturbance of metabolic functions of the body, reducing the amount absorbed by the leaves of photo synthetically active energy and results in accelerated aging. Additionally all transport and haulage vehicles using the road, including construction traffic, should use dust protection tarpaulin or other suitable cover.

Temporary or longer term localized flooding and water logging shall be prevented by culverts and drainage systems to ensure flora and fauna are not affected.

Any loss of trees will be offset by a tree replacement ratio of at least 1:1 plus a contingency for the portion of saplings that does not grow (typically 25%). This replanting will be undertaken in a separate planting contract.

Specific Fauna mitigation during Construction:

The Contractorshall ensure that no unnecessary disturbance to fauna within or close to the alignment takes place. The Contractor and Supervision Engineers shall monitor the incidence of any sightings of any larger or unusual fauna within or close to the alignment and to notify the Rayon Administration. Any accidental injury or death of larger fauna to be reported and the Rayon notified. Review need for further animal crossing points

6.3.6 SOCIAL AND ECONOMIC MITIGATION

Local Businesses

The road development may have some impact on the economic activities of the local communities on the present road alignment. Alongside the present road there are various permanent and temporary commercial activities including restaurants, convenience stores, car repair establishments, and temporary stalls selling local fruit, vegetables and other local produce. These businesses rely predominantly on passing traffic for their customers. This is particularly strong in the western part of the road, closer to Almaty. With the construction of the new alignment some of the businesses may lose some, though clearly not all, of the passing trade. It is likely that much of the existing trade will not be lost when the new road is constructed though it is impossible to make any definite predictions. There are no World Bank or domestic policy requirements to compensate persons indirectly affected in this manner. During the recent consultation process this matter was not referred to by any members of the community or the Rayon administrations.

There are however a number of approaches that would provide opportunities for the local community adversely impacted by the road development. Three approaches would be:

- Providing sites for local businesses and farmers to sell their produce to travelers using the new road. Information obtained from Regional Department of Roads, Almaty is that there will be 5 Rest/Service areas along the alignment. These sites are not part of the present design and land will be purchased on a willing buyer-willing seller basis and design and development will take place at a later date. They are the responsibility of the ministry of Tourism. It is recommended the design should included sites for local farmers and business as a means to ensure that the local community can benefit from the new road and as a means of offsetting potential losses to existing businesses on the present road.
- Good signage on the new road and at junctions to show the location of the nearest petrol station, shops, market, restaurants etc. located on the original road. This will enable users of the new road to make easy access to the local commercial uses on the original road. A good example would be to include signs at junction at km 126 in Section 2 informing travelers on the new road of the restaurant and market facilities at Baiseit

- After the construction of the road and prior to opening of the Service/rest areas to allow small traders to set up at vacant sites at some interchanges. This would need to be in accordance with road safety regulations and should only occur at specific approved sites where space is available of the road for parking and visibility is good. Signs informing roads users of these locations should be incorporated into the proposed road signage.

Livestock crossing points

During the first consultation many farmers were concerned about ensuring that sufficient livestock and farm equipment crossing points were included in the design. This is particularly important where a farmer's land is along both sides of the road alignment. But it is also an issue where the road blocks traditional routes for farmers moving livestock and machinery. The design has included 36 under road crossing points for livestock and farm machinery. In addition there are local road overpasses. The Regional Department of Roads, Almaty has agreed that additional crossing points can be provided if the community shows that a route is necessary for the famers or other land users in the area, and that it is possible in engineering terms. At the commencement of the construction activity, the Rayon administration, the Contractors, the Supervision Engineers and representatives of the Regional Department of Roads should discuss and agree if any additional culverts are needed and their approximate locations. If any additional culverts are considered necessary they will be included in the scope for the construction works via appropriately prepared variation orders. At this time no changes to the design of the alignment will be necessary.

Outstanding Acquisition

Land acquisition mitigation aspects are covered in the Resettlement Implementation Report but it is important to stress that the outstanding acquisition is to be completed as soon as possible in accordance with Government procedures and the Resettlement Implementation Report. Any objections and complaints should be in accordance with the Grievance Mechanism included in the RIR for the completion of the acquisition and for the construction period. The issue of crossing points for livestock and farm vehicles and equipment is also covered in the RIR.

6.3.7 PHYSICAL CULTURAL RESOURCES MITIGATION

Since there are no Physical Cultural resources within or close to Section 3 alignment special mitigation will not be required.

Nevertheless in the event of any PCR that are discovered during the construction works procedures shall apply that are governed by Kazakh legislation and guidelines, specifically by paragraph 2 of Article 39 of the "Law on Protection and Use of Historical and Cultural Heritage in the Republic of Kazakhstan" which stipulates: "*In case of detection of objects of historical, scientific, artistic, and other cultural value, physical and legal persons are obliged to suspend the further conduct of the work and inform the authorized body*. "

Time will be required for investigation and salvage dig at any discovered site.

6.3.8 ROAD SAFETY AND AESTHETICS MITIGATION

Road Safety

The provision of a new well designed restricted access divided highway ensures many inbuilt safety features not provided in an existing traditional road. Specifically the design of the proposed road will incorporate the following:

- Divided carriageways;
- Limited access and exit;
- Multi level interchanges at busy junctions;
- Good horizontal and vertical sight lines and visibility;
- Clear and consistent road markings;
- Absence of pedestrians and non motorized vehicles;

- Emergency lanes and emergency parking areas;
- High intensity lighting at key intersections and other locations;
- Clear warning and information signs;
- Safety barriers in accordance with international standards, at junctions, embankments and cuttings.

At junctions and access roads to the proposed road it will be necessary to ensure appropriate warning and information signs, street lighting where necessary, and safe facilities for pedestrians and non motorized traffic. Specifically the design has included speed cameras at intersections connected to a central control area. Rumble strips prior to junctions and at other locations have been also included in the design to warn drivers of junctions and slow traffic.

Pedestrian Crossing Points

No specific pedestrian crossing points have been included in the design. Consideration must be given to the provision of pedestrian crossing points where there may be pedestrian movement in Section 1. At Shelek it may be necessary to review the need for a pedestrian crossing at the road junction at Km 107. At grade pedestrian crossing points should include white (zebra) strips on the carriageway, signs and advance warning signs.

At junctions and access roads to the proposed road it will be necessary to ensure appropriate warning and information signs, street lighting where necessary, and safe facilities for pedestrians and non motorized traffic. Specifically the design has included speed cameras at intersections connected to a central control area. Rumble strips prior to junctions and at other locations have been also included in the design to warn drivers of junctions and slow traffic.

Aesthetics

The objective of good aesthetics is to ensure a high quality of deign, construction and operation to ensure that the road and its associated structures enhance and improve the landscape and esthetic quality of the area. This can be done through the following design and operation requirements:

- The design of the road and its associated development is of the highest quality, in keeping with the local landscape characteristics and features, and visually pleasing to the eye;
- Wherever possible for the road to be designed to follow existing contours so reducing the need for visually obtrusive deep cuttings and embankments:

The above two requirements have already been incorporated into the design of the road.

- Ensure that all non operational land is planted and landscaped to the highest level with trees and vegetation that are endemic and suitable for the severe Kazakhstan climatic conditions
- Ensuring the all warning signs, kilometers signs and all other road furniture is designed as a whole and are compatible with the landscape features of the area.

The above two requirements will be incorporated into the detailed design of the road.

- Ensuring that all elements of the road are well maintained, particularly the adjacent landscaped areas and any embankments and cuttings;

This will be an operational requirements of the road operators.

6.3.9 WASTE MITIGATION

Waste During Construction Period

The project preparatory work should provide special site provision for temporary storage of waste, indicating methods of removal to a place of disposal, processing or marketing. Disposal of wood and waste from tree and plant trimming should be carried out during the season of felling (preferably in winter).

Contractors must provide containers for all construction waste and should be separated; metals, plastics and construction materials. Any waste and scrap that can be recycled or reused must be separated and stored or taken off site as necessary. Waste materials for recycling and reusing within the construction site should be clearly marked and separated. In all cases storage must take place in clearly marked areas and taken off site as soon as practical. The Waste Management Authority and Rayon Akimat should be consulted in all waste

maters. It must be the responsibility of the Contractor to dispose of all waste and to do so in accordance with local and national regulations. Any hazardous waste must be disposed of in accordance with local and national regulations. Disposal of any waste on adjacent sites with or without the land owner's permission, outside the construction site perimeter is not permitted unless the sites are approved waste disposal sites.
Prevention of construction waste incineration: burning or incineration of any waste should not normally be permitted Unless specifically approved by the waste disposal authority and environmental authority.

All general waste from the workers camps and office locations will be regularly taken by the contractor to the nearest approved waste disposal site. Disposal and incineration at the construction site will not be allowed. Temporary collection points will be provided within the site for all general waste and these will be clearly signed and will be collected regularly. Any medical waste will be disposed of separately to approved medical waste sites.

At the completion of the contract all waste including all temporary site buildings and installations and all unused materials shall be taken off site by the contractor. No waste should be left on any part of the construction site.

Waste During Operation Period

Waste generated during operation will mainly be gravel and salt remnants from winter care, sludge / cake from settling ponds for storm-water, and asphalt, concrete and gravel from repair and maintenance works. None of these wastes is very hazardous and disposal pathways will either be existing municipal waste management facilities, landfills for mineral materials (gravel, rubble) or recycling facilities (cement kilns or asphalt plants). The annual quantities will fluctuate depending on weather conditions (length and severity of wintery conditions) and volume of maintenance works. The range is expected to lie between a few 100s to a few 1,000s of m^3 per annum.

Existing waste management disposal facilities within the area are the responsibility of the Rayon. The operator will agree prior to operation on what waste will be delivered to the publicly operated waste management sites. Other waste disposal will be agreed with the Rayon prior to any disposal. Only Rayon approved disposal sites will be used. Any hazardous or medical waste will be disposed of at separate approved disposal sites. The operator will be responsible for all collection within the road and service areas and disposal to the approved and agreed sites. No disposal will take place on the alignment or at the service/rest areas. No incineration will take place on the alignment or service rest areas unless it is in accordance with local and national incineration regulations.

7. ENVIRONMENTAL MANAGEMENT: MONITORING AND INSTITUTIONAL RESPONSIBILITIES: SECTION 1, 2 AND 3

Table 7.1: CONSTRUCTION IMPACTS; MITIGATION, MONITORING AND RESPONSIBILITIES

ENVIRON MENTAL CATEGORY	POTENTIAL IMPACT	SIGNIFICANCE	SIGNIFICANT LOCAL IMPACTS	MITIGATION	RESPONSIBLE	MONITORING	RESPONSIBLE	LONG TERM IMPACT
1. Air Quality	Air Pollution: • emissions from construction vehicles and equipment, • emissions from concrete, asphalt mixing plants, stone crushers etc Dust: • dust from construction activities • dust from disturbances to soil	Possibly some local impacts without mitigation.	• Mainly located along construction access points; existing roads or new routes; • Potential impact at Km 0 where new housing subdivision fronts road. • Potential impact to various uses adjacent to road in Shelek (Km 106-Km 109)(some housing at km 107); • No predicted local impacts in Sections 2 and 3	• All vehicles and equipment used in construction to be modern and to be regularly maintained and used in accordance with manufacturers recommendations. • All construction vehicles to be watered before leaving the construction site, and within the construction site. • All transport haul routes to be located at a suitable distance from sensitive uses. • All mixing and other plants to be operated in accordance with manufacturers recommendations and to be located at a distance from all sensitive uses. • All cutting of soil and sub soil to be carried out in accordance with Republic of Kazakhstan regulations. • Regular monitoring in vicinity of Km 0 and Km 106-109 to determine whether any specific mitigation is necessary at these locations	Contractor to be responsible in accordance with Environmental Specifications in Contract. Monitoring and management to be recommended and enforced by Supervision consultants.	Regular monitoring in accordance with Environmental Specifications near residential and other sensitive uses during construction activities	Contractors in association with supervision consultant and Environmental authorities	Generally limited long term impact
2. Noise	• Noise from construction vehicles and equipment on site • Noise from concrete and asphalt mixing plants, stone crushers	Possibly some local impacts without mitigation.	• Mainly located along construction access points; existing roads or new routes • Potential impact at Km 0 where new	• All vehicles and equipment used in construction o be modern and to be regularly maintained. • All transport haul routes to be located at a	Contractor to be responsible in accordance with Environmental Specifications in Contract. Monitoring and management to be recommended and	Regular monitoring in accordance with Environmental specifications with calibrated noise-meter near residential and other sensitive uses	Contractors in association with supervision consultant and Environmental authorities	Generally no long term impact

ENVIRON MENTAL CATEGORY	POTENTIAL IMPACT	SIGNIFICANCE	SIGNIFICANT LOCAL IMPACTS	MITIGATION	RESPONSIBLE	MONITORING	RESPONSIBLE	LONG TERM IMPACT
	etc • Noise from vehicles on access routes		housing subdivision fronts road. • Potential impact to various uses adjacent to road in Shelek (Km 106-Km 109)(some housing at km 107); • No predicted local impacts in Sections 2 and 3	suitable distance from sensitive uses. • All mixing and other plants to be operated in accordance with manufacturers recommendations and to be located at a distance from all sensitive uses. • Restrict all night time activities near to sensitive areas at Arman and near Shelek • Restrict all construction traffic to 60km per hour • Regular monitoring in vicinity of Km 0 and Km 106-109 to determine whether any specific mitigation is necessary at these locations	enforced by Supervision consultants	during construction activities		
3. Water, drainage and flooding	• Potential for insufficient sustainable local water resources for construction activities • Potential for insufficient well resources for drinking and other domestic uses • Potential for some temporary flooding of site and adjacent areas during rainy season • Potential for contamination from run off to streams and rivers; • Potential for contamination of groundwater where deep cuttings occur • Seepage into aquifers of contaminated water; • Contamination of groundwater at borrow pits;	• Not significant impact. The Rayon Akimats have recommended water for construction to be taken from identified wells and springs. • Also recommended water for drinking use to make use of local piped supplies which can be brought to construction sites by water tanker. • Flooding will only be short term and localized • Unlikely to occur since major cuttings only occur in eastern part of Section 2 and in sand dune area in section 3; • Contamination of surface water and aquifers only significant if construction management not effective; • Contamination at borrow pits not possible to predict; • Wastewater contamination only significant if management not effective • Significant contamination	No specific local impacts known at this time.	• Department of Roads, Water Resources authorities and Rayon Akimats in consultation with Contractors to ensure all extraction only takes place from sustainable resources from wells (for construction activities) and from piped supply system (for domestic use in camps etc). • Good management of site to ensure no short term flooding. • Good management of construction site to ensure contamination from all construction activities does not occur. • All surface water courses will be protected by settling ponds and filters. • Waste water from construction camps will be treated on site before discharge into surface rivers; • Septic sludge from	Department of Roads, Committee of Water Resources in consultation with Contractors. Contractor to be responsible in accordance with Environmental Specifications in Contract. Monitoring and management to be recommended and enforced by Supervision consultants. Includes all activities at Ili Bridge.	• Regular monthly monitoring of all groundwater resources and conditions to ensure no pollution taking place and adequate sustainable resources. • Regular monitoring of all construction activities at Ili Bridge	Contractors in association with supervision consultant and Environmental authorities	Potential for long term impact if water is not sourced from sustainable sources

ENVIRON MENTAL CATEGORY	POTENTIAL IMPACT	SIGNIFICANCE	SIGNIFICANT LOCAL IMPACTS	MITIGATION	RESPONSIBLE	MONITORING	RESPONSIBLE	LONG TERM IMPACT
	• Contamination of surface and groundwater by wastewater from construction camps • Potential contamination of Ili River and groundwater for construction of new Ili Bridge; • Temporary disruption of irrigation water	of Ili River at bridge construction will not occur; • Disruption of irrigation water for short periods will not be a significant impact.		toilets to be taken to offsite treatment plants. • Ensure all construction activities at Ili Bridge are carried out in accordance with good construction management techniques; • Ensure minimal disruption to irrigation water and maintain dialogue with farmers.				
4. Soil and subsoil erosion and contamination	• Potential for soil erosion (mainly by wind, but also by rain) caused by cutting of soil and sub soil and disturbance to soil and sub soil • Potential pollution of soil and sub soil from construction activities	Low level of impact since alignment is largely on flat land with no extensive cutting of soil and sub soil for construction of cuttings.	Cuttings only occur in eastern part of Section 2 and Sand dunes area of Section 3.	• All recommended construction methods to reduce and eliminate erosion are incorporated into construction program; • And construction methods to reduce or eliminate pollution of soil and sub soil. • All land used temporarily to be reclaimed and returned to agricultural use in accordance with government regulations	Contractor to be responsible in accordance with Environmental Specifications in Contract. Monitoring and management to be recommended and enforced by Supervision consultants	Regular monthly monitoring of erosion outside construction site by Supervision Consultants	Contractors in association with supervision consultant and Environmental authorities	Potential for widespread erosion if not managed carefully during construction period.
5. Flora and fauna and sensitive and protected areas	• Loss of existing flora along alignment; trees and other planting. • Impact on all flora in vicinity of road construction • Loss of habitat of fauna along alignment • Disturbance to fauna within vicinity of road construction • Loss of fauna migration and travel routes • Loss of existing roadside and other trees • Impact on wet area at Norly in Section 2 • Possible increase in illegal hunting due to	• Medium level of significance in Section 2. • No impact on any sensitive and protected areas in section 1 and section 2; • Possible some impact on wet area near Norly; • Some potential for loss of habitat and travel routes of animals in Section 2 between National Parks;	• Significant loss of trees at Km 0 – Km 6. Existing roadside trees. In total 11,330 trees will be felled. • Some loss of roadside trees on existing alignment in Section 2 and 3 north and south of Ili Bridge; • Potential for loss of local habitat and wet area near Norly • Potential for loss of habitat and routes for fauna in Section 2 between 2 national parks. • Potential for illegal hunting in Section 2	• Not possible to avoid trees, but separate replanting program will include new trees and landscaping along complete alignment. Temporary fencing to ensure larger wildlife does not enter construction site; • At beginning of construction all parties (Regional Dept of Roads, Rayon, National Parks, Contractors, supervision consultants) review need for any additional wildlife underpasses in Section 2: No change in design) • Major replanting along new route to off set	• Department of Roads through Environmental Specifications • Replanting of route to be undertaken by separate contract • Supervision consultants and Contract to review provision of wildlife crossing points: culverts and under bridges • Supervision consultants to ensure contractor does not undertake any illegal hunting; • Contractor to report all accidents to large fauna	Regular monitoring by supervision consultants to ensure only trees needed for construction are felled; Regular monitoring of wildlife impacts, sightings and accidents in section 2.	• Contractors in association with supervision consultant and Environmental authorities; • Monitoring of wildlife to be carried out by Uigur Rayon Forestry Department	Some long term disturbance to flora and fauna

ENVIRON MENTAL CATEGORY	POTENTIAL IMPACT	SIGNIFICANCE	SIGNIFICANT LOCAL IMPACTS	MITIGATION	RESPONSIBLE	MONITORING	RESPONSIBLE	LONG TERM IMPACT
	illegal hunting due to improved accessibility			significant loss of trees during construction (separate contract) • Contractor and workers not to undertake any illegal hunting within the vicinity of the road; • Contractors must not disturb fauna in vicinity of road and to report any deaths of animals and sightings of large animals, in particular in Section 2.				
6. Social/Economic/Farmers	• Loss of land/acquisition of land; • Potential employment opportunities during construction • Disturbance to farmers access and activities • Potential loss of trade to businesses on old route • Significant short term and long term benefits to local economy and employment.	• Can be a medium impact to those affected • Medium impact on local employment opportunities • Can be significant impact on famers operations if construction not managed properly • Can be significant impact on some businesses 'by passed' by new alignment	No specific local impacts except at some existing villages by passed by new road.	• All outstanding acquisition to be carried out in accordance with government regulations • Encourage use of local labor • Ensure contractors act responsible and inform farmers in advance of loss of land and potential disruption • At beginning of construction all parties (Regional Dept of Roads, Rayon, National Parks, Contractors, supervision consultants) review need for any additional wildlife underpasses in Section 2: No change in design)	For farmers disturbance Department of Roads, Rayon Akimats, Contractors and Supervision consultants with contractors to ensure minimal disturbance to farmers and that all crossing points are included in construction,	Regular discussions with farmers and site survey to determine any issues	Regular monitoring of farmers potential disturbance by Rayon Akimats in consultation with supervision consultants	Can have long term impact if crossing points not included in construction.
7. Physical Cultural Resources	• Some cultural resources in area and one site (Mound No. 1 Bayserke Cemetery at Km 8) within direct line of road. • Danger of loss and destruction of mounds not directly affected in section 1 • No other impacts in section 2 and 3	Could be significant impact if Government and project specific chance find procedures are not followed. Time must be allowed for full excavation, extraction and recording of Mound No 1 Bayserke Cemetery. No other impacts	• Significant impact at the location of the Bayserke Cemetery. Some indirect impact to other Archeological resources within 600 meters of alignment. • No direct or indirect impact on Archeological resources in section 2 and 3.	• In accordance with government regulations, work to be immediately stopped to allow for investigation, recording and recovery. Sites not within alignment but within 2 kilometers of road must be protected from looting and destruction. • Salvage dig to be carried out by approved company before works start on site in area.	Contractors to inform Committee of Culture immediately any artifacts or remains found and all construction stopped until investigation completed Protection of other sites in Section 1 to be the responsibility of Committee of Culture	Regular monitoring of potential impacts where historical and archeological may be located	Supervision consultants in association with Committee of Culture	Provided government regulations are followed and all relicts are recovered and recorded properly there will be no long tem impact. Other sites must be protected.
8. Road Safety and	• Some impact from	Can be a medium level of	At construction access	• Speed limits to be	Contractors and local	Regular reporting of any	Supervision	No long term

ENVIRON MENTAL CATEGORY	POTENTIAL IMPACT	SIGNIFICANCE	SIGNIFICANT LOCAL IMPACTS	MITIGATION	RESPONSIBLE	MONITORING	RESPONSIBLE	LONG TERM IMPACT
Aesthetics	construction access routes near settlements • Some additional traffic on main road may reduce road safety. • Not sufficient pedestrian crossing points	impact if mitigation not implemented	points near settlements	enforced. • Proper signage • Education and information to local community. • Contractors to act responsibly. • Review need for any additional pedestrian crossing points	community	accidents and complaints	consultants	impacts
9. Waste Disposal	Large amount of construction waste and waste from workers to be disposed of.	Medium level of impact	No local impacts unless disposed of near existing communities	• All construction waste to be taken off site and special managed landfills under control of local government to be established. • Workers waste to be regularly taken off site • At end of contract all temporary buildings and installations to be taken off site	Contractor in close consultation with local authority	Regular monthly monitoring of site and waste collection and disposal activities by Supervision Consultants	Supervision consultant and Environmental authorities	Provided all waste taken to proposer managed landfill sites, no long term impact
10. Borrow pits and haul routes	Borrow pits • Disturbance to local environment, in particular dust and noise from equipment and vehicles; • Local loss of trees and disturbance to wildlife; • Impact on groundwater; • Disturbance to agricultural activities Haul routes of material and equipment • Noise and air pollution • Danger to other road users, particularly pedestrians and non motorized and farm vehicles • Disturbance to agricultural activities	Can be significant impacts if not properly managed and mitigated. Potential locations of borrow pits already proposed within 5 km of construction site. Haul routes must be agreed with supervision consultants prior to construction start or within 2 weeks	Potential for some significant local impacts adjacent to borrow pits and haul routes	• All borrow pits and haul routes to be agreed before start of work • Only approved borrow pits to be used with EIA that has a plan for closure, remediation and recultivation	Contractors, Supervision consultants and Rayon Akimats	Regular monthly and ad hoc monitoring of any impacts, incidents and complaints	Supervision consultant, Environmental authorities and Rayon Akimats	Provided impacts properly managed and mitigated there will be no long term impacts.
Impact on other major infrastructure within area	Adverse affect on Natural Gas pipeline; no disturbance or construction activities within 200 meters of	No impact provided no activities occur within 200 meters of Natural Gas line	No local impacts	Contractors not to disturb land within 200 meters of line	Contractors and supervision consultants	Regular monitoring by supervision consultants	Supervision consultations	None

ENVIRON MENTAL CATEGORY	POTENTIAL IMPACT	SIGNIFICANCE	SIGNIFICANT LOCAL IMPACTS	MITIGATION	RESPONSIBLE	MONITORING	RESPONSIBLE	LONG TERM IMPACT
	centerline of pipeline. Nearest point of road alignment is 250 meters from Natural Gas Pipeline							

Table 7.2: OPERATION IMPACTS: MITIGATION, MONITORING AND RESPONSIBILITIES

ENVIRONMENTAL CATEGORY	POTENTIAL IMPACT	SIGNIFICANCE	SIGNIFICANT LOCAL IMPACTS	MITIGATION	RESPONSIBLE	MONITORING	RESPONSIBLE
1. Air Quality	• Emissions from vehicles using the road • Emissions from repair and maintenance activities	Generally will not be significant provided vehicles are well maintained	• Potential impact at Km 0 where new housing subdivision fronts road. • Potential impact to various uses adjacent to road in Shelek (Km 106-Km 109)(some housing); • No other local impacts	• Ensure all vehicles confirm to Government emission standards • Enforce minimum and maximum speed limits to reduce excessive emissions. • Ensure all repair and maintenance vehicles confirm to Government emission standards • Regular monitoring in vicinity of Km 0 and Km 106-109 to determine whether any impact.	Road operation company and Ministry of Environment Protection	Regular monthly monitoring at potential issue points at Km 0 and Km 106- Km 109 and at other locations as necessary	Road operation company
2. Noise	• From vehicles using road. • From repair and maintenance activities	Generally will not be significant provided vehicles are well maintained	• Potential impact at Km 0 where new housing subdivision fronts road. • Potential impact to various uses adjacent to road in Shelek (Km 106-Km 109)(some housing); • No other local impacts	• Ensure all vehicles confirm to Government noise standards • Ensure all repair and maintenance vehicles confirm to Government noise standards • Regular monitoring in vicinity of Km 0 and Km 106-109 to determine whether any impact	Road operation company and Ministry of Environment Protection	Regular monthly monitoring at potential issue points at Km 0 and Km 106- Km 109 and at other locations as necessary	Road operation company
3. Water, drainage and flooding	• Sustainable source of water for operation, • Flash flooding • Water-logging due to blockage of natural drainage • Interruption of irrigation and natural watercourses • Surface and groundwater contamination due to road activities and rest/service areas	• Not significant since Rayon Akimats have confirmed sources of water. • Flooding will not be an issue since design incorporates drainage requirements for local conditions. • Interruption of water courses not likely to be significant if road managed effectively. • Contamination not likely to be significant is road managed	No specific local impacts	• Adequate drainage included in approved design. • Good management and maintenance will ensure that interruption of water courses and contamination will not occur	Road operation company in association with Water Resources authorities	Regular monitoring of groundwater water resources and drainage facilities within road boundary.	Road operation company in association with Water resources authority

ENVIRONMENTAL CATEGORY	POTENTIAL IMPACT	SIGNIFICANCE	SIGNIFICANT LOCAL IMPACTS	MITIGATION	RESPONSIBLE	MONITORING	RESPONSIBLE
		effectively					
4. Soil and subsoil erosion and pollution	• Loss and destruction of soil and subsoil may cause erosion near road alignment • Potential for pollution from oil, deicing and non slip materials, from tire wear etc	• Some level of impact if appropriate construction management techniques not followed • Provided roadway maintained to correct standards impact will be minimal.	Potential for localized impact near cuttings and embankments in vicinity of Shelek	• Proper management of soil and sub soil necessary to be in accordance with Government regulations. • Ensure that landscaping is properly maintained and no erosion takes place.	Design Engineers and Contractors. Already included in design and contractors specifications	Regular monitoring of soil erosion and stability	Road operation company
5. Flora and fauna and protected areas	• Existing trees and planting • Long term disturbance to wildlife, particularly migration and travel routes • Damage to flora and fauna by use of salt and chemicals to disperse snow and ice • Possible increase in illegal hunting due to better accessibility	Medium impact	No specific local impacts though there may be some fauna migration routes blocked within the central and eastern part of Section 2	• Ensure all trees and planting close to ROW are managed effectively. • Tunnels to be provided for larger wildlife to cross road (included in design), additional crossing points added during construction if considered necessary in section 2. • Design and tender for replanting along alignment already prepared • Where possible reduce use of salt and chemicals to disperse snow and ice in favor of sand and gravel to reduce impact on soils, flora and fauna • Illegal hunting to be controlled and stopped	Road operation company and Rayon Akimats to strictly enforce all hunting laws and regulations	• Regular monitoring of health of adjacent trees and flora; • Monitoring of activities of fauna and need for additional crossing points	Road operation company and Forestry Department to monitor impact on adjacent wooded areas. Road operation company in association with Akimats to monitor need for additional crossing routes for mammals and others
6. Social/Economic/Farmers	• Increase in economic activity caused by better road access to rest of Kazakhstan and to China. • Opportunities for permanent employment with roads authority • Opportunities for business and employment within service areas • Some disturbance to farmers activities where road passes through their original land used by them; • Loss of business by	• Potential for significant economic benefits and social benefits • Some adverse impacts if farmers operations affected by road because of lack of crossing points for animals and farm equipment.	• No specific local impacts except in agricultural and grazing areas. • Existing communities along existing road	• Local communities need to be advised on how to best benefit from road improvement • Additional crossing points added during construction if considered necessary • Existing businesses on main road to be given first chance to take sites in rest/service areas; • Existing commercial uses to be advertise and signed from new road to encourage traffic to stop in existing communities. • Temporary sites for	• Rayon Akimats; • Road operation company to review need for any additional crossing points (bridges) in cooperation with community.	Monitoring of any adverse impacts on local community and farmers	Rayon Akimats

ENVIRONMENTAL CATEGORY	POTENTIAL IMPACT	SIGNIFICANCE	SIGNIFICANT LOCAL IMPACTS	MITIGATION	RESPONSIBLE	MONITORING	RESPONSIBLE
	existing commercial operations on existing roads			local businesses near junctions			
7. Physical Cultural Resources	Impact on those monuments remaining near new road; danger of damage and loss due to greater awareness and numbers of people in the area.	Low impact	Bayserke Cemetery Mounds 2-5, Alga Cemetery all 3 mounds, Salamatka Cemetery all 2 mounds	Committee of Culture to ensure the remaining sites are protected	Committee of Culture	Monitor condition of all antiquities within 2 km of roads	Committee of Culture
8. Road safety/Aesthetics	• Increase in accidents • Danger to pedestrians, not enough crossing points	Low/medium impact	No specific local impacts except where pedestrians cross	• The special features included in design will reduce potential for accidents: divided highway, good visibility, limited access and exits, warning signs, rumble strips etc. • There will be few settlements near the road and very few pedestrians near the road or crossing the road • Review need for additional crossing points in particular at Shelek (SEE CONSTRUCTION PERIOD)	Already included in design.	Monitor and record all road accidents	Road operation company
9. Waste disposal	Waste from operational activities and rest/service areas : collection and disposal issues	Low impact	At proposed service and rest areas.	Road Authority must ensure regular cleaning and collection of all liquid and solid waste, and disposal in accordance with government and local government regulations and procedures. Road authority to be responsible for collection from rest/service areas.	Road operation company and Local Akimats	Regular monthly monitoring of site and waste collection and disposal activities.	Waste management authorities and Road operation company

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