

SFG2280 REV

**REPUBLIC OF KAZAKHSTAN
MINISTRY OF INVESTMENT AND DEVELOPMENT
COMMITTEE FOR ROADS**



**WESTERN EUROPE – WESTERN CHINA
INTERNATIONAL TRANSIT CORRIDOR
UZYNAGASH – OTAR ROAD SECTION**



ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

**FINANCED BY INTERNATIONAL BANK FOR RECONSTRUCTION
AND DEVELOPMENT AND REPUBLIC OF KAZAKHSTAN**

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ABBREVIATIONS

Akimat	Regional body of executive branch in Kazakhstan
CfR	Committee for Roads (of MoID)
DE	Design Engineer
ESS	Environment and Social Sphere
EBRD	European Bank for Reconstruction and Development
EMPF	Environmental Management Plan Framework
EMP	
ESIA	Environmental and Social Impact Assessment
FS	Feasibility Study
H&S	Health & Safety
HGV	Heavy goods vehicle
IFI	International Financial Institutions
IsDB	Islamic Development Bank
MEP	Ministry of Environmental Protection
MOID	Ministry of Investment and Development
PAP	Project Affected Person
PCR	Physical Cultural Resources
CSC	Construction Supervision Consultant
PMC	Project Management Consultants
RAP	Resettlement Action Plan
RPF	Resettlement Policy Framework
SEE	State Environmental Expertise
SoW	Scope of Work
WB	World Bank

EXECUTIVE SUMMARY

The Committee for Roads of the Ministry of Investment and Development (MoID) of Kazakhstan is implementing the Western Europe –Western China Corridor Project: Uzynagash – Otar road section, passing across the territory of Zhambyl and Almaty oblasts. The length of the road sections, where road widening will be carried out (from 2 to 4 lanes, Category I) is 69 km and the length of bypasses (2 lanes, Category II) is 27 km. Total length of the alignment under the project is 96 km. 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 also significant impacts on topography, climate, natural conditions and human activity. Road alignment crosses almost similar forms of land, land use types and micro-climatic zones.

This Executive Summary describes the project and summarizes the results of various environmental and social studies.

It is intended that the project implementation will be partly financed by the International Bank for Reconstruction and Development (IBRD). The project has been developed and it is implemented in accordance with Kazakhstan National Requirements (Environmental Code of RK, 2007 and other instructions and regulations) and World Bank Safeguards Policies.

PROJECT DESCRIPTION

Uzynagash - Otar road section is a part of «Western Europe – Western China» transit corridor and passes through Zhambyl and Almaty oblasts. The length of the designed section is 96 km, including bypasses of Samsy v. 17 km and Targap v. 10 km. In terms of administrative division the designed road section passes across the territory of Zhambyl District of Almaty oblast and Korday District of Zhambyl oblast.

- The length of designed road section is 96 km.
- The road alignment section from km 63 to km 80 passes on low bald hill relief and from km 80 to km 160 on flat terrain.
- Climate of the area is continental, road-climatic zone - IV;
- The hottest month is July; Average temperature is +25,4°C; Absolute maximum of air temperature is +47°C; The coldest month is January; Average temperature is 11,7°C; Absolute minimum of air temperature is -46°C; Thickness of snow cover with estimated probability of 5% excess is 35 cm. Wind region - III.

The projected road will be dual carriageway, except by-passes, by keeping the existing road in one side, more preferably on the left hand side towards Otar. During the field investigations carried out on October 2014, all the detailed features of the existing road have been reviewed and analyzed including the proposed by-passes of Samsy and Targap villages, which will improve the road alignment, road safety, reduce the number of road accidents as well as reduce the length of the road and provide opportunity for the future development of adjacent villages.

The Right of Way of the existing (single carriageway) road is 40 m. In connection with the road widening the right of way width will be established at 70 m. According to the preliminary assessment along the alignment and proposed bypasses, there is the necessity of land acquisition. Some agricultural lands and irrigation system may potentially be affected. About 80% of the alignment will follow the existing road alignment that is narrower and worse in terms of road quality. The road section ends near Korday Bypass at km 162.

Process of Environmental and Social Impact Assessment (ESIA)

The ESIA has been prepared by «KazdorNII» JSC as a part of consulting services for suggested Uzynagash-Otar section of Western Europe – Western China Corridor, in accordance with Kazakhstan's National Requirements (Environmental Code of RK, 2007 and other instructions and regulations) and World Bank Operational Policies OP 4.01 and OP 4.12.

World Bank Safeguards Policies and Recommended Categorization of the Project

The World Bank's system of environmental project classification is determined according to the probability and risk magnitude, connected with the project (and subprojects).

Taking into account spatial scales of the project and its potential negative impacts, the project was classified as project of Category A according to the Bank safeguards policy. This classification is substantiated by large-scale survey of broadening of 2-lane to 4-lane road on the existing road highway, as well as bypass and other engineering structures construction.

Below is the discussion of the Bank's safeguards policies, which are directly applicable to this project.

Environmental Impact Assessment OP/BP 4.01 (triggered): The main envisaged potential negative impacts during construction are the development of borrow areas, generation of waste (construction materials, expendable materials and spare parts, household waste and wastewater from camps), excessive land use, topsoil destruction/erosion, and potential impacts on physical cultural resources. There is also a potential impact on groundwater and surface water (e.g. excessive turbidity and silting, accidental spills of fuel and lubricants). During operation of the road, storm water drainage, noise, dust, air pollution may be considered as potential issues.

The Environmental Management Plan (EMP) has been developed and the requirements for compliance will be integrated into bidding and contract documents to provide clear guidance and contractual obligations for environmental due diligence in detailed project design and implementation.

Natural Habitats OP/BP 4.04 (not triggered, but addressed in ESIA):

Designed road will pass on the existing A2 road. At this moment the existing A2 road does not affect protected zones/national parks or natural habitats.

Forests OP/BP 4.36 (not triggered, but addressed in ESIA): There are only small patches of low-value plantations at the western part of the road. No significant impacts on forests are expected and therefore, the policy is not triggered. Trees of roadside belts (low-value tree species) will be cut down during road construction. Compensation forest planting will be undertaken according to the requirements of the EMP.

Physical Cultural Resources OP/BP 4.11 (triggered):

Kazakhstan is a country with rich cultural heritage, especially along the historic silk-road corridor. An archaeological survey was carried out by licensed archeologist. PCR objects were found in construction area, which are located in protected zone equal to 200m from road (according to legislation of Kazakhstan and can be affected by project activities). This OP/BP is applicable in this project; more detailed report on PCR, found during archaeological inspection of road section is attached in Appendix 2. Detailed site management plans for PCR will be developed during preparation of the detailed design of the road sections. Key mitigation measures include avoidance, graphic, photo and video fixation, full archaeological survey/excavation and recovery to museums, if feasible. If the impact cannot be avoided, following the archaeological survey the monuments

will be removed from the List of State Registration of Monuments. Chance finds are likely to be found during the construction. Clauses on “Chance finds procedure” will be included in construction contracts.

Involuntary Resettlement (OP/BP 4.12, applicable):

This policy covers the direct economic and social impacts that are caused by the involuntary land acquisition, as a result of (i) relocation or loss of shelter; (ii) loss of assets or access to assets; or (iii) loss of income sources or means of livelihood, involuntary resettlement of the involved; or the involuntary restriction of access to legally designated parks and protected areas, which as a result can lead to negative social impact. If a project requires either land acquisition or resettlement (as defined above) either a shortened or full Resettlement Action Plan (RAP) will be required, depending on the scale of the impact (significant or non-significant).

The Social Management Framework and the Resettlement Policy Framework (RPF) has been prepared as separate documents by «KazdorNII» JSC and agreed with the Committee for Roads (MID). RAP of specific site will be prepared upon completion of the detailed design of the road section along with the completion of list of property, business and people, having occurred under impact of construction of this road section.

Pest Management OP 4.09 (not triggered). This policy is not triggered (herbicides to manage roadside vegetation will not be applied).

Safety of Dams OP/BP 4.37 (not triggered). This policy is not triggered.

Projects on International Waters OP/BP 7.50 (not triggered): The project will not influence on the international waterways. Impact on the hydrological mode and rivers flows crossed by the project will be insignificant, as their hydrological mode completely remains invariable. The territory of the project is in a zone of the basin of Balkhash lake with closed (without exit to the sea) system of the rivers, flowing both in Kazakhstan (downstream as the receiver) and in China (upstream) with small part (upstream) in Kyrgyzstan. Waters flow down into the lake through seven rivers, the biggest of which is Ili, which brings the majority of river inflow. As both China and Kyrgyzstan are upstream, the cross-border hydrological influences will not occur from the project.

Environmental and Social Baseline Conditions

The design corridor lies parallel to Tien Shan ridge on all the length at distance from 10 to 30 km. Thus, the project will be in the alluvial valley, which has soft morphology. Relatively there are a lot of underground waters in the territory of the project, which depth varies from the superficial water-bearing horizons in young deposits to deep thermal waters.

The climate is continental: cold winter and hot, dry summer, rainfall during rather short period in the spring and in the autumn. Natural cataclysms do not represent risk in the territory of the project. The greatest danger proceeds from the crossed rivers, many of which begin in mountains and have high seasonal variability with a considerable potential for floods during heavy rains. Erosion or mountain slides, landslides and mudflows don't represent risk for the road.

The major part of the road is in a zone of the existing human activities. The site is located to the north-west from Almaty city. It passes through Zhambyl district of Almaty oblast and Kordai district of Zhambyl oblast. In the west of the Site the existing network of roads is the densest, with high economic activity, including productions, construction, extraction of materials and intensive irrigated agriculture. Zones of the irrigated agriculture are located throughout the entire corridor. In the whole design corridor the anthropogenous influences in the form of animal husbandry, agriculture, residential zones and settlements, or infrastructure and transport corridors are noticeable. There are no natural habitats in the project's area of impact.

Impacts and its Mitigation and Management

Measures for minimization of environmental impacts will be implemented into the road Design.. The design will include measures for population protection from noise and improvement of traffic safety (speed restrictions, pedestrian crossings and underpasses). The design will also include requirements of farmers along the alignment for cattle droves construction and safe crossings for farm machinery. The underpasses for cattle will serve as crossings for other animals random movement of which is possible). The design will take into account the results from hydrographic and hydrological studies, installing sufficient culverts to avoid damming of permanent or seasonal watercourses and the creation of swamps or waterlogged areas. The dimension of bridges is calculated given the seasonality of water discharge, as well as possible flash floods.

Most impacts during the construction period (dust, noise, exhaust gases and wastewaters from camps and road) will be mitigated by standard procedures for the prevention and minimization of impacts. Surface watercourses will be protected by settling ponds and filters (e.g. straw bales) , if necessary. Wastewater from construction camps as well as septic sludge will be transported to the existing wastewater treatment plants. Project impact on surface water is not expected. Water for camps will be taken in relatively small quantities from the existing wells or from the existing water supply systems.

Inconvenience to the population will moreover be minimized by limiting work hours and not allowing nighttime works. In cases when works are carried out in close vicinity to residential areas additional measures, such as noise barriers, will be applied, if necessary.

Borrow pits will be operated by the Contractors only at locations for which both operational and environmental permits have been obtained. No borrow pits will be operated without a site specific EMP. The EMP will contain a plan for borrow pit closure, remediation and re-cultivation. According to the requirements of legislation of Kazakhstan this plan will have to be approved by the local environmental department (as required under Kazakhstan's legislation). Construction supervision consultant will also review and approve the borrow pit closure, remediation and re-cultivation plan and ensure that international good practice is followed).

All the environmental management measures to be carried out by the Contractors during the construction period will be integrated in the tender documents and become a part of the contractual works. This will also include a manual on chance find procedures to be followed in case of unanticipated discovery of potential NCR. 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.

Burial mounds identified by the preliminary survey of PCR will have to undergo full archaeological survey (excavations). Following the completion of the said survey, historical and cultural finds obtained during the survey will be preserved and transferred to the possession of state museums. The archaeological monument will be removed from the List of State Registration of Monuments. Based on the survey, the research report and the conclusion will be prepared in consultation with the Ministry of Culture and Sports of the Republic of Kazakhstan.

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

Analysis of Alternatives

Alternative options for Uzynagash-Otar road section are considered for bypasses of Targap and Samsy villages only, because generally the road will pass on the existing alignment. Alternative

options, "without the project" and "with the project", are also considered in the project of Uzynagash-Otar section.

Absence of the project would have much more negative consequences on environment and social conditions in the settlements along the existing road, as danger to local users of roads will increase due to the increase in traffic flow. In case of the design option, which assumes broadening of the existing road and bypasses for the settlements, the highway will detour settlements and influence on local society will be minimum. In general, from the point of view of environmental protection, it is considered, that the chosen plan of the road offers the best approach to the solution of problems with the existing road, with stimulation of economic development and with improvement of social communication between the cities.

LAND ACQUISITION AND RESETTLEMENT

The Resettlement Policy Framework agreed between the CR and the Bank for the use throughout the Western Europe – Western China Corridor Project will be applied to the proposed section of the road. ;

As per preliminary assessment, design road will go along the existing road without any major change of alignment of the road other than the new road alignment sections, proposed by-passes, only few people will be affected by the Project in connection with construction of Bypasses and road broadening. According to initial assessment of bypasses, only 12 households along Samsy village and 19 households along Tartap village will be affected, there are no potentially affected persons detected. However, additional land acquisition might be required to expand the road for road construction in some distinct regions. All the detailed information on properties and land affected due to the proposed expansion will be in detailed project and in the project documentation.

Road reconstruction will require temporary land acquisition for the entire period of construction to provide ground allocation from far off borrows pits, construction camps, parking of road-building equipment and road-building materials warehousing sites.

Furthermore, lands, required for temporary use, will be obtained on a voluntary basis, negotiated directly between landowners and contractors, who will work and use the lands during construction, the agreements on the compensation payment for temporary land use will be concluded.

The Resettlement Policy Framework has provided all the detailed information in relation to various types of land acquisition required.

Upon finalization of the detailed design, in accordance with national legislation, as well as the World Bank's requirements OP 4.12: «Involuntary Resettlement», the Resettlement Action Plan (RAP) will be prepared for Uzynagash-Otar road section. RAP will be fully implemented prior to works beginning on relevant road sections.

The RAP will specify the procedures to be followed by the Government of Kazakhstan through the Committee for Roads (CR) and the Ministry of Investment and Development (MoID) and the actions, which will be taken to properly resettle and compensate Affected People. The document provides a description of the land, households and businesses that will be affected by property acquisition. The RAP's objective is to mitigate the negative impacts of land acquisition and displacement, and to set out the entitlements of the different categories of affected persons, paying particular attention to the most (non-protected) vulnerable ones.

The RAP will be applied to all affected persons regardless whether or not they have a legally registered title to the land. Nevertheless, the severity of the impact will however affect the nature

of the compensation and other assistance provided. The RAP document will become the result of various phases of public hearings, data collection and analyses.

The RAP's requirements are binding to both, the Government of Kazakhstan through the Committee for Roads and the Contractors involved for the implementation of the Project.

PUBLIC HEARINGS AND DISCLOSURE

Public hearings were organized in the settlements, located along the alignment in Zhambyl oblast (August, 2015) and in Almaty oblast in Sarybastau settlement designers (July 21, 2015).

Additional public hearings and consultations of Stakeholders will be held to discuss the draft ESIA with participation of people from the nearby settlements and local settlements, located along a site of the road. More informal consultations will be done during project implementation through:

- The preparation and dissemination of brochures in Kazakh and Russian, explaining the project, works required and anticipated timing of the works; and
- Setting up a formal grievance redress committee involving representatives from the local community. The Project supervision Consultant in association with the Contractor will be responsible for managing the effective grievance redress program.

LOCAL COMMUNITY AND SOCIO-ECONOMIC SITUATION

For all communities situated along the proposed road corridor section, impacts have been evaluated for land use, road infrastructure, water supply networks, power and gas supply, health, education, culture and sport facilities as well as industry and business.

During site visits and contacts with the population, no impact on ethnic minority groups was mentioned.

The principal negative impacts are as follows:

- The proposed road will be a potential obstacle for farmers and cattle movements,
- In some locations, the proposed road will be a potential obstacle for reaching schools, stores and other local facilities,
- During construction, water, electricity and gas supplies to the communities and farms might be affected by the project,
- During construction, drainage of the fields will be affected,
- Influx of workers,
- Land acquisition and involuntary resettlement may cause adverse impacts on Project Affected Persons (PAPs), particularly if the process is not managed properly,
- During the construction, some restrictions to land use of PAPs might occur,
- Land acquisition and the construction of the road may negatively impact on the livelihoods of PAPs in terms of agricultural production.

The principal positive impacts are:

- The new road will provide a better connection with the rest of the districts, the regions and the country.
- Broadened four-lane road will recover local economy as it will promote construction of new stores, restaurants, bars, petrol stations, local grocery stores.

- The project road will result in significant positive contribution to regional and national economy following adequate, safe, cost effective and reliable transport service by the project.

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The project-level Environmental and Social Management Plan (ESMP) has been prepared as part of the EISA in order to define the environmental and social mitigation measures and procedures that will need to be followed by the contractors and other parties responsible for project implementation. The ESMP may need to be revised during the course of the project implementation. The revision of the ESMP will be done based on agreement between the Bank and the Borrower.

The project-level ESMP contains the following information:

- Potential environmental and social impacts
- Mitigation measures;
- Institutional roles for implementation of mitigation measures during construction and operation of the road;
- Environmental monitoring plan.

Site-specific Environmental and Social Management Plans (ESMPs) will be developed by the contractors for specific road sections/lots and will need to be approved by the Borrower and by the Bank. These ESMPs will define the timing, frequency, duration and cost of mitigation measures in the form of implementation schedule, and these actions will be integrated into the overall project work plan. Site-specific ESMPs will include Monitoring Plan, through which monitoring of the environmental impacts and the implementation of the mitigation measures during the construction phase will be carried out.

FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

The proposed road widening project will have moderate environmental and social impacts. With appropriate mitigation measures during the project construction phase, the environmental impacts referred to in this report will be acceptable. Improvement and broadening of Uzynagash-Otar road section of Western Europe-Western China corridor will bring social and economic benefits for the population, living along the road alignment. High-speed, safe road that is and accessible under any weather conditions will allow effective and quick transportation between China, Kazakhstan, Russia, as well as towards Europe and Central Asia. Goods, produced in these countries, will be quickly delivered on route. Agricultural products and other products of local production can be quickly transported to larger markets from that territory, where it is the main business. The labor force will also be able to move more freely between the countries, the most significant tourism for regional and international economy will also develop. There will be more opportunities for employment and development of businesses. On regional level, the population of Zhambyl and Almaty oblasts will receive more benefit from reduction of time of travel to other cities and regions of Kazakhstan.

Implementation of the road project will contribute to reduce accidents and the associated loss of resource and human lives.

The major adverse impacts with the project result from land take for new road pavement & material sites development. This will result in loss of some agriculture land, loss of

settlement house, loss of scattered trees in the in and around the areas. Other adverse impact by the project includes erosion & sedimentation, water pollution risk, public health, HIV/AIDS with implementation of the proposed mitigation measures & proper compensation the adverse impact can be controlled to acceptable level.

The following recommendations result from the EISA:

- *The design documentation (detailed design) will include the requirements for environmental mitigation measures;*
- *Contracts shall include appropriate clauses to cover all environmental protection requirements as listed in the Chapter 7. Construction materials (gravel and sand) should only be taken from the licensed borrow pits. Waste and debris should be disposed in an environmentally friendly way.*
- *The contractors will implement the environmental management plan and monitoring plan. These plans will be updated based on site specific conditions.*

The draft ESIA will be disclosed and public consultations organized. The final version of the ESIA will be updated to take into account comments from the consultations. Site-specific ESMPs for separate sections/lots shall be prepared, disclosed and consulted upon at the stage of the detailed design for each section involving stakeholders and local communities residing along the design section. A number of informal consultations will be also organized during the project implementation through:

- *The preparation and dissemination of brochures in Kazakh and Russian, explaining the project, works required and anticipated timing of the works;*
- *Setting up a formal grievance redress committee with a representation from the affected people. The Project supervision Consultant in association with the Contractor will be responsible for managing the effective grievance redress program.*

1. INTRODUCTION

The length of “Uzynagash-Otar” road section, where road widening will be carried out (from 2 to 4 lanes, Category I) is 69 km and the length of bypasses (2 lanes, Category II) is 27 km. Total length of the alignment under the project is 96 km.. The project passes through various reliefs, types of land use and (micro) climatic zones. Project highway is located in Zhambyl district of Almaty oblast and in Kordai district of Zhambyl oblast approximately 16 km.

In August, 2014, the Government of RK requested the World Bank to finance Otar-Uzynagash road section of 95,376 km length, which is a part of Western Europe - Western China Corridor in order to:

- Reduce vehicle-operating costs;
- Reduce travel times;
- Provide greater access to markets and job opportunities;
- Increasing economic opportunities; etc.

In accordance with the requirements of the legislation of the Government of Kazakhstan an Environmental Impact Assessment (EIA) has been prepared. This EISA 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 EISA meets the requirements of "Guidelines for the Assessment of Designed Economic and Other Activities on the Environment

in Development of Pre-Planning, Planning, Pre-Design and Design Documentation, as approved by the Order No. 204-p of the Minister of Environment of the Republic of Kazakhstan on June 28, 2007.

In accordance with the World Bank requirements and operational procedures this road corridor section has been defined as a Category A and EISA has been prepared in accordance with World Bank Operational Policy (Environmental Impact Assessment OP 4.01). This work has been carried out by “KazdorNII” JSC, in accordance with the agreed Terms of reference from Committee for Roads.

The purpose of ESIA is to identify the environmental and other impacts of the designed road development. This report includes the following main sections:

- Policy and Administrative Structure
- Project Description
- Analysis of Alternatives
- Environmental and social baseline data
- Potential environmental and social impacts of the project
- Social and environmental impact mitigation measures
- Environmental Management Plan
- Institutional responsibilities
- Disclosure of information, consultations and public hearings. Participation of parties and grievance redress mechanism.

2. PROJECT DESCRIPTION

2.1 GENERAL INFORMATION

"Uzynagash-Otar" road section project with a general extent of 95,376 km, including Samsy village bypass of 17,071 km and Targap village bypass of 10 km, is a part of "Almaty-Kordai-BlagovesPCRenka-Merke-Tashkent-Termez" road of republican importance, which in its turn will provide communication in the international corridor between Western China and Western Europe. The purpose of the corridor is providing separate road through Western China, Kazakhstan and Russia under any weather conditions. This corridor will increase economic profit, will significantly improve flow of goods, tourists, improve social communication between China and Kazakhstan.

The designed road section from km 63 to km 159 is a part of "Western Europe-Western China" transit corridor. Based on administrative division, 80 km of the designed section passes across the territory of Zhambyl district of Almaty oblast and 16 km passes across Kordai district of Zhambyl oblast.

In 2006 road reconstruction has been carried out, 49 km (km 14-63) – Category I (dual carriageway, two lanes in each direction with a dividing strip), 99 km (km 63-162) – Category II (2-lane, one lane in each direction).

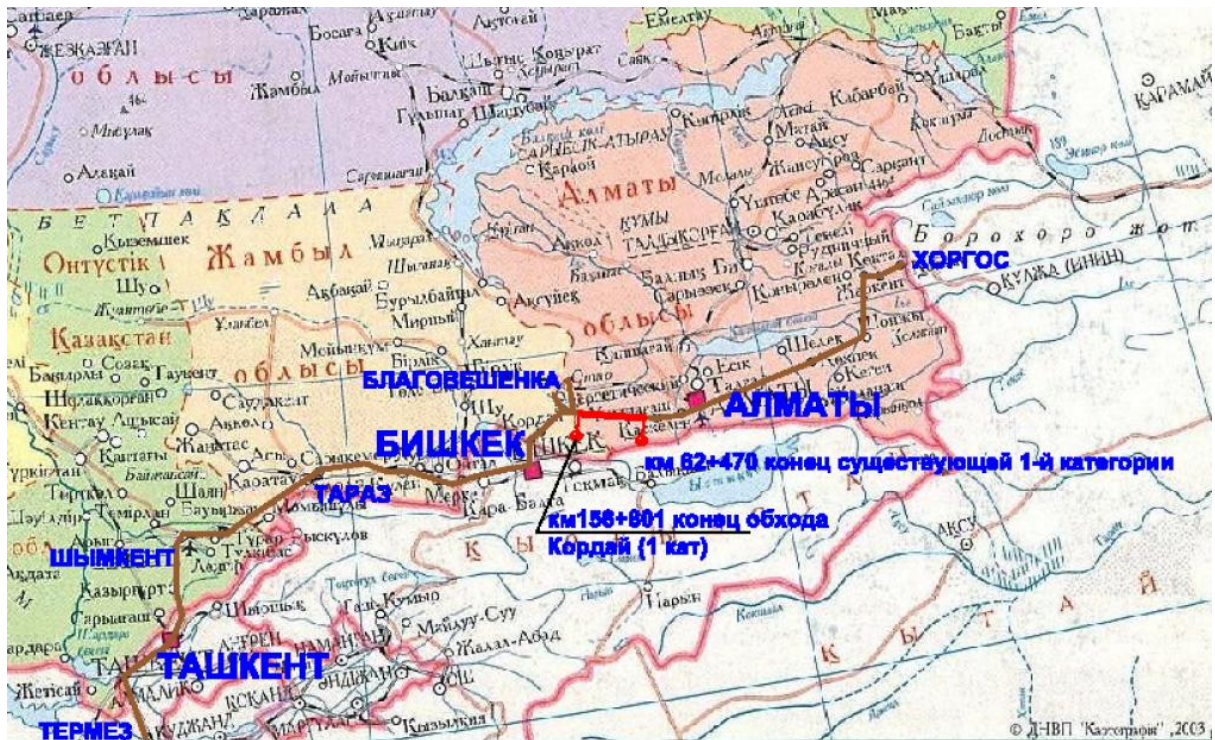


Fig. 2.1-1 – Situational Pattern of “Uzynagash-Otar” Section

2.2 PROJECT SPECIFICATION

Key features of the projected road:

- Road category – Ib;
- Length – 95,376 km;
- Subgrade width – 27,5 m;
- Number of traffic lanes – 4;
- Traffic Lane width – 3.75m
- Dividing strip width – 3 m and 5 m;
- Maximum width of right-of-way – 70 m;
- Maximum estimated speed – 120 km/h;
- Estimated average speed – 80 km/h;
- Multi-level interchanges – 2 units;
- Bridges and overpasses
- Culverts
- Type of road pavement and type of pavement – asphalt-concrete.

Estimated construction period: 24 months.

Construction works include:

- Site clearance and preparation;
- Installation and operation of borrow pits;
- Construction of construction camp, warehouses and workshops
- Construction of subgrade;

- Construction of road pavement;
- Construction of intersection and junctions;
- Construction of transport interchanges in different levels;
- Construction of bridges and overpasses;
- Installation of road signs and guard rails;
- Road marking application;
- Construction of drainage system from carriageway and bridges
- Construction of flanking dike at artificial structures.

Bypass for Samsy village will be km 63+000 - 80+398 (the length of the bypass will be 17.071 km).

Bypass for Targap village will be km 89+705 - 100+000 (the length of the bypass will be 10 km).

2.3 UZYNAGASH – OTAR ROAD SECTION

The section (km 63 - km 162) begins to the North-West from Almaty city from Uzynagash village and ends connecting with Kordai bypass in Otar. "Uzynagash-Otar" road section lies through heights, the flat and hilly area. The road has initially northern direction, begins at the height of 765 m, passes the flat ground on Karatorpak narrow, falling to 685 m, then lies to 27 km in a mountainous terrain with several passes with heights to 760 m, the last one goes out to the flowing valley.

Samsy village is located at 13 km and Ungurtas village is located at 18,50 km from the end of the four-lane road, i.e. from 57 km of the road going from Almaty through Uzynagash towards Otar. Between Uzynagash and Otar villages other settlements are located along the road, namely Ulguli, Ungurtas, Targap, Kopa, Degeres, Beriktas.

During the field researches which were carried out on October 22, 2014 all detailed features of the existing road were studied and analysed, including the offered bypasses of "Samsy" and "Targap" villages. On the enclosed drawings the offered bypasses are specified, which will improve the road highway, road safety, will reduce quantity of road accidents, and also will reduce the extent of the road and will provide possibility of future expansion of settlements, which are not located far from them in order to avoid negative impact of bypasses. During detailed design, alternative variants of bypasses can be considered to an assessment and acceptance.

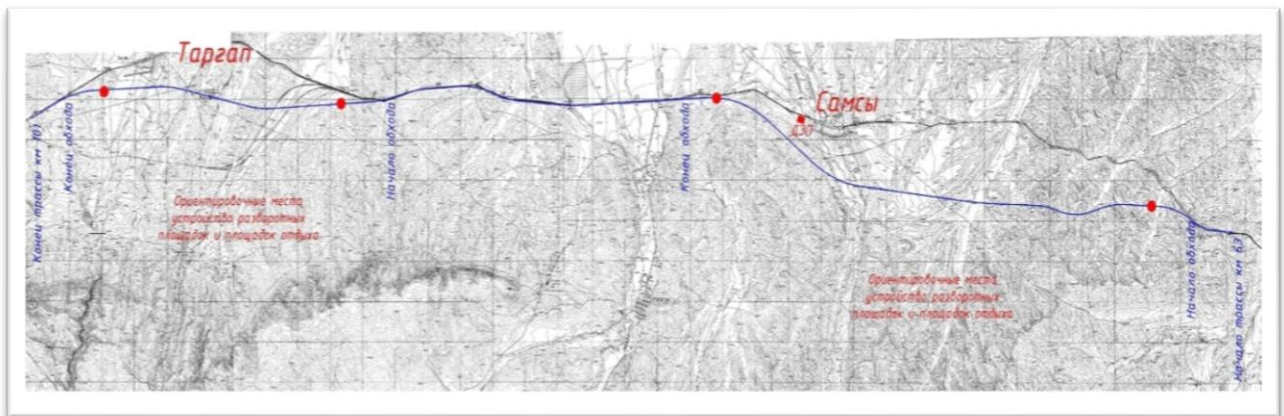


Fig. 2.3-1 – Situational Pattern for the Proposed Bypass

The right-of-way of the existing road is equal to 40 m. Due to the expansion of the road, according to a preliminary estimate along the road and the offered bypasses there is a need of repayment of lands. Some farmlands and irrigating system will be affected along the Site. About 80% of a site will pass along the existing road much smaller worse on quality of the road. The site ends near Kordai bypass on 162 km.

Natural zones, ecosystems or sensitive habitats are not presented along this site.

2.4 RIVERS AND BRIDGES

The area of the road location is provided with surface water. The main surface water sources in the area of the reconstructed road are Karasu, Kurozek, Samsy, Zhyrenaygyr, Targap rivers.

The rivers' nourishment is mainly ground and atmospheric, and water levels therein are dependent on the annual amount of solid precipitation. The extent of mineralization in the spring is small and increases in the summer and winter.

Groundwater of the modern Quaternary and Paleozoic sediments that lie at great depths dominate in the territory of the oblast. Ground water are significantly spread. Its depth varies from 2 to 10 meters. It is fresh by quality. In some sites, at the bases of the detrital cone, groundwater form springs and wetlands (saz), blowing out.

In spring and summer, floods occur in many rivers, which results in flooding of bridges.

Spring and mudflows of mountain rivers carry large amounts of gravel and sand deposits. When exiting the mountain, waters of the rivers are intensively taken for irrigation.

The project provides 2 traffic interchanges at different levels by the "tube" type at km 59+120.

The existing bridges will be reconstructed with broadening for additional two lanes. The average level of a site is 600 m above sea level; with a minimum of 560 meters and a maximum of 640 meters. Bridges and traffic interchanges of a site are given in Table 2.1.

Table 2.4 – Bridges and Interchanges

No.	Section
1	Km 74+580 bridge over aryk
2	Km 76+200 bridge over stream
3	Km 80+500 bridge over Zhirenaigyr river
4	Km 96+500 bridge over Targap river
5	Km 115+750 bridge over stream

Along passing of "Uzynagash - Otar" road section the artificial constructions for the passage of maximum water expenses of rainfall floods, are presented by round and rectangular culverts of various diameters and sizes. All pipes have been constructed in 2004 and are in rather good operating condition.

On road section, passing through Kordai district of Zhambyl oblast all the existing 20 pipes need in increasing of mouth. The road highway, passing across the waste plain, brought into subjection to the general land relief. On the considered site the longitudinal profile has convex character. The most lowered district marks, where there is a concentration of a rain drainage are on the ends of a site of km 144 and km 157.

On road site, passing through Almaty oblast in the existing 39 pipes, 50% need in increasing of mouth. And the artificial constructions offered by designers are given below.

Table 2.5 Recommended artificial structures are shown below:

Рекомендуемые искусственные сооружения

№	км+	сущ. сооружения	Рекомендуем. Сооружения	Напор перед трубой	Условия водоотвода	Скотопрогоны
1	101+902	2,0x2,50	1,5	0,4	в резерв*	
2	103+742	2x(2,0x2,0)	2x(2,0x2,0)	0,7	свободный	2x(2,0x2,0)
3	104+053	2x1,50	2x1,5	1,1	в резерв*	
4	104+965	1	1,5	1	свободный	
5	105+786	1,50к	2,0x2,0	1,1	затруднен*	2,0x2,0
6	106+477	1,5	1,5	1,3	в резерв*	
7	106+920	1,5	1,5	1,3	затруднен*	
8	107+462	1,50к	2,0x2,0	1,2	затруднен*	2,0x2,0
9	108+449	1	1,5	1	затруднен*	
10	109+153	1	1,5	1,4	в резерв*	
11	109+919	1	1,5	1,15	свободный	
12	110+451	1,5	1,5	1,5	затруднен*	
13	110+788	2x(1,0x1,50)	1,5	1,5	свободный	2,0x2,0
14	111+685	1	1,5	1	свободный	
15	112+380	1,5	1,5	1,25	свободный	
16	113+941	1	1,5	1,5	в резерв*	4,0x2,50
17	114+747	1	1,5	1,3	в резерв*	
18	115+989	2x(4,0x2,50)	2x(4,0x2,50)	1,24	свободный	2x(4,0x2,5)
19	147+061	4,0x2,50	4,0x2,50	1,4	свободный	4,0x2,50
20	118+141	1	1,5	1,3	свободный	
21	118+607	2x(4,0x2,50)	2(4,0x2,50)	1,8	свободный	2x(4,0x2,5)
22	120+686	1,5	1,5	0,5	затруднен*	2,0x2,0
23	122+271	1	2,0x2,0	1,3	свободный	2,0x2,0
24	122+974	1,5	2,0x2,0	1,65	свободный	2,0x2,0
25	124+185	2,0x2,0	2,0x2,0	1,45	свободный	2,0x2,0
26	124+599	1,04x0,94	2,0x2,0	1	в резерв*	2,0x2,0
27	126+700	доп	1,5		свободный	
28	127+681	1,5	1,5	1,3	свободный	
29	127+752	1,5	1,5	1,1	свободный	
30	128+578	1,5	2,0x2,0	1,45	свободный	2,0x2,0
31	129+500	доп	1,5		свободный	
32	130+698	1,0к	1,5	1,65	свободный	
33	132+631	2,0x1,0к	2,0x2,0	1,9	свободный	2,0x2,0
34	134+300	1,0к	1,5	1,45	свободный	
35	136+902	1,10x0,63	1,5	1,35	в резерв*	
36	137+994	1,0к	1,5	1,25	затруднен*	
37	138+283	1,50к	1,5	1,15	в резерв*	
38	138+988	1,0x0,95	1,5	1,1	в резерв*	
39	139+488	0,94x1,0	1,5	1	в резерв*	
40	140+322	1,06x1,0	1,5	0,95	в резерв*	
41	141+232	0,94x0,94	1,5	0,85	в резерв*	
42	142+481	0,95x0,90	1,5	0,8	в резерв*	

2.5 BORROW PITS

According to the Terms of reference for the detailed project development, the designer will define some existing and explored soil reserves and borrow pits along the reconstructed road with a registration in the name of the Employer of a permit authorization for the exploration and production of common minerals, the harmonization of their location with the land users and the competent authorities in the use and protection of water resources, forestry, wildlife protection, reproduction and use of fauna and especially protected natural territories, with the conclusion on suitability of the soil and the availability of necessary volumes confirmed by the state expertise for mineral reserves, as well as with the positive conclusions from the state environmental expertise of the Committee of Environmental Regulation of the Ministry of Energy of the Republic of Kazakhstan and sanitary-epidemiological expertise of the Committee for Consumer Rights of the Ministry of National Economy of the RK (Resolution of the Government of the RK No. 721 "On Approval of the Rules for Subsoil Use Rights" dated July 12, 2013).

The existing roads will be used to access borrow pits and construction sites. The construction activity will influence transport stream and noise levels near settlements. Detailed monitoring will be conducted prior to the construction start. Calculation of the traffic taking into account all access roads together with the program of monitoring will be prepared prior to the construction start, as part of measures for environment management.

Table 2.6 Borrow Pits

No.	Borrow Pit	Materials	Status	Length, km/ Distance from the alignment
1	Borrow Pit №1 (S = 30,3 ha)	Soil	Has been studied/ proposed by the designers	km 110+500 / 5,7 km
2	Borrow Pit № 2 (S = 24 ha)	Soil	Has been studied/ proposed by the designers	km 127+500 / 5 km
3	Borrow Pit № 3 (S = 37,5 ha)	Soil	Has been studied/ proposed by the designers	km 139+925 / 0,78 km
4	Beriktas-2 Rock Quarry (S = 10 ha)	Sandy gravel	Existing	km 107/ 8,2 km
5	Crushed stone plant in “Targap-1” section “Assyl-Tau-Zhan” LLP	Sandy gravel	Existing	km 103+500 / 4,7 km
6	Crushed stone plant “KSMK-2” LLP	Sandy gravel	Existing	km 83+900 / 1,3 km
7	Crushed stone plant “Nurly-Tas” LLP	Sandy gravel	Existing	km 62+500 / 16,3 km

3. ANALYSIS OF ALTERNATIVES

Alternatives of road plan

During conceptual design and the feasibility study the alternative roads with the main variants, relating to a site in connection with the existing road and its location were not considered. It is considered that the real highway of Otar-Uzynagash road section, as it is defined in the present report, is the most suitable from the point of view of impact on environment, which will entail the smallest negative impact on environment and social aspects. The chosen road has the maximum ecological advantages. It does not pass close or through any existing or planned settlements, and also does not divide or isolate any existing settlements.

The project lies on the existing "Almaty-Korday-BlagovesPCRenka-Merke-Tashkent-Termez" road of republican value through Samsy and Targap villages. According to CSaR RK "Motor Roads" for the safe traffic, in connection with increase of intensity of traffic, the Employer made the decision on change of road category from category 2 on 1b, with provided two bypasses of Samsy and Targap villages, located on the 77 km and 98 km of the existing road. Possible bypasses were analyzed from an economic and environmental point of view and in terms of safety. Taking into account the bypasses, the total path length of 1-2 km will be reduced, decreasing the number of re-arrangements for the crossed communications, reducing the demolition of green space along the existing road, reducing the area of valuable land seizures and the length of bypass roads. During the construction, method of the roadbed construction will be followed, which is important in high seismicity, as well as transport will not be delayed while driving under renovation for the most part of the site, thus reducing the accident rate and the travel time. Subsequently, the existing road in the settlements will be used for the needs of the local population, which will significantly reduce the exit of agricultural machinery on the main highways and improve the situation of safety in these settlements.

The road section will not have essential changes, only broadening of the road under 1b category which will entail partial land withdrawal.

Environmental Impact in the event of project abandoning

Reconstruction of the existing road through the settlements will lead to the increase of the amount of road-traffic accidents (hereinafter, RTA) with a high probability of occurrence of congestion in connection with the following circumstances:

- Sharp decrease in traffic speed, mainly due to the lack of visibility. In this case, the high intensity and high traffic speed may result in possible RTAs. Such sites usually have a reduced capacity;
- Change in the speed due to the presence of tight curves on the road;
- Merger or crossing of traffic flows at intersections, access roads, junctions, acceleration and deceleration lanes;
- Location of bus stops, rest areas, etc., where there is the possibility of sudden appearance of pedestrians, animals and vehicles from the roadside;
- Reduction of the estimated speed from 120 km/h to 60 km/h, as well as up to 40 km/h in some sites.

Project withdrawal means that the entire future traffic flow will pass through the existing road. It will cause the significant negative adverse consequences for the existing settlements along the road. It will increase the level of noise and vibration, and deteriorate road safety for the local population and road users, especially pedestrians. Traffic congestion on the roads will increase, that will cause the negative economic consequences. In general, quality of ecological and social

conditions will deteriorated along the existing road. As traffic intensity will increase on "Astana-Bishkek" direction, quality of atmospheric air will decrease and noise level will increase. On sensitive sites considerable impact will be made. In general, quality of ecological and social conditions will deteriorated along the existing road.

Environmental Impact in the variant of broadening of the existing road

The alternative of broadening includes broadening of the existing road to 4-lane with a dividing strip. Environmental aspects are reduced to the impacts of the works undertaken on the air and water, operation of large construction machinery, stone crushing and concrete plants, work of borrow pits. Issues of potential adverse impacts are discussed in detail in Section 6.

Conclusion

Absence of the project would have much more negative consequences on environment and on social conditions in settlements along the existing road. Danger for local road users and pedestrians will increase. The chosen alternative that includes proposed broadening for the existing road, will bypass villages as necessary and the impact on local community will be minimal. During construction there will be a small and short influence on agricultural activity related to land acquisition. Owners may suffer some inconvenience due to possible destruction of irrigation system, lack of access roads to the section, during the construction. There will be no considerable impacts on natural complexes expected. In general, from the point of view of environmental protection, it is considered that the chosen road plan offers the best approach to the solution of problems with the existing road, with stimulation of economic development and with improvement of transport communication.

4. JURIDICIAL AND ADMINISTRATIVE FRAMEWORK

This section represents the review the politician/legal basis, also the guides to an ecological assessment of the republic of Kazakhstan, which are applicable to the offered project. This section also defines policy of safeguarding of the World Bank, which will be applied in the project.

4.1 Overall legal framework

Environmental protection is administered in Kazakhstan by the Ministry of Energy of the RK. This Ministry is made during reorganization of the Government of the RK in August 2014. The Ministry has taken functions and responsibilities of liquidated Ministry of Oil and Gas of the RK, Ministry of Industry and New Technologies and the Ministry of Environmental Protection and Water Recourses. 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.

4.2 Environmental Impact Assessment

All EIA requirements are included in the Environmental Code. The basis of EIA development is an “Instruction on conducting environmental impact assessment of designed economic activity when developing pre-planning, planning, initial project and project documentation, approved by the Order of the Minister of environmental protection, dated 28 June 2007, No.204-p” (furtheron Instruction). In addition the requirements of the World Bank OP 4.01 Environmental Assessment are also taken as a reference.

According to the Instruction, there are four stages of the EIA process:

- 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 on the territory of the project, planned for construction, analysis of practical application of this territory and determination of main positions of EIA.

The Second stage of EIA “Preliminary EIA” defines potential possible changes of components of nature, socio-economic environment and its impacts. The purpose of this stage is to assess baseline environmental conditions on the project territory, identify potential impacts, and design mitigation measures to offset such impacts, which is then included as a chapter into feasibility study of the project. The results of this stage should be included in 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 Ministry of Energy for projects of the I environmental category and by its territorial subdivisions for II and III categories, and from 2007 by local bodies (territorial subdivision on environmental safety) for IV category of the enterprise. Recourse to external experts can be made but they play only a consultative role. Services provided by these

experts are paid by project developers, and 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, even to inspectors on sections.

According to Article 36 of the Environmental Code, “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 Order of Ministry about Rules for carrying out public hearings, 2007. EIA and SEE (State Environmental Expertise) are two interconnected procedures. The developer has to conduct an EIA, which is being carried out by accredited private companies and in general he is responsible for preparation of all EIA documentation. The EIA procedure is a two-phase process: the proper EIA and then SEE. Once the EIA is approved, the developer should apply to the SEE. The competent authority checks the consistency and the quality of documents, prepares own evaluation and returns both documents 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 on emissions, and the developer has to attach the EIA report and the report of expertise to license application on emissions. EIA procedure takes about two months and SEE up to three months. A post-project analysis by the authorities is mandatory and is carried out one year after the construction is completed. Experience in the other IFIs, financed projects in the country, shows that, the authorities, are proactive and compliant with regulations of project supervision with potential significant environmental aspects.

It is forbidden to implement the projects 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 new projects, land acquisition shall be approved with environmental authorities, despite the fact that land acquisition is performed by Akimats (sub national administration). At this stage, project developers are obliged to assess baseline environmental conditions and to present results, together with the Declaration of Intent for ecological expertise. The Declaration should be discussed with the general public in hearings organized for this purpose. If environmental expert evaluation is positive, land maybe allocated to the project design.

A “preliminary” EIA is required at the feasibility study stage at consideration of project variants and solutions. For a large-scale project the field survey also should be conducted at this stage. Impacts should be described, but precise emission calculations are not obligated. The feasibility study, including all environmental related documentation, is then presented to the Environment expertise. This Environment expertise is carried out by Ministry of Energy staff or its departments at 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 study. 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 situations plan, monitoring programs of pollutants, 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 are required to be 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 operation of the road 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 ESIA. Minutes from these hearings are part of the ESIA documentation. Although the 1st public hearings` conducted 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 also in real practice. Second public hearings will be organized to meet the requirements for the project category.

Table 1-1 Legislation and Regulations Governing the EIA Process

Name of Law	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 Designed Economic Activity when Developing Pre-planning, Planning, Initial project documentation,	Approved by the Order of the Minister of Environment Protection, 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 Designed Economic Activity when Developing Pre-planning, Planning, Initial project and Project documentation”	Approved by the Order of the Minister of EP, 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 EP, 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 EP, 10 February 2005, No.51-p”.
Final Environmental Supervision Experts Opinion on Definite of Types of Licensed Works and Services	Approved by the Order of the Minister of EP, 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

4.3 TRANSPORT LAW

The Law of Republic of Kazakhstan «About 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 and dimensions and providing land.

According to renew in 2014 Legislation of RK «About the roads» the size of the right of way for projected roads for common use depends on the road category and it is set under the rules of allotment of land for roads of public use. So, 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.

4.4 AIR QUALITY STANDARDS

The standards for air quality establish the permissible limit of the content of harmful substances both in industrial areas and in residential areas. The main terms and definitions related with the atmospheric air contamination, monitoring programs, behaviour 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 Minister of Health RK No.629 dated 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 permission is based on total emission quantity, which is determined by applicant (the developer) and doesn’t content information about emission quantity of separate transport. The procedure for emission permission issuance on atmosphere pollution during transport or other transfer jigs works is determined by Government of the Republic of Kazakhstan.

In addition, the World Bank Group Environmental Health and Safety Guidelines will be used as a reference for air emissions and ambient air quality. In case, there is a conflict between the national legislation and the World Bank Guidelines the more stringent standard shall be implemented.

All motor vehicles of any type (including buses and trucks) are required to pass an annual roadworthy test, which also includes emission test and they shall comply with the requirements of regulations as follow below.

Table 1-2 Documents, regulating atmosphere air protection in the project

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 RK No.61-P dated 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 Bio resources 01.12.96. <i>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 No 324-p dated October 27, 2006</i>
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 RK No.217-p 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 Bio resources dd 01.08.1997. <i>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 No 324-p dd October 27, 2006</i>
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 No.100-p 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 Bio resources of the Road August 1, 1997 and Order of the Ministry of natural resources and environmental protection of the RK No. 156 dd 06.07.2001 <i>Included the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection No.324-n dd October 27, 2006</i>
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 RK No.516-P dd 21.12.00 <i>Included the List of the current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental</i>

	<i>Protection No.324-n dd October 27, 2006</i>
The Calculation Procedure of Motor Vehicles Emissions for Carrying Out of the Summary Calculations of Atmospheric Pollution Guiding normative document 211.2.02.07-2004	The Order of the Ministry for Environmental Protection of the RK No.324-p dd October 27, 2006 <i>Included in the List of current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection No.324-n dd October 27, 2006</i>
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 for Ecological and Bio resources of the Road 09.07.97. <i>Included in the List of current regulatory legal acts in the field of the environmental protection, the Order of the Ministry for Environmental Protection No.324-n dd October 27, 2006</i>
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 No.100-p 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 No 124 dd February 8, 2008
The Rules of Restriction, Stoppage or Decrease of the Greenhouse Gases Emissions into Atmosphere	The Governmental Decree No.128 dd February 11,2008
World Bank Group General Environmental Health and Safety Guidelines	April 30, 2007
World Bank Group Environmental, Health, and Safety Guidelinesfor Toll Roads	April 30, 2007

4.5 WATER QUALITY STANDARDS AND LEGISLATION

The main legislative act in the field of water resources protection and its use is the Water Code of the Republic of Kazakhstan No.481 dated July 09, 2003. According to the definition provided in this document “Protection of water resources” 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 of the Water Code water resources should be protected from:

- natural and industrial pollution by hazardous chemical and toxic substances and their compounds, as well as thermal, bacterial, radiation and other types of pollution;
- infestation (blockage) with hard, non-soluble subjects, production and household and other wastes;

- depletion.
- II. Water resources should be protected to prevent:
 - disturbance of the environmental stability of the natural systems;
 - causing harm to the lives and health of population;
 - reduction of fishery resources and other water fauna;
 - deterioration of the water supply conditions;
 - weakening of the natural self-reproduction and cleaning functions of the water bodies;
 - other unfavourable conditions that negatively affect physical, chemical and biological qualities of water bodies.
- III. Protection of water resources is carried out through:
 - demands related to the protection of water bodies to all water users who use water for any purpose;
 - improving and applying water protective activities/ measures with the help of new equipment and environmentally and epidemiologically safe technologies;
 - water conservation zones and sanitary protection zones for protection of public (drinking) water supply sources;
 - public (state) and other forms of control over the use and protection of the water bodies;
 - sanctions for non-observance of the water protection requirements.
- IV. Central and local execution authorities of the regions (cities of republican status, capitals), in accordance with the legislation of Republic of Kazakhstan, take measures in compliance with the principles of sustainable development towards water resources conservation, 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 Code regulates issues related to the water protection zones: to maintain water resources and water facilities in the status required by the hygiene and sanitary and ecological regulations; to prevent contamination, blockage and depletion of the surface water; to preserve flora and fauna water protection zones and belts are constructed.

In the development of any project that may affect the water system / resources, the project plan should be coordinated with local authorities for the protection of water resources. Water Code was accepted on March 31, 1993 and acts in Republic of Kazakhstan up to now. The Government confirmed *The concept on development of water sector within economic and water policy till 2010*, also approved *the Sectoral Program for drinking water*.

In the development of the Water Code, the Government of the Republic of Kazakhstan approved the regulations on the procedures to authorize the use of reservoirs for special needs, according to the procedures for issuing permits for special use of water, on procedures for the use of water for firefighting, according to the classification of waterways, on procedures for the use of water tanks for the needs of air transport. The Government has developed a list of water resources (groundwater) that have curative value in the Republic, and bodies of water that are of particular national importance or are of special value, which limits their use is either entirely prohibited.

As standards of air, maximum permissible concentration (MPC) was developed for water. As a rule, the MPC for fishing grounds is stricter than the MPC for drinking water. It must be

emphasized that this is primarily related to the fishing industry and the protection of human health is likely there has been taken into account through the principles of the protection of water ecosystems. As is the case with the atmospheric air, different codes are provided for comparing the water pollution, which take into account the presence of several pollutants. The most widely used index is the water pollution index (WPI). The main document regulating the status of surface waters and concentrations of pollutants are "Sanitary requirements for the protection of surface water from pollution." No. 3 from 02.03.2004, approved by Order of Minister of Health of RK No.506 dated 28.06.2004.

The legislative, regulatory and procedural documents applicable on water protection are listed below:

Table 1-3. Water Quality Legislation

Recommendations on implementation 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 Bio resources of the RK 1992. <i>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 No.324-p dd October 27, 2006</i>
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 RK No.516-p dd 21.12.00. <i>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 No.324-p dd October 27, 2006</i>
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 No.100-p 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 RK No.156-p dd 06.07.2001 <i>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 No.324-n dd October 27, 2006</i>
The Recommendations on Control over the Operation of the Treatment Facilities and Discharge of the Wastewaters.	The Order of the Ministry of Ecology and Bio resources of the RK dd 21.05.94. <i>Included in the List of the current regulatory legalacts in the field of the environmental protection, the Order of the Ministry for</i>

	<i>Environmental Protection No.324-n dd October 27, 2006</i>
The Rules of Surface Waters Protection in the RK Guiding normative document 01.01.03-94	The Order of the Ministry of Ecology and Bio resources of the RK dd 27.06.94. <i>Included in the List of the current regulatory legalacts in the field of the environmental protection, the Order of the Ministry for Environmental Protection No.324-n dd October 27, 2006</i>
The Guidelines on Application of the Rules of Surface Waters Protection in the RK	The Order of the Ministry of Ecology and Bio resources of the RK dd 12.02.97. <i>Included in the List of the current regulatory legalacts in the field of the environmental protection, the Order of the Ministry for Environmental Protection No.324-n dd October 27, 2006</i>
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 Bio resources of the RK dd 1997
General Environmental Health and Safety Guidelineson Wastewater and Ambient Water Quality	April 30, 2007
World Bank Group Environmental, Health, and Safety Guidelines for water and sanitation	December 10, 2007

4.6 SOIL STANDARDS

New sanitary rules introduced in Kazakhstan based on the long-term scientific studies - SanPiN 2.1.7.1287-03. Sanitary and Epidemiological Requirements for Quality of Soil and Subsoil establishes requirements on 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.

Main terms regarding chemical soil pollution are determined in the GOST 27593-88 «Soils.Terms.Definitions». The basic regulatory document for control of the soil pollution 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 RK No.99 dated 30.01.2004 and Order of the Ministry for Environmental Protection of the RK No.21II dated 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.

These standards are common to all types of land use. But there are some procedures for assessing soil contamination for residential and agricultural land. Determination of the maximum allowable concentrations of chemicals in the soil is based on 4 main principles of assessment.

4.7 NOISE STANDARDS

The level of the road traffic noise is determined according to the regulations of the CSaR (construction standards and rules) 11-12-77 “Noise Protection”. The limit of noise generated by the motor vehicles in the distance of two meters from the buildings in compliance with the CSaR 11-12-77 makes 70 dB.

The maximum allowable noise level in areas neighbouring the residential houses, rest areas of the micro-districts and residential groupings, schools, play grounds is assumed as follows:

- for noise made by the motor vehicles - 10 dB
- for residential construction works - 5 dB
- for daylight time from 7 hour till 23 hour - 10 dB

4.8 Health and safety during construction and operation

During the works it is necessary to meet the requirements of CSaR 3.06.04-91 “Construction Safety”. Also there are other regulations such as 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», that should be followed strictly. During road construction works it is necessary to use the «Safety Instructions» for each construction equipment.

The personal protective equipment shall comply with the applicable GOST (special aprons 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 should be kept in safe, clean and good sanitary conditions. 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). In this regard the Contractor shall be guided by the CSaR №3.01.016.97

In addition, the World Bank Group Environmental Health and Safety Guidelines will be used as a reference for health and safety during construction and operation throughout the whole project. In case, there is a conflict between the national legislation and the World Bank Guidelines the more stringent standard shall be implemented.

In addition, it is necessary to carry out regular 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 necessary 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 shall be kept in the separate containers, which will be provided in the construction sites and field camps. The drinking water should be located at the distance of maximum 75 m from the working area. Permission for water use should be obtained from the sanitary bodies and disease control authorities and comply with the requirements of the CSaR of RK No. 3.05.017.97.

It is allowed to perform works during the hours of darkness ensuring that artificial lighting is 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 should be equipped with the independent (built-in) lighting of the working elements and control arrangements.

Fuel and chemicals should be handled according to HSE requirements. Specifically, it should be stored in the special place with the mandatory barbed wire fence. The storage area shall not be located near the water source. The filling and unloading of materials shall be strictly controlled and performed in accordance with the established procedure. To prevent any spill all valves and plugs shall be properly sealed and be protected against the undesirable interference, and be turned off and opened easily when used. The inner surface of the tanks should be clean. Measures shall be taken on preventing impact of moisture and water.

4.9 ARCHAEOLOGICAL AND CULTURAL HERITAGE

Historical and cultural resources include monuments, constructions, art works, sites of outstanding historical value, aesthetic, scientifically ethnological and/or anthropological points of view, including cemeteries and burials. The given responsibility for preservation, maintenance and an assessment of historical and cultural monuments in Kazakhstan is assigned to regional Departments for culture and art of the Ministry of Culture and Sport.

One of the questions, considered at road construction is preservation of historical and cultural monuments, to which certain constructions, memorable places and other objects belongs, connected with historical events of people life. The works of material and spiritual creativity, presenting historical, scientific, art value (ancient constructions, burials, archaeological objects).

The main legislative documents on cultural heritage are the followings:

- The Law of the Republic of Kazakhstan "About Culture", dated 15.12.2006 No.207-III
- The Law of the Republic of Kazakhstan "On Protection and Use of the Historical Cultural Heritage", dated 2.07.1992 No.1488-XII
- The Land Code of the RK, dated 20.06.2003 No.442-II

For the purpose of recording and protection 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 region (city of republican status, capital), districts (centres of regions).

According to Art. 127 of the Land code of the Republic of Kazakhstan dated June 20, 2003 No.442-II construction works without carrying out of archaeological examination are connected with risks for the project.

According to Art.39 of the Law of the Republic of Kazakhstan "About protection and use of objects of historical and cultural heritage". That is, after full archaeological studying of the monuments, located in a zone of road construction and their removal from the State account:

- The survey on identification of objects of historical and cultural heritage have to be carried out prior to land acquisition..
- In case of detection of the objects having historical, scientific, art and other value, private and juridical persons are obliged to suspend further works conducting and to report about it to authorized body.
- Work conducting, which can create threat to existence of objects of historical and cultural heritage is forbidden.

Any works, which can expose to danger the existing monuments, are forbidden. The enterprises, organizations, institutes, public associations and citizens in case of identification of archaeological or other sites of historical, scientific and cultural value, are obliged to inform authorized bodies on preservation and use of historical and cultural heritage, and to stop the current works.

4.10 COMPARISON OF KAZAKHSTAN ENVIRONMENTAL LAWS AND WORLD BANK POLICY

An evaluation of the national environmental protection legislation and WB procedures and its meaning for the Project is presented in this section. Environmental legislation of Kazakhstan has been developed to provide control for developments and control for adverse impacts on the environment and human health. The submission of EIA reports for Ecological Expertise does not accord with best international practice, which includes a significant component of continuing evaluation in an iterative process. The EIA reports preparation in Kazakhstan focuses more on the calculation of emissions, for which charges are levied and is weak on relevant analysis of avoiding or mitigating impacts. Data collection for report not always connected with EIA purpose itself and with the project frame.

Public hearings are often not visited by general public in Kazakhstan, and it happens, that it is limited by participation by representatives of local bodies. On June 5-6 and on June 17-18, 2015 public hearings concerning this project with participation of representatives of the Employer of OAB "Kazavtozhol" NC JSC, designers, PMC environmental specialist, heads of local executive bodies and representatives of country farms, and also locals were carried out.

Comprehensively discussed this situation with representatives of the local authorities, it was decided to re-call a public hearings in the settlements along the road. The next hearings on the EIA decision will be held in 30 days after the publication of the EIA draft. Changes made as a result of these public hearings will be included in the final version of the EIA.

Routine procedures in Kazakhstan are not always adapted for monitoring during the project construction. For example, the Regional Department of Ecology should apply to the prosecutor's office to conduct an audit, and can do this only once a year, with the notification of the organization for 2 weeks prior to the audit. The content of environmental protection plans includes only the description of the overall mitigation and monitoring of impacts, without information on the place and the responsible people, focusing on references to regulations and standards, and of little use for contractors.

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

In general, there are several governmental and public organizations involved in environmental protection. These include the Ministry of Agriculture, Ministry of Energy and Mineral Resources. There are special institutions in Kazakhstan such as the State Environment Expertise and several survey centres.

Table 4.10 shows a comparison of the legislation

Table 4.10. Comparison of Kazakhstan's EIA and Environmental legislation with World Bank's Standards

EIA stage	Kazakhstan	WB
Reference	Ecological Code of RK 2007 Ministry of Environmental Protection Order 204-c, dated 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 3 rd 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 4 th and 5 th level severity, respectively and as such generally do not require an assessment.	Projects are categorized according to the most sensitive component, e.g. if 6 of 7 components are not sensitive and one is sensitive the entire project becomes a Category A or B.
	The planning and conduct of an assessment is the duty of the proponent, in this case Automobile	Usually EIA are required to be prepared by the country, and donors will request this. Often the

EIA stage	Kazakhstan	WB
	road committee of 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.	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 for Committee for Roads in Astana in accordance with World Bank politician.
Document Preparation		When the donor funds are used to prepare IEEs, SiEA and EIA <u>on behalf of the country</u> , 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 MEP in Astana, Category 2 and 3 by the Oblast or Regional Environment Department, and 4 at the region 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 far from 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-alone g section or set of Tables.
Public hearings	Kazakhstan has a procedure of public hearings conducting, but it	Public hearings is a requirement for WB. The World Bank has a

EIA stage	Kazakhstan	WB
	rarely involves state sector and common citizens.	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 interim 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 announced and for full EIAs advance notices of consultations and contact details must be published in the media for several weeks in advance of the hearings.
Classification	Projects are classified by the 5 danger levels of danger 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 little 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 project that requires a full EIA.	There is a classification of activities according to risk level from I (high) to V (low) in Kazakhstan. Depending on the risk level Environmental Category from 1 to 4 is assigned. Sanitary-Epidemiological Regulations specify Environmental Category through lists of activities by sector (e.g. chemical industry, metallurgy, agriculture, etc.) and by risk category (i.e. I - V). Environmental Category 1 covers activities of the I and II risk levels. This “dual” classification does not specify size of the facility or scope of production. The main purpose of Sanitary Rules is to establish sanitary-protection zone (SPZ), which for Category 1 facilities is not less than 1000 m for risk category I and not less than 500 m for risk category II.
Document Form	Nothing specified other than a ‘minor environmental statement’	No specific documentation required
Consultation & Information Disclosure Timing	No requirements	Not required
		EIA and EMP are published prior to project approval on local level in information bulletin of the World Bank. In EASI the alternative analysis is not required.

EIA stage	Kazakhstan	WB
Document Form	All EIA documents is several report	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	Public hearings are not conducted	At least once during EIA/EASI preparation
Disclosure	Not 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 includes environmental and social assessments. 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 several document with prescribed format and the level of detail.	Several document with prescribed format and minimum level of detail
Summary Documentation	Each of 5 assessment stages has several documents; and each has a “Conclusions” section, which acts	An executive summary is prepared and is attached to the EIA but often used separately. An executive

EIA stage	Kazakhstan	WB
	as a summary.	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 published by the MOEP Order №135, 7th May 2007.	Minimum 2 are mandatory, with timing specified. Once with the TOR for the EIA, once to present the interim EIA. For the disclosure of the interim/ draft EIA, Category A projects must be allowed a 120-day period for stakeholder evaluation and comments between disclosure of interim /draft EIA/EMP and project appraisal. The 120 day rule will commence once this document has been completed in accordance with World Bank's requirements.
Disclosure	Submission of a full environmental assessment to the local /oblast-level environmental authority and its review by the central government takes 60 days. During the first 30 days there is a theoretically a time for the public to comment. But since there is no real announcement this does not happen. Further, there is a 'public debate/hearings are held as part of the final EIA approval. There is no other disclosure. 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 its submission the next round of public hearings will take place.	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 appraisal. Loan processing cannot proceed during this period. This document will be disclosed at WB website and CR website once agreed by the WB as suitable for public disclosure.
Land Acquisition and Resettlement Review	Not accept process of review of land acquisition and resettlement.	World Bank requested a review of resettlement, land acquisition and compensation payment to ensure all activities will be undertaken in all the 14 sections in accordance with World Bank Guidelines OP 4.12. A Resettlement Policy Framework (RPF)) was undertaken by the KazdorNII on behalf of CR. This will be finalized upon completion of the detailed design.
Rule of the most sensitive component	Rules of "the most sensitive component" are not revealed. Sensitivity of the project is measured by Sanitary and epidemiologic classes of danger. There are four categories and in	Projects are given categories on the basis of the most sensitive component, for example, if 6 or 7 components aren't sensitive and one is, all project falls under the category A or B.

EIA stage	Kazakhstan	WB
	everyone, one or more levels of danger, the project of category 1 has two levels of danger, for both is necessary full of EIA. The project of category 2 corresponds to the 3rd level of danger and the smaller assessment is conducted, though it is called - Environmental Impact Assessment. Projects 3 and 4 of category correspond to 4 and 5 levels of danger, and thus, don't need an assessment.	

4.11 Conclusions and Recommendations from difference analysis

The following conclusions and recommendations address those issues where divergence of standards and subsequent practice between Kazakhstan and the World Bank may lead to shortages in compliance with these standards throughout the project, because local practice may be rigid and well established, and incorporating new elements or changing of existing procedures may require extra efforts during project supervision:

Conclusions:

- a) In case the World Bank requirements and Kazakhstan national laws/standards differ, the more stringent requirements will prevail. This includes application of the World Bank Group Environmental Health and Safety Guidelines (EHSGs) for noise, air quality and other parameters as referred to in OP 4.01.
- b) Kazakhstan has not yet put into practice an iterative (active, permanent) 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 Kazakhstan 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 re-approval of the 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 Employer for approval and construction. Such design changes are likely to mainly concern the number and location of cattle passes and overpasses for animals, farm equipment and pass ways for wildlife.
- c) In order to prevent negative impacts on the environment, efforts to build capacity and control during the project implementation will be required along with the conduct of practical trainings for contractors, supervision engineers and environmental protection agencies (including forestry, water resources households, national parks, etc.) that are ready to be implemented.
- d) Site-specific ESMPs will be prepared and included in construction contracts.

Recommendations:

- a) The competences and powers of Kazakh environmental authorities regarding site inspections are very limited, with visits legally limited in numbers and having to be announced several weeks in advance to the project owner. Though 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 is recommended to entrust a project management consultant (PMC) with enforcing mandate that together with the authorities would be implementing best practice in countries. Simultaneously, environmental authorities must be aware of all project activities and invite them to a program of training and potential raising.

5. ENVIRONMENTAL AND SOCIAL BASELINE DATA

5.1 GENERAL DESCRIPTION

"Uzynagash-Otar" road section of km 56h-162 is the road that connects Kazakhstan and the republics of Kyrgyzstan, Uzbekistan and Tajikistan. The designed section of road of km 56-143 and road structures is located in Almaty oblast in the territory of Zhambyl District. The site of km 143-162 is located in Zhambyl oblast in the territory Kordai District.

The section (63-162 km) begins in 47 km to the north-west from Almaty centre (kilometrage from "Almaty-Bishkek" road). Starting from Uzynagash village the road steadily goes in east and north-east direction, approximately 2-5 km to the north and in parallel to the existing main road, A351 ("Kuldzhin Tract"). The road crosses approximately 3 seasonal rivers (km 74,58; km 76,2; km 115,75), which dry in summer, but can bear a significant quantity of water and deposits in the spring. On km 80 Zhirenaigyr river and km 96 Targap river, these rivers are constant waterways, though with big fluctuations in water expenses. The existing bridges will be reconstructed and the new bridge is built for additional two strips.

Uzynagash-Otar is a part of "Western Europe-Western China" International Transit Corridor, and it is the main source of traffic intensity increase annually. The territory of the road alignment and road structures differs in natural conditions and different types of forms of the relief.

In the south, the mountain ranges of Trans-Ili, Kungey and Tereskey Alatau are stretched. These mountains belong to the peripheral part of the mountain ranges of Central Asia.

In Almaty and Zhambyl oblasts, where the road passes, the terrain is represented by foothill steeply sloping plain of Trans-Ili Alatau that is undulating to the north.

A characteristic feature of the relief of Trans-Ili Alatau is a wide strip of foothills, stretched along the northern slope. Foothill stage is morphologically clearly expressed throughout the range.

Absolute elevations are ranging from 720m to 890m.

The slope of the terrain defines a well-formed sub-meridian hydrographic network from the south to the north. The main watercourses are Karasu, Kurozek, Samsy, Zhyrenaygyr, Targap rivers. These are the rivers with a constant flow. They originate high in the mountains, have a mixed nourishment and two peaks of high waters: during the spring snowmelt and during the intensive melting of glaciers in summer. Short climbs of water are also resulted by heavy rains in the mountains and foothills.

In general the site will be constructed along the existing A2 route.



Figure 5.1. - Planimetric map of Almaty oblast

The total area of Almaty oblast is 428,0 thousand sq.km. The administrative centre of oblast is located in Taldykorgan t. There are 16 rural areas, 10 small cities, 15 settlements, 759 villages (auls) in oblast. Population of area made 1 631,4 thousand people (without Almaty).

Total length of this site on the project makes 80 km (Fig. 5.1).

Zhambyl district – Extent on the project is 80 km. The total area of Zhambyl oblast is 144,264 thousand sq.km. The administrative centre of oblast is located in Taraz. There are 10 rural areas, 3 small cities, 7 settlements, 14 villages (auls). Population of area made 1 070, 239 thousand people.

Kordai district – Extent on the project is 16 km.

There is no data on social objects as for today.

5.2 Climate

Climatic characteristics of the main settlements along the designed road are presented in Table 4.1. basic climatic factors are as follows:

1. Sharply continental climate. In the coldest winter months (January) -8°C , -11°C . In the warmest summer months of $+40^{\circ}\text{C}$;
2. Rainfall varies from 150 mm to 400 mm a year. The greatest number of rainfall in the spring and the smallest in the summer;
3. Snow is in November and snow cover lies 80-100 days, 21-38 cm thick;
- 4) Snow cover protects the soil from deeply frost penetration.

- 5) Winds usually from the north-east and the north-west;
- 6) Sandy storm can cause an erosion of soils in the summer.

The main climatic characteristics of the passing region of the projected road section according to the closest meteorological stations of "Almaty" are presented in table 5.2

Table 5.2 – Main climatic indices of «Almaty» MS

No.	Climatic indices	Almaty
1	2	3
1	Average annual temperature °C	+8,9
2	Average temperature of the coldest month (January) °C	- 6,5
3	Average temperature of the warmest month (July) °C	+ 20,7
4	Absolute minimum temperature °C	- 38,0
5	Absolute maximum temperature °C	+ 42,0
6	Average precipitation level, mm, including winter period	491
7	Thickness of snow cover with 5% exceedance probability	50
8	Number of days in a year: ice-slick hail snowstorm wind>15m/sec	12 7 5 21
9	Typical period of air temperature More than 0°C begin end duration	13/03 11/11 242
	More than 5°C begin end duration	27/03 25/10 211
	More than 10°C begin end duration	13/04 9/10 178
10	Average annual wind speed m/sec	1,7

5.3 LAND FORMS AND LANDSCAPE

Most of "Uzynagash - Otar" road alignment is located within the foothills of the Trans-Ili Alatau, Korday Mountains, that differ in heterogeneity of soil conditions (climate, vegetation, topography and others). When changing climate, hydrological conditions, geology, vegetation and other factors, a change in the leading factors of soil formation for the soil surface occurs. As a result, there are two clearly expressed soil-climatic zones in the territory of the oblast: light brown and gray desert soil. Light brown soils are found on the steeply sloping plains of the blurred foothills. Light brown soils are all calcareous. These soils have the fully developed profile, and mostly are used in agriculture. The humus content varies from 2 to 2.7%. The humus horizon is 25-30 cm. These soils contain a considerable amount of total nitrogen. Soil absorbing complex of these soils is saturated

with calcium. The amount of the absorbed sodium is insignificant. These soils are not saline.

In addition, light brown eroded soils are found within Zhambyl District on the dissected steeply sloping foothill plains. These soils have a shorter humus horizon, and they are less fertile.

Soil-forming rocks in this part are loess and loess-like loam.

At lower altitudes, light-brown soils give way to ordinary gray soils, which differ little from the first. These soils form a second subzone of desert-steppe zone. The band of spread for ordinary gray soils is confined to the middle and the bottom parts of the sloping piedmont plain, characterized by steeply sloping hilly terrain and relatively smooth surface. This soil has fully developed profile with a relatively low content of carbonates. The amount of humus ranges from 1.5% to 2.0%; there is a small capacity humus horizon 24-25 cm. The texture of ordinary gray soils is referred to medium loams.

The big influence on soil of the area where the road passes has been shown by anthropogenic factor. The soils are largely cultivated in connection with long-term use in irrigated agriculture. These soils occur in the 1st saz band. Groundwater occurrence is shallow.

The geological structure at the construction sites is dominated by loess loams, sandy loams, sometimes with streaks of sand, gravel, silty clays, which are characterized by high pulverescent nature (50%) and the presence of subsidence properties. There are the first type ground subsidence conditions. Soils are non-saline.

According to studies in soils, the following geotechnical elements have been identified:

- top soil,
- bulk soil layer, dissected layer capacity of 0.3 m,
- semi-hard loam, dissected layer capacity to 15,0m,
- stiff loam, dissected layers and sub-layers capacity of 0.3 m,
- high-plastic loam, dissected layer capacity of 0,0 ÷ 9.0 m,
- very soft loam, dissected layer capacity of 0,0 ÷ 3,4m,
- pebble layer, dissected layer capacity of 2.3 m.

Geographically, the site of the designed road is related to the Ili province, the corresponding extensive mountain hollow, which extends latitudinally between Jungar Alatau in the north and Ketmen and Ile Alatau mountains ranges in the south. Around the middle of this depression, there is a sharp narrowing extending almost to Ili river, hills of Katu and Kalkan on the right bank, and Boguty mountains on the left bank.

Local morphological conditions of Ili Valley in place of its narrowing define specific conditions for the waterways runoff formation of northern exposure. The mountains here are the best mountain rise on the way of moist air masses of the westerly direction; therefore, they are mostly provided with moist.

Along the foothills of mountains bordering it to the north and south, Ili basin is contoured with technological faults that define its high seismicity. The project area is classified as 9 out of 12 within the Mercalli intensity scale, "Destructive" zone of seismicity. The depression is a thick layer of red sandstone, sandy clays and sands, where variegated clays and sands lie replaced by the gravel and conglomerates in some places.

Sandy alluvial pumps in the riverbed band of the depression are deflated by wind and turned into barchan and hilly aeolian sands, especially in the eastern part of the road.

5.4 SOCIAL AND ECONOMIC CHARACTERISTICS

"Uzynagash-Otar" road, km 56-162, is a part of the road linking the southern capital of Kazakhstan, Almaty, with the Republic of Kyrgyzstan, Uzbekistan and Tajikistan. There are 148,110 people who live in Zhambyl District of Almaty oblast, including 73,578 men and 74,832 women, including 38,022 people in Uzynagash village that is made up by 18,904 men and 19,118 women.

In the road alignment, there are Targap and Samsy settlements located.

5.4.1 Population and Demographics

The population of Almaty oblast, as for 01.06.2015, is 1 642 334 people. Most of the population lives in cities and suburbs. Recently, there was a decrease in employment of the population in industry and agriculture, but similar figure was significantly increased in trade and service sectors.

Targap (1 299 ppl) and Samsy (1 500 ppl) settlements are located in the road alignment area.

Since 2009, the population in the settlements has increased by 12 and 19%, respectively.

From 2002 to 2005, "Almaty - Bishkek" road was reconstructed, in connection with which the volume of cargo transportation increased and livelihood of the population improved.

Uzynagash is a village in Zhambyl District of Almaty Oblast of Kazakhstan, the administrative center of Zhambyl District. The administrative center of Uzynagash Rural District.

In 1999, the village population was 23 887 people (11 579 men and 12 308 women). According to the 2009 census, the village population was 30 589 people (14 952 men and 15 637 women).

Uzynagash is located 43 km from Almaty.

Zhambyl District is an administrative unit in the south-west of Almaty Oblast of Kazakhstan. Administrative center is Uzynagash Village.

Ethnic composition (as of January 1, 2010) in Zhambyl District

- Kazakhs - 100 964 people (80.06%)

- Russian - 12 887 people (10.22%)
- Uighurs - 3759 people (2.98%)
- Turks - 2225 people (1.76%)
- Azerbaijanis - 1333 people (1.06%)
- Germans - 882 people (0.70%)
- Tatars - 807 people (0.64%)
- Kurds - 484 people (0.38%)
- Ukrainians - 421 people (0.33%)
- Uzbeks - 380 people (0.33%)
- Kyrgyzstan - 336 people (0.27%)
- Chechens - 290 people (0.23%)
- Koreans - 163 people (0.13%)
- Other - 1177 people (0.93%)
- Total - 126 108 persons (100.00%)

During 2014, the birth rate increased by 0.3%. Index of total mortality decreased by 0.6. The natural population growth rate is 24.6%.

Otar is a village of Korday District of Zhambyl Oblast of Kazakhstan. Administrative center of Otar Rural District. Located 69 km to the north-east from the district center, Korday Village.

In 1999 population of the village was 4 355 people (2 156 men and 2199 women). According to the census of 2009, there were 4 540 people living in the village (2 239 men and 2 301 women).

Korday District is the most eastern district in Zhambyl Oblast of Kazakhstan. Located in Shu Valley, on the northern bank of Shu River. District center is Korday Village.

According to the regional statistical office, the population of the district as of September 1, 2011 was 128 157 people.

More than 30 nationalities live in the area, including 70.4 thousand Kazakhs (or 55.0% of the total population), 36.8 thousand Dungans (28.7%), 14.3 thousand Russians (11.2%), all the rest - 5.1%.

5.4.2 Industry and Economy of Zhambyl District

In January-December 2014, goods amounting to 11 billion 465 million tenge were produced, the physical volume index was 101.7%.

During the reporting period, two new industrial facilities “Caspian Contractors Trust” LLP in Ulken Village, “Texan Invest Kazakhstan” in Kasymbek Village, in the amount of 625.0 mln. tenge have been launched, and additional 136 jobs have been created.

In 2014, 8 enterprises and organizations of oblast implemented the international standards of quality management system, ISO series, including 4 industrial ones: “Zhartas” LLP, “Almaty Kandy” LLP, “Company Zhenis-2006” LLP, “Zhol” LLP)

During 2014, the volume of investments in fixed assets was 36 318 million tenge, the physical volume index of 107.4%. The bulk of investments in the amount of 27 392.7 million tenge, or 75.4%, were used extra-budgetary funds (own funds of enterprises, organizations and individuals – 6 438 100 000 tenge borrowed funds). Volume of budget investments amounted to 8 925.0 mln tenge or 24.6%. In the sectoral structure, investment in transport and warehousing is of the highest priority constituting 56.7%, industry - 17.7%, electricity, gas, steam air conditioning supply - 14, 2%, real estate transactions - 11.2%.

Within the framework of the State program for accelerated industrial-innovative development in the Industrialization Map in Zhambyl District, “Almaty Poultry Sunkar” LLP project has been launched for the production of the commodities in the amount of 877 million tenge with the creation of 41 jobs. During the 2nd quarter of 2013, 2 stores have been commissioned.

In 2010-2012, 2 facilities in the amount of 2 437 900 000 tenge have been commissioned and 60 jobs have been created: “Company Zhenis-2006” LLP, a fish processing plant, and “Tascom –KZ” LLP, a plant for the processing of natural stone.

In agriculture, goods worth 24 435.6 million tenge have been produced in 2014, the physical volume index was 100.9% compared to the corresponding 2013 indicators.

The number of all types of livestock has been increased. The number of cattle amounted to 97.1 thousand head (115.3% compared to the corresponding period in 2013), sheep and goats -485,4 thousand head (111.0%), pigs - 456 head (24.8%), horses - 25,1 thousand head (101.2%) and poultry - 306.7 thousand head (103.6%).

Total road length covered by all types of repair in 2014 in the district: 168.1 km of (71.8%) compared with 2013. There were 278.2 mln tenge allocated for the medium repair of transport infrastructure for 6.8 km of road, the current repair involved 20 000 kilometers with 76.1 million tenge allocated.

There are only 98 educational organizations, including 62 educational institutions, 29 pre-school organizations, 2 extracurricular organizations, 2 educational and industrial complexes, 1 vocational and technical college, 1 medical college.

In total, funding for education from the state budget involved 5.5 billion tenge allocated (50.5% of the budget).

In 2015, it is planned to open private kindergartens in Uzynagash, Kargaly, Mynbayev, Kaynazarov villages under the state program.

The district has 64 healthcare facilities, including 62 public and 2 private ones. There are 331 doctors and 593 medical nurses working in the district healthcare facilities. Healthcare budget in 2014 amounts to 1 733.3 thousand tenge.

5.4.3 Industry and Economy of Korday District

The area has the best known in Kazakhstan Korday field of red granite. There are no analogues of natural granite in the world. Fine-grained stone structure gives it the valuable qualities. It is available to any type of processing and polishing.

In March 2011, memorandum was signed between akimat of Zhambyl Oblast, “KEGOC” JSC, “ZhES” LLP and the investor, “Central Asia Green Power”, on cooperation in the development of renewable energy sources, in Taraz. The first phase with a capacity of 4 MW was launched on Korday pass in 2013. In 2014, with the launch of 9 “Vista International” wind turbines, Korday WPP increased its capacity up to 9 MW per year. Korday wind farm will allow reducing the purchase of electricity in Kyrgyzstan.

Not far from the highway of Western Europe - Western China, crossing Korday Pass, Kokadyr gold mine and "Central Asia Gold Corp" LLP plant for mining and processing of gold ore are located. Production started in 2014. The average gold grade of the deposit is 1.5 grams per tonne. Production capacity is processing up to one million tonnes of ore to extract tons of gold per year.

5.4.4 Agriculture

Construction of the road will enhance agricultural development as the local people will be encouraged to produce more because of the opportunity to have easy access to markets;

5.4.5 Livelihood and Poverty

The eastern part of the road is one of the more industrialized project areas, relatively well served by transport and other infrastructure, benefited from the industrial development, advances in agriculture production and medical care, education etc.

The rehabilitation and widening of the project road is expected to create employment opportunities and jobs for the local communities. The youth and women residing in the project area will benefit from the employment opportunities created due to the construction of the road.

The project construction is estimated to take about 3 years, hence significant benefit is expected from employment opportunities during this period. After the completion of construction, road will be handed over to the Road Maintenance Authority (KazAvtoZhol), who will engage contractors and the Contractor will engage local labor for routine maintenance activities, many of which are labor-intensive tasks that create local employment. Compared with a conventional road, additional employment opportunities will be created during and upon completion of the road. Proposed enhancement measures include: The contractor should employ work force mainly from the locality where the construction work is undergoing especially in positions that may not require special skill; In the process of employment, the contractor should give priority or

preference to women especially in less risky jobs, and provide training for women in different skills as this contributes to the ongoing effort towards poverty reduction mainly at local level.

There could be income opportunities to be created to residents in the project area during construction works. Businesses such as shops, catering services (or small bars and restaurants) located along the project road and near the construction camps could earn additional income due to the presence of large number of construction workers. The opportunity for generation of income may continue during the project operation phase as long as availability & provision of other services like water supply, electricity etc. prevails along the new route. The existing services & infrastructure may be improved along the link roads contributing to improvement of local economy.

The Project will not result in physical displacement of any community or household in general. No person will lose employment or livelihood from the project. Rather there will be job opportunities for the youth, local food service providers and food vendors. Roads to be rehabilitated have been demarcated already and are free from any structures / buildings and land plots used for agriculture needs. No negative impacts on vulnerable groups in the society (such as the elderly, disabled, women, children and minority groups) will occur as a result of the roads civil works. The Project has no inherent negative impact or bias towards any vulnerable group.

5.5 NATURAL AND CULTURAL RESOURCES

The characteristic peculiarity of the oblast's climate is considerable dryness and sharp sentimentality. Flora and fauna of natural resources is vast and varied. The vegetative world of the oblast numbers more than 3 thousand species. The total area of hunting grounds is 13.9 thousand hectares; over 40 species of animals live in this area. The fish industry fund occupying the area of 27.8 hectares includes 81 water reservoirs, 59 of which are fit for fish industry activities. Large-scale storage ponds include Tatsokelskoye Reservoir and Ters-Aschibulakskoye Reservoir. The predominate food fish are carp, sazan, zander, bream, vobla and others. Three game reserves function in the territory of the oblast: "Urochishche "Berkara" State Natural Game Reserve (complex) with a total area of 17.5 thousand hectares, where it is possible to face more than 50 species of the most valuable woody-shrubby and herbaceous plants recorded in the Red Book, and animals such as argali, the Indian porcupine, paradise flycatcher, "Urochishche "Karakunuz" State Natural Game Reserve (botanic) with a total area of 3.07 thousand hectares located in western spurs of Zailiyskiy Alatau. Fruit plantations of apple-tress, cherry-trees, cherry-plums, grapes are changed with districts of maple forest, locust, mulberry-tree, walnut; Andasayskiy State Natural Game Reserve (zoological) with a total area of 1 000 thousand hectares located on the right bank of the Shu River to the West of Moiynkum Village. Feather-grass, fescue, saxaul the black, and thickets of bushy willows prevail in the herbage.

The animal world is presented by argalis, koulans, roes, goitered gazelles, hogs, hares, pheasants, partridges. The Oblast is focused on industrial-agrarian production: 23.8 % of the gross production is for industry, 20.2% - for agriculture, 16.6% - for transport and communications, 6.5% - for building, 9.2% - for trade, 23.7 % - for other fields. The agrarian sector prevails in 7 village centers; industry is more developed in the rest three

regions due to the presence of large mining-ore complexes. The considerable contribution to the development of industry is made by enterprises of the oblast center, the city of Taraz. Zhambyl Oblast is a unique base of phosphorite and fluor-spar raw materials. There are 71.9 % of balance stores of the Republic's phosphorites in its territory, 68% of fluor-spar, 8.8 % of gold, 3% of copper, 0.7% of uranium. The oblast is rich with non-ferrous metals, barite, facing, board and technical stones, building materials. Several fields of natural gas have been discovered in the bounds of Shu-Sarysuyskaya Cavity. From the beginning of working-out of Amangeldinskoye Gas Field, 18 wells have been drilled with the daily supply of the blue fuel of up to 820 thousand cubic meters. Construction of the mini-factory for gas condensate processing is soon to be finished.

On the basis of applicable laws of RK archaeological researches along road section, located on Almaty and Zhambyl oblasts were conducted. Archaeological researches have been conducted by the qualified Archaeological company. Expertize has been carried out according to a method of carrying out of archaeological examinations by preliminary work with archival and bibliographic data, the analysis of pictures from space. During examination conducting all objects of historical and cultural value (Further in the text "Monuments") were fixed within an examination zone (200 m to the right and 200 m to the left from Road Highway axis).

As a result of research the objects of PCR were not found along road site in Zhambyl oblast. 28 objects of PCR were found on road site in Almaty oblast. The detailed archaeological report is submitted in the Appendix 2 of this report.

5.6 SOILS

The territory of Almaty region differs in non-uniformity of conditions of soil formation. In case of change of climatic, hydrological conditions, a geological structure, vegetation and other factors, there is a change of the leading factors of soil formation.

On natural agriculturally division into districts of land fund of the Republic of Kazakhstan the object is located in a semidesertic and desert zone. 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-delluvial 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 at earth works performing) GOST 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 following 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%.

Group 2 (unsuitable) – Soils unsuitable for topsoil removal

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.

5.7 HYDROLOGICAL CHARACTERISTICS

Surface waters

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, Lepsi, Issyk, Shelek, Charyn, Horgos, Zhirenaigyr, Targap, Samsy etc.

All major rivers originate in the high mountains, where conceal snow, glaciers and there is a year-round rain, but despite it the small-sized rivers dry up during the droughty period. During the period from March to June there can be short-time floods when the expenditure of the rivers and an amount of precipitation is much higher. Level of precipitates in a zone of the Section 1 is varied within 400-300 mm a year.

Underground waters

Designers carried out hydrological and geological researches along the project road with drilling of slits through each 500 m on plains and with more frequent drilling on changes of a landscape.

The characteristic of underground waters is shown in fig. 5.7-1



Figure 5.7-1 – Hydrological map of project territory

Flows of the underground waters, coming to cavity, begin the formation on hillsides and on the way to cavity center. Under the terms of an underground sink there are 4 hydrological regions: hillside, foothill step, foothill loop and foothill alluvial-proluvial plain. On the water horizons, on the hillsides converted to a cavity, the flow of underground waters is created in rocky crack breeds with the most intensive water exchange in a zone of aeration and on tectonic breaks. Owing to strongly partitioned relief the part of a flow falls out within a hillside, and the part goes to a cavity in the underground ways. In a quantitative sense the first component, for low-mountainous areas is on average equal 6,5 l/sec. with km². The second part of a flow going to a cavity in the underground ways according to Institute of hydrogeology, is estimated in 1,7 l/sec.km² and makes 7% of total quantity of an atmospheric precipitation.

Vibration amplitudes of levels of underground waters make to 1,0-20,0 m, however the general depth within the designed road makes 5 m. On the irrigated lands the level of underground waters is at a depth up to 10 m. Pressure underground waters usually at a depth of 20-25 m. Chemical properties are varies. Light-salted and salty waters, with the salt from 1,5 to 5,0 g/l are dominated. The excessive mineralization occurs under stagnant conditions and the sand-salt soils.

Use of data of an operational hydrometry of the pilot balance studies of Almaty hydrogeological station allowed to define a ratio of the volumes of water, arriving from different sources. Filtrational waters from river beds (50-60%) participate in a supply of underground waters of alluvial cones and an irrigational intereconomic network (10-16%), an underground sink from a massif (8-14%), an infiltration of an atmospheric precipitation (9%), filtering of irrigation waters (9%) and water condensation – 2%.

The module of the general underground sink of a foothill loop is estimated at 27,2 l/sec. with km².

A proluvial-alluvial plain occupies the bottom of the valley. The deposits, forming the plain, are represented by sands, gravels, sandy loam and loam inter bedded 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.

Water-bearing horizon

Water-bearing horizon 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 / 1, the remaining area is dominated by sodium sulfate saline water (1.4-2.8 g/1).

Water-bearing horizon is of sandy-clay quaternary deposits 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 Hi 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 /1, 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.

5.8 FLORA AND FAUNA

Flora and Fauna: methodology of study of a biodiversity along the road

During preparation of the ESIA, the information on biodiversity, landscapes, and other environmental parameters available from surveys reports and Internet was analyzed. Also, field visits by environmental specialists of the design institute visited project area. Public hearings organized in 2015 contributed to understanding of environmental issues, including aspects related to flora and fauna.

Flora and fauna

The project area was under the influence of human economic activity for a long time. No rare or endangered species were found. The region is characterized by the abundance of domestic animals, well adapted for life and reproduction, stress-tolerant species. Most of the territory of the alignment is represented by arable land planted with grain crops (soybeans, corn, wheat), clover, less vegetable and melon crops and pasture and grassland. Selected for a long time not cultivated massifs are covered with thickets of weeds: thistle, wormwood, burdock, etc.

Vegetation of light-brown soils of fescue-wormwood and wormwood-ash with feather, ebeleka, bulbous bluegrass. As we move to the north, to the sub-zone of gray soils, vegetation changes gradually, the amount of cereals reduces.

The vegetation on sierozemic soils is provided generally by a wormwood to which are almost always added in a small amount leban, ebelik, it is often possible to meet also a feather grass. The considerable part in a vegetable cover is taken by ephemeral plants: meadow grass bulbous, fire, small-sized sedge meadow, poppies.

From shrubs brere, barberry, wild cherry, meadowsweet, decorative plantations of willow and elm can be found

Due to high level of urbanization, the road section is not rich in the diversity of species of fauna. There are no registered rare, endangered or vulnerable animal species or birds.

Works under the project will not have negative impact on rare or endangered species compared to the existing situation with human economic activity (intensive agriculture) in and around the project area.

Conclusion: There are no existing protected areas or natural habitats in the area of project influence. There is no permanent or seasonal migration of animals in this region. Engineering structures, such as bridges over the rivers, culverts, cattle passes and agricultural underpasses will serve as a potential route for accidental migration of random animals in the area of the alignment.

6. ENVIRONMENTAL IMPACT ASSESSMENT

6.1 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;
- pollution of environment by road-building machines and mechanisms, used on construction works;
- noise caused by machines and equipment and other various construction activities;
- pollution by dust and products of wear of road pavement and car tires at traffic, and also at transporting of road-building materials;
- contamination of food production activities in the production of road-building materials, the development of soil sub-grade arrangement and road pavement;
- possible pollution of soil, surface water sources, bordered to road of different types of flora;

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

- Air pollution and noise from all vehicles passing along the new route;

- contamination with dust and wear products pavement and car tire at vehicle traffic;
- pollution of roadside strip by production and household waste;
- pollution by surface drainage from carriageway;
- possible pollution of underground waters from drainage and other sources from pollutions;

Zones of influence

Territories for roads, suffering influence:

- Influencing area: more than 3000 meters, which may be the effect of the road (eg, noise, dust, air pollution);
- Protection zone: the territory that borders with the right of way has a quite significant impact. In some cases, the impact can be very significant; noise and air quality, drainage, soil pollution, etc.
- Reserve-technological lane: road is adjacent to the territory, which is needed for emergencies, has the potential future use for roadside service, excavation and embankment. Significant impact and environmental changes will occur during the construction period.

The approximate sizes of a zone of influence, protective strip and reserve and technological strip, are specified in Table 6.1

Table 6.1- The approximate sizes of a zone of influence, protective strip and reserve and technological strip.

Name of territories of influences	Distance from carriageway, m, for ecological class of road		
	I	II	III
Zone of Impact	3000/1500	2000/1000	600
Protection strip	250/150	150/90	60/30
Reserve-technological strip	30	12	-

6.2 AIR IMPACT ASSESSMENT

Construction and Operation Period

Planned economic activity on the construction and further exploitation of Uzynagash – Otar road section will be accompanied by emissions of air pollutants and then spread them in the surface layer of the atmosphere during operation of construction equipment (emissions from construction activities and from the engines and machinery) during the construction period, and emissions from the engines moving vehicles on the track during operation.

In table 6.2.1 there are lists of work, name and description of sources of allocation of emissions to the atmosphere during the construction and operation of the highway.

Table 6.2.1 - Characteristics of emission sources into atmosphere

Types of work	Name and characteristics of emission sources	Name of potential air emissions
1	2	3
Road Construction	Emission of soil dust and construction materials during the work of machines and mechanisms	Inorganic dust
	Emission of products of combustion in CE of machines and mechanisms	Nitrogen dioxide, soot, carbon monoxide, benz(a)pyrene, hydrocarbons
	Welding	Iron oxide, manganese and its compounds, hydrogen fluoride
	Paint works	White spirit, xylol
Operation of the road	Isolation of products of combustion in fuel engines of vehicles	Nitrogen dioxide, soot, sulfur dioxide, Carbon monoxide, hydrocarbons C12-C19, lead compounds

The road construction is associated with concrete plants and stone crushers, work of which leads to high dust content. During the concrete production, cement and organic dust, as well as silicon, are emitted into the atmosphere. These substances can cause harm to the human health and environment. Prevention of air pollution as a result of the concrete plant and stone crushers operation is under responsibility of owners of the plant and quarries and is not included in the EIA within the road construction project.

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 shall be done based on predictions in accordance with calculations. 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. As the calculated value the concentration of harmful substances contained in exhaust gases from the various types of cars in mixed-flow traffic is accepted. 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.

The assessment of level of impact of the enterprise on the air basin of intended for building territory is carried out on the basis of simulation of distribution of issues in the atmosphere, according to "A method of calculation of concentration in atmospheric air of the harmful substances containing in bursts of the enterprises. RND 211.2.01.01-97". In calculating the dispersal of emissions from vehicles and in determining the concentration of toxic substances at a distance of 20 meters from the road, the Gaussian model is used by distribution the pollutants in the atmosphere at low altitudes.

Calculations have been made for a single concentration (MPC) in accordance with SanPiN «Requirements for atmospheric air of populated areas» No.3076 dated 18.09.2004, No.841 dated 3.02.2004, approved by Ministry of Health of Republic of Kazakhstan.

Calculations have been performed and presented in Appendix 3.

Table 6.2-2 – Results of calculations of emission dispersal from vehicle.

Emission types	Concentration of pollution in atmosphere at distance of 20 m from edge of carriageway of the road, mg/m ³	Maximum permissible, maximum one-time concentration MPC m.p., mg/m ³	Average daily maximum permissible concentration of toxic components exhaust in the air of settlements, mg/m ³	Class of danger
1	2	3	3	4
Carbonoxide	0,056	5,0	3,0	4
Hydrocarbons	0,011	1,0	1,5	3
Nitrogenoxides	0,0056	0,085	0,04	2
Leadcompounds	0,000032	0,0010	0,0003	1

Conclusions on the construction and operation period:

Construction period: the results of calculations of air emissions in the construction and operation period were within the established limits. As the road passes through open land with only two sensitive areas, the harmful effects on health of the people will be minimal. The road passes close only to two sensitive zones: residential zones Samsy and Targap villages. Houses are located close to the existing road, the project offered bypass of these villages which will improve the route of the road, and also road safety.

Guardrails are stipulated on bypasses, also directing grid for cattle pass will be installed to exclude cattle access to the highway, which is observed at present. Social Monitoring is set forth in Section 8 of the Resettlement Policy Framework Document.

It is very important not to allow the organization of construction warehouses or construction sections near this zone.

Operating period: The results of calculations show, that size of transport influence on atmosphere air is not exceeded the maximum permissible concentration at a distance of 20 m from the nearest lane. The concentrations of toxic substances contained in the exhaust gas within the area adjacent to the road - a reserve-technological strip, it will be within the allowable during the period of maintenance, and will not have a negative impact on the environment and health of human.

6.3 Noise and Vibration Impact

Construction Period

The technological processes during the construction of roads are a source of intense noise, which can adversely affect human. The intensity of noise from road-building technique and mechanisms depends on the type of machinery and equipment, type of drive arrangement, work regime and the distance from construction work places to residential zone. Especially the noise is created at 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.

There are no sensitive receptors¹ in the project area.

Noise levels during construction will not exceed MPL (1 hour)80 dBA (requirement stipulated by GOST 12.1.003-83 Section “Noise”). This was confirmed by the results of monitoring of noise levels at the road sections of comparable traffic intensity in the on-going project (reconstruction of the road Khorgos-Almaty-Shymkent) in April 2016. Tests on measuring levels of noise generated *during construction works* along the highway within the settlements were conducted according to the requirements of :

- GOST 12.1.003 - 83 (ST SEV 1930 - 79) «Noise. Safety general requirements»
- SIT 2.04-03-2005 «Interstate construction standards. Protection against noise».

Table 8

Name of impact factors	Established norms (dBA)	Actual result of monitoring (dBA)	Keeping to the norms (NRB 99)
Sampling point			
742 km	80	78	normal
750 km	80	63	normal
755 km	80	65	normal
760 km	80	62	normal
765 km	80	53	normal
769 km	80	69	normal
774 km	80	68	normal

Conclusion: Construction Period

Given that the route plan will take place within the existing road, it can be assumed that the impact of noise on residential houses will be negligible. Based on the experience of road construction on similar projects can be assumed that the noise level is below the recommended level in the regulations mentioned above. Due to the construction, the intensity of traffic on the existing road will slightly increase and in the access and adjoining roads leading to the highway project.

Location pits will be approved and the selected contractor, in consultation with engineers and local authorities on environmental issues, which will offer the most suitable

¹ Sensitive receptors include, but are not limited to, hospitals, schools, daycare facilities, elderly housing and convalescent facilities. These are areas where the occupants are more susceptible to the adverse effects of exposure to toxic chemicals, pesticides, and other pollutants. Extra care must be taken when dealing with contaminants and pollutants in close proximity to areas recognized as sensitive receptors.

locations to begin operational activities. However, no matter what career is used, the existing secondary roads will be used for the passage of the track to the project.

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 by the contractor, to be 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 permissible noise levels (MPL) – 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 MPLs 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 and the World Bank Group General EHS Guidelines for noise management.

Thus, maximum levels of noise with 1 hour exposure, caused by vehicles in residential areas will not exceed 55 dBA during the daytime and 45 dBA during the nighttime.

Conclusion for the Operation Period:

From experience and engineering judgment, it is still predicted that noise levels will remain below the levels recommended in the regulations referred above.

In conclusion, during the operation period the predicted noise impact to any residential or sensitive uses will be minimal, and if necessary it can be reduced by engineering tools, such as noise protection barriers, green areas and landscape elements. It is necessary to monitor the noise level, characteristics along the alignment and the adjoining roads regularly. If the additional measures are needed to reduce the noise level, they will include it in the budget of the contract for the maintenance and repair roads and implement within the framework of this contract.

6.4 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 areas: surface and groundwater.

Water Needs for Construction Period

In the process of construction of the facility, water is used for production needs and for drinking needs of workers involved in the construction. The use of surface water and groundwater in the construction of roads is permitted only with the consent of the Committee for Water Resources under the Ministry of Agriculture of RK. Sources of water for construction purposes will be determined after the completion of the design and obtaining a permit for special use by the Committee on Water Resources under the Ministry of Agriculture of RK.

The use of water during construction is not much. On the construction, the water is consumed only for the preparation of concrete and mortar.

Calculation of households' drinking water consumption is carried out on the number of workers and the duration of the construction period. The calculation of water consumption in the construction period for the entire section of the road will be made in the EIA report, MPD in accordance with regulations of RK.

In the course of construction, water is used for domestic and production needs (preparation of mixtures, making wheel washing system. The source of drinking water is imported water from drinking well column of Samsy v. and Targap v. Safety and qualities of water will be provided according to "The instruction of quality and safety of food products", approved by the Government resolution of the Republic of Kazakhstan, from November 29, 2000 №1783.

Technical water supply is scheduled to be received from the rivers Samsy and Targap, as well as from water basin near Ungurtas village which are close to the road and with the approval of the Committee on Water Resources under the Ministry of Agriculture of RK. Necessary water volume of 500-600 thousand cubic m based on 0,1 cubic m for 1 cubic m of compacted soil, and for watering of detour, curing of layers, etc.

According to information, resulting of the research of road section, the designers of "Kazdorproject" LLP, "DRI "Kazdorproject" LLP and "SK Engineering" LLP, the region is rich in groundwaters. Surface water is sufficient to meet the needs of water during construction. It is assumed that the reserves of water will not be depleted in construction activities.

Table 6.4 – Volume of water consumption for drinking and technical needs at the stage of road construction

Name of water source	Delivery terms				discharge dm3/sec	Water quality mineralization mg/dm3	Purpose
	Up to PK/km +	dista nce km.	including				
			km	Type of road			

		total					
Water basin in Ungurtas village	186+40	4,9	4,9	a/c	sufficient	Slightly salted, 1166 mg/dm ³	Service water supply
Samsy river	117+40	0	0	lack of roads	sufficient	fresh, 948 mg/dm ³	Service water supply
Targap river	343+00	0	0	lack of roads	sufficient	fresh, 948 mg/dm ³	Service water supply
Drinking well column in Samsy village	114+40	1,4	1,4	Gravel road	sufficient	Corresponds to GOST 2761-84	Potable water supply
Drinking well column in Targap village	338+40	1,3	1,3	Dirt road	sufficient	Corresponds to GOST 2761-84	Potable water supply
Drinking well column in Uzynagash village	0+00	9,5	9,5	a/c	sufficient	Corresponds to GOST 2761-84	Potable water supply
Artesian well at RMD km 127	127 km	0,2	0,2	a/c	unlimited.	Corresponds to GOST 1120	Potable water supply
Artesian well at RMD km 127	127 km	0,2	0,2	a/c	unlimited.	Corresponds to GOST 1120	Service water supply

Conclusions on Water Resources during the Construction Period

During the road construction process, water is used for household and industrial needs (preparation of mixes, feed of wheels washing system, open ground irrigation). The source of drinking water supply is imported water. Safety and quality of water will be provided according to “Instruction on Quality and Safety of Food Products” approved by the Resolution of the Government of the Republic of Kazakhstan No.1783 dated November 29, 2000.

According to information obtained during ESIA preparation, the area has abundant reserves of ground water. Surface water has the capacity to supply water for engineering purposes during the construction process. Based on the preliminary estimates for water requirements during the construction period, it is assumed that sufficient volumes of water for all construction activities and water are available, they will not be depleted.

Water Needs for Operation Period

Water intake will take place on the domestic needs of road maintenance companies. Water is also required for various purposes within the rest/service areas.

Contamination of water resources

Existing bridges across Samsy, Targap and Zhirenaigyr rivers are subject to dismantling because of that the bearing capacity of superstructures, slant leg and abutment is not sufficient for perception of existing car loads A14 (car load 14 tons). NK-120 (structures load 120 tons) and NK-180 (structures load 180 tons). These rivers have potential environmental risks associated with bridge construction, if mitigation measures are not implemented.

Additional mitigation measures are described in Section 9 of EMP.

Conclusions on Contamination of Groundwater Resources: Construction and Operation Period

Based on the groundwater levels which are available along the road section and the characteristics of the project, it can be concluded that contamination of underground sources during the construction and operation period will not occur. Significant work which is less fertile layer, such as dredging and drilling is not expected. Water for construction work and for the camps will be taken in small quantities from existing wells, or water pipes. In general, water availability is not a problem in the project area. Also, the top water level is not used for the drinking water, and will not be disrupted.

During the operation period, pollution of groundwater will not occur, provided that the provisions of good practice are reflected by the designer and properly implemented.

Pollution of a surface sink from highways

The assessment of pollution of a surface sink from highways and detection of need of its cleaning is made by calculation of maximum-permissible reset of substances in water object. The maximum permissible discharge (MPD) of substances in water object is understood as the mass of substance in waste water, the maximum permissible to assignment with the set mode in this point of water volume in unit of time for the purpose of support of quality of water in control point.

In the detail project it is recommended to make calculation of maximum-permissible discharge of MPD from the bridge crossings, located on sections of the designed road through the rivers having constant sinks. Calculation of MPD will be made according to "Recommendations about requirements of the account for environment protection in case of design of roads and bridges" Moscow, 1995.

Conclusion on Contamination of Surface Water: Operation Period

Discharges to water should be within the MPL, and thus in the case of compliance with all rules and procedures, the project will not have any impact on the water sources of the operational period.

Quarries

Potential quarries are defined by designers, however the final choice is still with the Contractor. Existing career must be approved by the ESIA from the competent authorities, and thus, it can be assumed that they will not affect the aquifers that are used as a source of drinking water. Moreover, apart from the occasional spill (unlikely, that is no specially) quarrying has a slight risk of contamination. The greatest risk associated with improper closure and reclamation of quarries can lead to their transformation into illegal landfills, which already have a significant risk of contamination. An important part of closing of quarry, thus, it is the dismantling and / or blocking all access roads.

Construction camps

Construction camps will generate sanitary waste from workers and staff, who work and will live close to the alignment. At this scale of construction, the number of workers will simultaneously reach several hundred in the area. The location of the workers' settlements will be determined at the stage of detail design by Contractors. As part of the road mainly passes through the agricultural land, Contractors will take measures to prevent the contamination of soil and groundwater. Moreover, the Contractor will provide an apparatus of sewage treatment systems and garbage removal, which should be provided in the draft workers' settlements.

Hydrology Conclusion

Overall, the impact on groundwater and surface water is expected to be moderate or low. Streams and rivers will be crossed by bridges, with application of engineering solutions to prevent adverse effects on the river. In the sub-grade, a sufficient number of culverts are established to prevent congestion of the water and subsequent waterlogging. Data on engineering structures are shown in table 2.5 of this report.

6.5 SOIL AND LAND IMPACT

Soil Damage

Cleaning the area, excavation and backfilling of the mound, the subgrade device usually gives a major impact on soil and subsoil. A substantial amount of topsoil will be removed for the construction of roads and detours, quarrying, construction camps and other construction activities. In those areas, there is a possibility of contamination, disturbances and damage to the soil cover. In particular, the soil may be compacted and damaged along the temporary access roads and on construction sites. Violation of soil is inevitable, and it will be more critical in areas with high soil humus content, which are very fertile. However, this can be minimized at performing of correct construction procedures.

Soil Contamination

There is a potential for contamination of soil during construction, as a result of the oil spill on quarrying along the route. Such contamination can then move on to the surface and underground water and agricultural activities in the vicinity of the alignment. Some contamination can occur during normal construction work, but the most serious

contamination can occur during the accidental fuel spills, and during the prolonged storage of building materials without precautions.

During the construction phase the most important potential for contamination will be on the sub soil, which will be exposed after the removal of fertile layer. Materials used for road layers can cause contamination. Provided that the sources of aggregates (sand, gravel, soil, crushed stone) for construction will be brought from local quarries, the base layer contamination is not expected.

Soil contamination may also occur during the operational period. The main criterion for evaluating the hygienic danger of soil contamination by chemicals is (MPQ) - the maximum permissible quantity of this substance in mg / kg of absolutely dry soil, which guarantees the absence of a negative direct impact on human health. Hazardous assessment of the effects are made on lead, it is an indicator which has a presence in the soil of other toxic elements. Maximum permissible concentration of lead in soil (MPC) in the Republic of Kazakhstan according to the "standards of maximum permissible concentrations of harmful substances, harmful microorganisms and other biological pollutants in the soil," is approved by the joint Order of the Minister of Health from 30.01.2004 №99 and Minister of Environmental Protection of 27.01.2004 of №21-p, and is set at 32 mg / kg.

Because of products of wear of pavings and car tires, decay of exhaust gases of engines of cars and construction equipment, the fuels and lubricants getting on the carriageway as a result of leak from fuel system of engines or negligent actions of drivers and the service personnel, impurity of the roadside territory and level of the content of lead can increase.

De-icing materials, especially salts of falling precipitation and melting snow from the road at the roadside, are less dangerous than other toxic materials. So, level – 0,04% is taken for a maximum permissible concentration CL (chlorides) at impact of deicing substances on soils in a roadside strip of this zone. With significant accumulation, they can change the biological soil composition of roadside strip.

Soil Impact Conclusions: Construction and Operation Periods

Based on the research and the characteristics of the territory, it can be concluded that, subject to the appropriate construction technology, the harmful effects on the soil and subsoil during construction and operation period, such as pollution, erosion and landslide, will not arise. Similarly, during the operation period, there won't be any adverse impact on soil and subsoil.

6.6 FLORA AND FAUNA IMPACT

One of the main problems in the design and implementation of the route project is the protection of the natural ecological systems, including plants, animals and natural landscapes. Rare or endangered plant and animal species should be specially protected.

Construction of the road and its operation may affect flora and fauna 1) during construction through the loss and habitat destruction, or 2) during the operation of the effects of pollutants on flora and fauna. Transport emissions in the air can cause

destruction of the pigments, the suppression of the synthesis of proteins, enzymes and disrupt other functions of plants. The track can also impact on certain types of animals that pass through the route or live near it, because of the separation of populations of some animals in small unstable group.

Contamination of flora can lead to impaired growth and development; accelerate the aging process, especially for perennials. Pollution of surface and vegetation transport emissions occurs gradually, and is directly dependent on the distance from the carriageway of the road. For some sensitive plants the pollution by exhaust gases of vehicles is higher than for humans and animals. Among inorganic contaminants that can have a significant impact on the environment, it should be noted a variety of anti-glaze chemicals, mainly salt. Salts have a negative effect on the road adjacent to the territory, the soil, plants, insects, animals and birds. Additionally, under the influence of the salt, the structure and physic-chemical properties of soils worsen, and adversely affecting all plants.

The harmful effects of salts on the greenery and plants occurs both in direct contact with the aerial parts, and through the root system. Direct contact with salts leads to the destruction of plant tissues, especially the cortex. Concentrated in the soil sodium ions interfere with the absorption of the root system of the plant nutrients.

Construction of the road can have short-time strong impact on habitats of the animals living near the road that can lead to violation of short and long migratory ways, to division and reduction of populations. Such influence begins when clearing a section from vegetation for construction and proceeds during operation. However, harmful effects on the majority of fauna can be effectively reduced after construction completion, by restoration of a landscape and vegetation and the organization of underground and elevated passes for the 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 through 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.

Besides, upon transition of big and slow animals across the road, they can be killed. Hedgehogs, and also foxes, mice, rats very often die. In general, total quantity of the animals killed on the road is not so highly. On this section the risk of murder of large mammals is reduced due to the lack of the dense bush or the wood near the route.

Conclusion on Flora and Fauna Impact: 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 the preliminary calculations made by the designer a insignificant number of trees will be cut within the ROW. 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 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. There 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 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.

Based on field research and discussions, there is no evidence that the project will have a significant impact on the animals, or any rare, threatened or vulnerable species.

6.7 SOCIAL ENVIRONMENT IMPACT ASSESSMENT

It should be noted that the project is rehabilitation and upgrade of an existing 2-lane to a 4-lane dual carriageway within the existing right of way (ROW) other than the proposed two new by-passes. Thus the range of additional environmental and social impacts will primarily be limited to the construction phase, and eventually to increase in road traffic and speed.

The proposed dualing will create obstacles for farmers and cattle movements along the road section due to dualing with the provision of central barrier. However, in the design and documentations of the project adequate measures will be required to be taken in consultation with the stakeholders in order to minimize these effects by providing sufficient pedestrian crossings and cattle under passes as and where applicable.

During construction and operation, noise and air pollution, water pollution may affect the nearby residents and in extreme conditions could impact on people's health, particularly on vulnerable groups; the old, those already sick, and children. However, as referred to above, noise, and 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 which may affect people's income and livelihoods particularly in the short term. Land acquisition has been discussed in the Resettlement Policy Framework (RPF).

The road development may have definite impact on the economic activities of the local communities living along the existing road. However, it should be noted that there are only few small businesses near the alignment near the villages, which are not subject to relocation and therefore, negative impact is expected to be minimal.

All Project Affected People (PAP) will be compensated at the replacement rates and receive adequate allowances according to severity of impacts and vulnerability status. Land acquisition under the project will be based on the following principles:

- Construct the road to avoid residential areas wherever possible to;
- minimize physical relocation of people and select alignments that minimize acquisition of privately or publicly held productive land;

- Adopt design standards that minimize the need to impose land use restrictions on adjoining areas;
- Develop fair and transparent procedures, as defined in the Entitlement Matrix of RPF, to determine compensation for (i) temporary loss of land/ assets during construction; (ii) permanent acquisition of land and assets; and (iii) restrictions on use of land that may be applied to areas adjoining the corridor;
- Acquire land (or right to use land) through negotiated agreements and with the use of the power of eminent domain only as a last resort;
- Upon completion of construction, restore land as best as possible to its original condition in the event of temporary disruption so as to enable landowners/users/lessees to resume their pre-project activities;
- Keep PAP and communities fully informed about the project, the process that will be followed to acquire and compensate for land, and their related rights and avenues for redress. Ensure that grievances that PAP may have will be redressed adequately, and that solutions in line with principles laid out in the RPF be employed;

All PAP, regardless legal status of their property, will receive support of various kinds, as per the principles set out in the Entitlement Matrix, to assist them in their efforts to maintain their livelihoods and standards of living prevailing prior to the Project. Those who illegally own land will not be compensated for loss of land, but will receive compensation for loss of other assets which had been established at their own expense and for loss of income such that they are also assisted in their efforts to maintain their livelihoods. Detailed measures to be implemented will be determined based on the census and socio-economic survey to be carried out when a RAP is developed; PAP will be notified of the Project implementation schedule and consulted regarding the principles of land acquisition and loss of or damage to assets; Damages to assets, such as standing crops, trees, fences and kiosks, and loss of income, including loss of harvest, will be minimized, and where inevitable, will be compensated without regard to legal status of ownership according to the Entitlement Matrix provided in the RPF.

Consultation and participation is an important process through which stakeholders influence and share control over development initiatives, and the decisions and resources that affect them. It is a two way process where the executing agencies, policy makers, beneficiaries and PAP discuss and share their concerns in a Project process. Consultation and participation has been a major principle in the planning and preparation of the detailed design of the Project. WB OP 4.12 gives high priority on public consultation and participation to enhance the community voice and assure incorporation of community's views in design and implementation of a socially and environmentally compliant project. The Kazakhstan laws also place strong emphasis on consultation and notification to ensure that PAP participates in the process. The focus of these consultations are to ensure that PAP and other stakeholders are informed, educated, consulted and allowed to participate actively in the process of road development and preparation of social and resettlement plan; reducing public resistance to change; helping mitigate and minimize any probable negative impact and bringing in the benefit of PAP.

The Committee for roads considers, that it is important to consider of service improvement in the areas, and according to the project, the possibility of resettlement potential recreation areas / service. 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 their products. Making of informative signs for existing communities and local services and the provision of temporary spaces for local businesses can offset some of the potential loss of trade in addition to give preference to negatively affected business owners on the service areas along the road.

Although there may be some local economic adverse impacts on overall economic of the road, it will bring significant benefits to the local, regional, and national economy. A fast, safe and all weather roads will allow the efficient and rapid movement of goods between China, Kazakhstan, Russia, and towards to Europe and Central Asia. Goods manufactured within these countries will benefit the fast route. Agricultural production 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, and not only to 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 will benefit from faster travel times between the towns and to other urban centers of Kazakhstan. More opportunities for employment and business will be opened.

6.7.1 Contractor's Work Camp

During construction, there will be a temporary increase in population whereby construction workers will settle in the area for a specific period of time. The expected workforce will include both skilled and non-skilled workers. The influx of people looking for work is a common phenomenon with all development projects since word spreads rapidly of the possibility of work and opportunities for earning money. The population increase and the project activities will have impacts on social disruption or sanitation/health conditions on the community.

Although the existing communities are highly vulnerable due to the above impacts , caused by population influx are considered as Medium Negative due to the fact that it will be short term in nature and reversible since most people will go back after construction.

Sites for contractor work camps will all be approved by the Employer represented by the Engineer and will not be permitted close to settlements, nearby any environmentally sensitive (e.g. forest, water bodies etc) or areas with sensitive receptors. This could influence negatively on local life style and sometimes may lead to cultural and social conflicts. They may attempt to cut down trees for fire fuel, timber trade, , dispose wastes and conflict with local communities.

In terms of impacts on fauna, there is the potential for construction workers to poach edible animals and birds of the locality in spite of prohibitions. The contractors will be responsible for providing adequate information to the workers regarding the protection of fauna.

Contractors will be responsible for supplying appropriate and adequate fuel in workers' camps (coal, liquid gas, electricity etc.) to prevent fuel-wood collection. Construction vehicles shall use carefully-located designated temporary access and haulage roads to minimize damage to habitats.

Construction camps may place stress on resources and infrastructure of adjacent communities which could lead to antagonism between residents and workers. To prevent such problems, the contractor will provide temporary facilities in the camps such as health care, eating and sleeping areas (including a cook and provision of meals), water supply, and prayer areas.

The project has the potential to contribute to local poverty reduction through provision of income generation opportunities such as construction employment and provision of goods and services to workers.

The mitigation measures require a number of specific provisions to be included in contract documents including provisions for (i) a set aside for jobs for the poor (60% of the direct unskilled and semi-skilled labour), including a minimum number of persons to be given agreed structured training for more skilled posts; (ii) explicitly prohibiting the use of foreign unskilled and semi-skilled workers or unskilled and semi-skilled workers from elsewhere in Kazakhstan unless there are no local unskilled and semi-skilled workers available; (iii) payment of legal wages to workers; (iv) no use of trafficked or child labour for construction and maintenance activities; (v) inclusion of women as well as poor in the local construction force, in accordance with the local gender balance, to the maximum extent possible; (vi) no differential wages being paid between men and women for work of equal value; and (vii) use of locally sourced materials used in the rehabilitation to the maximum extent possible;

Women are likely to be least favoured in the job provision. This is because of the nature of jobs available in the road construction that is perceived to be done by mainly men. There is likely to be developments of relationships between workers and the women of the area that are either engaged or already married, this can result into marriage break ups. There could be immorality especially with the young girls of the area in efforts to gain favour for employment opportunities, this can result into spread of sexually transmitted diseases such as HIV/AIDS. Impact on HIV will be long-term as its spread and associated impacts will continue even after construction. The risks associated with the above are proposed to mitigate by mitigation and enhancement measures as presented in Table 9.1: Project Impact during Construction.

Gender

Employment opportunity to local communities

The construction of the project road is expected to create employment opportunities and jobs for the local communities. The youth and women residing in the project area will benefit from the employment opportunities created due to the construction of the road. It can be assumed that this will be a considerable contribution to the reDUCTION OF POVERTY AT HOUSEHOLD level during the project Construction phase.

The project construction is estimated to take about 3.5 years, hence significant benefit is expected from employment opportunities during this period. After the completion of construction, contractors will engage local labor for routine maintenance activities, many of which are labor-intensive tasks that create local employment. Compared with a conventional road, additional employment opportunities will be created in the collection of tolls, when introduced, and the delivery of higher -level services to road users.

Required enhancement measures include:

- The contractor should employ work force mainly from the locality where the construction work is undergoing especially in positions that may not require special skill;
- In the process of employment, the contractor should give priority or preference to women especially in less risky jobs, and provide training for women in different skills as this contributes to the ongoing effort towards poverty reduction mainly at local level;
- Employment, wage system, and other administrative measures for the local workforce should be in line with the country's law.

Gender Issues:

- In order to address these and other issues raised, and in line with THE KAZAKHSTAN GENDER EQUALITY POLICIES the project has to incorporate Gender Mainstreaming Plan of Action to be carried out during implementation. The gender Plan of Action, among other things, will empower women through ensuring that women are encouraged to seek employment in the project and that they are not discriminated against in the recruitment process.
- The day to day activities of the HIV/AIDS, STD and Gender activities will be monitored by the supervision consultant. The specialized service provider REQUIRED TO ENGAGE BY THE CONTRACTOR will prepare monthly and quarterly reports to be submitted to the supervision consultant. The reports will provide updated information on will include HIV/AIDS, STD and Gender program implementation highlighting key issues and problem areas and recommended measures for resolving identified bottlenecks. The supervision consultant will forward the progress reports to THE COMMITTEE FOR ROADS.

A. Human resource/staffing

- Consider the project gender gap in human resource planning
- Apply affirmative action to FULFILL the human resource gender gap
- Show women's involvement & gender ratio progress in percentage
- Encourage female applicants for vacancies so that to increase the number of female professionals in the road project
- Empowerment women staff to be self-sufficient and confident which inherently linked to knowledge and voice.

B. Technical skill to be done by CONTRACTOR & OR CSC/CFR

- Provide gender awareness and gender mainstreaming training to the staff & communities there should be tailored to bring change at individual and organizational & community levels
- Screen expertise's for their knowledge on gender analysis, mainstreaming, Monitoring & Evaluation
- Enhance the skill and knowledge of Gender experts
- Provide assertiveness training to women specific staff

C. Implementation to be perform by the Contractor

- Consider gender mainstreaming activities as part of core activity & supporting activities
- Development gender sensitive follow up and reporting formats
- Ensure the gender balance of beneficiaries and customers in project implementation process
- Data collection & analysis should be based on sex and gender disaggregation
- Make an employment of gender experts in the project area.

D. Women staff facilitation in project areas

- Provide transport facilities , women specific sanitary supplies such as free distribution of modes to women staff and daily laborers in project camps and sites
- Water available & comfortable shelter with bath room in project camps.

In the project especially positions that don't require skill have to be used as an instrument to employ more woman than man.

Contractors are required to ensure jobs should be equitably distributed to both women and men as long as one has the qualification rather than based on gender.

6.7.2 Health and Safety

The project's construction phase can cause a range of health and safety impacts. The main impacts on health and safety are associated with (i) risks from construction work (noise, risk of injury), (ii) facilitation of transmission of communicable disease; (iii) contamination of local water supplies; and (iv) traffic safety issues.

The transmission of communicable diseases such as sexually transmitted infections (STIs) and even HIV/AIDS is a potential impact posed by construction workers engaging in either commercial sex or sexual relationships with local people. The civil works phase of the project can pose risks for both the construction workforce and the communities along the roads for the civil works/construction period. High risk groups in the project area include traders, people from household who travel for marketing or selling, seasonal migrants, poor rural people (who risk passing it on to their spouses or partners), intravenous drug users (IDUs), and commercial sex workers (CSWs).

Potential impacts to local water supplies include the possibility of temporary construction camps and the water supply and wastewater disposal associated with them. Contract provisions to ensure that these facilities are properly sited will be incorporated in project contract documents. Road improvement projects can also inadvertently cause adverse impacts on road and traffic safety as a result of higher vehicle speeds due to improved road conditions. The proposed rehabilitation works do not include design improvements that could encourage higher speeds above the design speed. However, some improvements may be carried out to improve safety, particularly line-of-sight, and at accident black spots. In towns, the design speed will be set at the statutory speed limit for such areas, with prominent speed limit and hazard signage and a ban on non-delivery

parking, which are usually strictly enforced by the traffic police, and footpaths, pedestrian crossings, and other safety features.

Air and noise pollution, which can affect the social as well as physical environment, have already been discussed.

Mitigation measures for the foregoing impacts include:

- Each contractor will recruit an environmental, health, and safety officer (ESO) to address health and safety concerns and liaise with the project supervision consultant and communities;
- Training of all construction workers in basic sanitation and health care issues, general health and safety matters, and on the specific hazards of their work;
- The contractor will provide personal protection equipment, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection, in accordance with relevant health and safety regulations, for workers;
- Implementation of a STIs/HIV/AIDS awareness and prevention campaign which includes HIV in the Workplace seminars and training provided through UNAIDS;
- Provision of hard, instead of soft shoulders, and road markings and signage to enhance safety and indicate that pedestrians should use the shoulders, rather than mix in the main stream if traffic;
- The contractor will provide adequate health care facilities including an HIV/AIDS education post and first aid facilities within construction sites;
- Contractors will ensure that no wastewater is discharged to local water bodies and safe and clean drinking water is provided to all workers;
- No site-specific landfills will be established at the construction camps;
- Septic tanks and garbage receptacles will be set up at construction work sites and camps, which will be periodically cleared by the contractors to prevent outbreak of diseases;
- Provision of adequate protection to the general public, including safety barriers and marking of hazardous areas in accordance with relevant safety regulations;
- Provision of safe access across the construction site to people whose settlements and access are temporarily severed by road construction.

Conclusion on Social and Economic Impact: Construction and Operation Periods

There can be some negative impacts on the socio-economic environment, including possible losses during construction period and possible losses in trade and business on the existing road, but in general the long-term economic vitality of villages along the road will increase, by that positively impact on socio-economic environment of Kazakhstan.

6.7.3 Road Safety

Enhancement of road safety solutions such as sidewalks, bus stops road crossings, cattlepass, guardrails, and safety barriers etc. will be designed and implemented with input from stakeholders through consultations, paying specific attention to the possible different needs of men and women.

In addition to that “Road Safety” issue during construction can be related to high construction traffic may result in damage of existing roads, accident, or by development of construction site (borrow pit, high cut & embankments, excavated land etc) and may result in accident on livestock and people, hence, the need for awareness required signs and fences needs to put in place in order direct to the safe and expeditious movement of traffic through the construction areas.

6.8 NATURAL CULTURAL RESOURCES IMPACT ASSESSMENT

A detailed study of the territory in the vicinity of the road section was carried out by means of work with archival and bibliographic data, and topographical maps and satellite images. During the study, historical and cultural monuments in the area of the alignment were found. In order to ensure protection and conservation of PCR Objects specific PCR sites will be protected (e.g. fenced or by-passed) or will undergo archaeological survey according to site management plan.

More detailed report on the archaeological and cultural heritage of the problems given in Appendix 2, in the conclusion of the preliminary archaeological inspection.

6.9 ROAD SAFETY AND AESTHETICS IMPACT ASSESSMENT

Road Safety

Road safety and possible accidents involving pedestrians and road users is an important issue for all new and existing road developments. It is expected that the existing route traffic flows, particularly for long distances (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.

Traffic on the highway project will be much safer because of the improvement of the project (such as optimized turning radius), separated carriageways in both directions, visibility and limited local access. Cross movement, slow and motorized movement will be excluded.

Nevertheless, there will still be a residual element of danger for pedestrians. Farmers, people working in the farm and herdsman may need to cross the road at certain points and there will be some pedestrian traffic near the 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.

Aesthetics

The proposed route passes through the beautiful landscapes with clear visibility. The draft of the proposed route will ensure that there is no negative impacts on the landscape, and will not reduce the beauty of the landscape.

6.10 WASTE FORMATION

Waste formation 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, crushed aggregates from crushing plants, scrap metal, sand and gravel mix 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, barrels and containers from fuels, lubricants and construction chemicals, and spent welding electrodes. This will be disposed via existing municipal waste management 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 if suitable made available for sale to the public as firewood.

The following table presents types of formed wastes and utilization methods:

Table 6.10 – Formation of constructed wastes (calculation has been prepared by designers)

N	Name, waste type	Classification	Storage and utilization methods
1	2	3	4
1	Constructionwaste	GG170 Green List Construction, construction sites Siteimprovement	Special range
2	Exhaustoil	AC-030, amberlistwastes	By special organizations On utilization
3	Electrodestubs	GA090 GreenList	By special organizations On utilization
4	Wasteend	AC-030 Amberlist	By special organizations On utilization
5	Solidmunicipalwaste	GO060 GreenList	Range

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 wintry conditions) and volume of maintenance works. The range is expected to lie between a few 100s to a few 1,000s of m³ per annual.

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 could be quite significant if all 5 service areas are operational, though this is unlikely that all will be operating for many years.

6.11 HEALTH AND SAFETY IMPACTS

Road construction represents certain risks to health and safety of workers and adjacent residents. In the process of construction, operation of borrow pits, crushing plants, batching plants and other associated infrastructure, workers are exposed to the such impacts of working environment as noise, vibration, air pollution, risk of work at height, risks of accidents broadly, including fire, injury associated with operation of machinery, etc. Local population of adjacent residential areas are exposed to air pollution, noise, pollution of ground water (drinking water wells), etc.

6.12 CUMULATIVE ENVIRONMENTAL IMPACTS

Cumulative impacts include direct and indirect impacts from the road construction. The following table presents potential cumulative impacts of the road construction projects implementation:

Type	Description	Examples
Simultaneous cumulative impacts from multiplesources	Frequent, repetitive and simultaneous environmental impacts	Increasing noise level from the construction of various facilities
Delayed impacts	Time delay between the impact cause and effect on other elements of nature	Changes in the surface of the water leads to changes in shallow water ecology
Transboundary movement	Impacts occur at a great distance from the source	Transfer of air pollutants over long distances
Fragmentation	Changes in the landscape	Division of woodland into parts resulting in the division of animal groups,

		ecosystems
Synergistic effects	The effects occurring as a re-sult of merging of several impacts, the nature of which is different from the original sources	Combination of NO _x and SO _x , which results in smog formation
Indirect impacts	Indirect impacts occurring from the direct impacts	Construction of commercial and residential facilities due to construction of the road, which entails impacts on elements of the environment
Initiators	Causes fundamental systemic or structural changes	Deterioration of the water system due to chemical pollution from the road flushing and clogging
Receiving impacts in small portions	Increasing or decreasing impacts	Gradual disappearance of natural places, such as forests, as a consequence of infrastructures development

Impacts on the atmosphere, water bodies, soil, noise pollution may collectively have a significant impact on the landscape and ecosystem. The impacts associated with the project implementation, such as quarrying, water intake from surface or ground water for construction and drinking needs will be included in development projects, as well as in the EIA developed for each road section in accordance with the applicable laws and normative documents of the Republic of Kazakhstan.

The impact resulted by the road construction project may be insignificant, but in the future it may have significant potential impacts on the environment in combination with the implementation of other projects in the alignment area. In accordance with applicable laws and normative documents of the RK that are regulating the development of environmental projects for economic and industrial activities, the EIA is developed separately for each project. Currently the zone of project influence is underdeveloped and there are no any cumulative impacts in relation to already implemented projects/ impacts factors. It should be noticed that currently there is no information about the projects that are planned to be implemented in the future in the region of the alignment are unknown.

Environmental permits are obtained by those responsible for the projects implementation taking in-to account assessment of cumulative impacts on environment. To reduce the load on the ecosystem

in a particular area, the Committee for Environmental Regulation, Control and State Inspection in oil and gas industry under the Ministry of Energy of the RK may refuse to

issue a permit for the implementation of other projects in the road alignment region and require to change the project im-plementation location.

7. MEASURES FOR MITIGATION OF NEGATIVE IMPACTS

7.1 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 radius, 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;
- Traffic mode, chosen by 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 reconstruction 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 asphaltting machines that will help prevent excessive concentrations of pollutants (e.g. aliphatic and aromatic hydrocarbons, including carcinogenic benz-a-pyrene, PAH)the working area and the surrounding areas.
- Eliminate nighttime construction operation within the vicinity of residential areas. No mixing of materials, storage of materials and construction camps or depots to be located within 200 meters of residential areas.
- Regular monitoring of air pollution shall be carried out throughout the construction period and focusing specifically, close to the communities of Samsy, Targap, Ungurtas and etc., and also settlements at the distance not less than 200 m..

Mitigation during Operation Period

- Improving the design of highways. Reduced longitudinal slopes, improved visibility in the horizontal vertical curves, 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.
- Providing in the projected road passes through flat terrain, the longitudinal slope does not exceed 10% of the radius 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.
- Construction of road with signs, markings, and fences will provide non-stop and reduce emissions in the exhaust gases (EG). These requirements were included in the draft design of the proposed road.
- It is necessary that users of roads bear responsibility for maintenance and for vehicle driving (the serviceable, well adjust engine throws out 10 times less carbon monoxide, than faulty);
- Recent legislation has established the requirement for every motor vehicle to be inspected and checked once a 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, close to the communities.
- Regular monitoring of air pollution should be carried out throughout the operation period and focusing specifically, close to the communities.
- Implementation of the requirements of the Technical Guideline of the Customs Union 013/2011 “Requirements for automobile, aviation, diesel and marine fuel, jet fuel and mazut” which was based on the EU Directives on fuel quality 98/70 and 2003/17. This Technical Guideline prohibits the use of K3 type fuel in Kazakhstan starting from Jan 1, 2016.

Dust Mitigation during Construction and Operation

Dust can be a major problem during construction and is caused as a result of preparation and construction 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.
- Periodic watering of dirt roads at a rate of 2 l/m² 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.

It is necessary to pay attention to dust prevention at PK 43+00, PK 42+40, PK 131+29.62, PK 307+87.09 near the villages.

7.2 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 03.12.2004, Republic of Kazakhstan, at 80 dBA.

Mitigation of Noise during Construction Period

Level of the noise is high at traffic on the road and 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 80km/h. This can reduce noise by 7 dB;
- Undertake construction work during the daytime to reduce any potential impact on sensitive uses particularly in construction access roads;
- To the extent possible undertake 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 muffers or plugs);
- All depots, special working areas, batching or mixing plants should be located at a distance from residential or any other sensitive areas;

Operation Noise Mitigation

The calculation of noise during the operation period indicates that traffic noise does not exceed the maximum permissible at any location along the alignment. However it will be particularly important to monitor operation noise levels along the built-up areas to determine whether noise levels are exceeded or whether the community is disturbed by the noise.

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.

7.3 Hydrological Mitigation

Construction period

Overall the impact on groundwater and surface water is expected to be low. There are no cuttings in. 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 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 the use of surface and groundwater resources from the district and competent authorities. Without obtaining these permits no water resources should not be used.

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.

To reset the waste water it is recommended to apply pit with the depth not less than 3 meters from reinforced concrete rings with a diameter of 1.5 m. So that sewage did not get into the ground water, it is necessary to concrete bottom of the pit. Waste water from these wells must be pumped into special water trucks and transported to the nearest facility for wastewater treatment.

Surface and Groundwater Protection

In water protection zones is prohibited pollution of the earth's surface, especially landfills, waste production, as well as parking, fueling, washing and repair of motor vehicles and road equipment. For the pollution and contamination of waters, commissioning works without devices to prevent pollution and contamination of water, wasteful water use, violation of water protection regime at watersheds and other violations, the perpetrators are liable in accordance with legislation.

Dimensions of water protective zone in to each direction from average summer river line for small rivers – 100 m, for large rivers – 500 m. Works within zone of water protection can be allowed under special permission by bodies of fish protection and sanitary services.

Specific Mitigation during Construction should include:

Local representatives of CfR, regional departments of the Committee of Water Resources and akimats together with Contractors shall 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 akimat and competent authorities. No water shall be used without 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.

Operation

During operation to prevent contamination, the road will include drainage channels and culverts for removing storm water from the carriageway of the road outside. Drainage from the roadway and bridges goes by means of transverse and longitudinal slopes. 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, and 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.

7.4 Soil Erosion and Contamination Mitigation

Soil Erosion

During the construction of the road to the number of priority works should include the elimination of pockets of erosion and the elimination of the causes of its occurrence. Due to the characteristics of the landscape and design solutions, even in extremely dry or humid conditions, landslides or erosion is likely will not occur. In spite of this, all construction work must be carried out with the prevention of 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.

According to the Land Code of the Republic of Kazakhstan from 20.06.2003 and "Guidelines for the assessment of proposed economic and other activities on the environment in developing predesign 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 of 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

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: Construction period

During the construction period, it is very important that the contractor undertook all actions according to contract specifications, operated all activity on a site taking into account preservation of environment.

For prevention of pollution of soils it is necessary to undertake the following actions:

1) To provide appropriate management of construction activity, so that there was no spills or leak of hydrocarbons and other substances. If it occurred, immediately to take measures to minimize impact on the soil.

- 2) To store construction materials only in the places which are specially taken away for this purpose;
- 3) Immediate sorting and export of building wastes in specially taken away places;
- 4) Dismantle of building sites and access roads after use.
- 5) Use of a fertile layer on free sites as soon as possible.

Spill cleanup and response. If an accidental spill occurs, the priority cleanup and response measures are to prevent oil or other polluting substances from leaching into groundwater or entering waterways as run-off, and to return the soil to productive use as quickly as possible. Manual recovery is the most common method of cleanup and involves teams of workers using rakes, shovels and other tools to remove oil and debris. The oiled materials are collected in buckets and drums for transfer to a processing station. Workers may also use hoses, pumps and vacuum trucks to recover spilled oil. Berms and trenches can be used to contain the spill, as long as their use does not allow the oil to leach into the soil. Where there is no danger to the water table, the contaminated area can be flooded, which “floats” the oil or moves it to the water’s surface, as it is typically lighter than water. This technique allows for recovery via vacuums and skimmers. Other possible techniques include mechanical removal of contaminated soil, in-situ burning, sorbents, and bioremediation.

Soil Contamination: Operational period

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.

7.5 Flora and Fauna Mitigations

Air pollution, noise and vibration, wind and water erosion can potentially negatively affect local environment .

All above measures for mitigation of negative impact of emissions from motor transport, noise and vibration influence have a direct bearing on flora and fauna. Reduction of negative impact on flora and fauna at construction of the road, requires implementation of the following mitigation measures:

- Ensuring high quality condition of the road surface throughout the operation period to minimize noise and air pollution ;
- Decrease in pollution of atmospheric air by ensuring access to the road only vehicles and road equipment of high quality with emission of admissible emissions;
- 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;

- All transport and haulage vehicles using the road, including construction traffic, should use dust protection tarpaulin or other suitable cover.

The 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.

Contractors will undertake careful spatial planning regarding designation of specific sites to be occupied by construction process proper or various facilities(i.e. batching plants, crushing plants, construction camps) to prevent impact on flora and fauna in the area of construction.

Fauna mitigation during Construction:

The Contractor shall ensure that no excessive and/or unnecessary disturbance to fauna within or close to the alignment takes place.

7.6 SOCIAL AND ECONOMIC ENVIRONMENT IMPACT MITIGATION

Local business

Road construction can influence economic activity of local population along the existing road. Along the existing road various temporary and continuous commercial activity, including restaurants, shops, service stations, temporary counters for sale of local fruit and vegetables, and also products of local production are developed. Generally business is based on clients users of roads. As a result of the project, sellers can lose part, but not all the clients users of roads. Most likely the majority of the existing trade won't be lost at construction of the road though it is impossible to make any forecasts. In policy of the World Bank and in the internal policy there are no requirements for compensation to people who get under indirect influence. During the last hearings the matter wasn't brought up by any representative of regional akimats or the population.

However, there are some ways which give opportunities for the local society getting under negative impact. There can be three ways:

- Providing sites under development of local business and for farmers for sale of products of the production to users of the new road. Along the road some zones of rest/service will be created. These sites aren't part of the project, and the land will be bought within free trade. Development of this infrastructure will be carried out later. The matter is under responsibility of the Ministry of tourism and sport. It is recommended to include in the project of these zones of rest/service of places for farmers and development of business somehow to avoid the possible losses of the existing business on the existing road.
- Informative road signs on the new road and adjunctions, with designation of location of the nearest gas stations, shops, markets, the restaurants which are earlier located on the existing road. It will allow users to reach quickly commercial objects on the existing road. Installation of signs with information

for users of roads on restaurants and floor spaces in Samsy and Targap settlements can be a good example.

- After completion of construction and before opening of zones of rest/service to allow small dealers to rise on blank spaces on outcomes. It has to be carried out with observance of the principles of road safety and only in the certain legally approved places where there is enough parking lot and good visibility. Informative signs have to be established properly.

Cattle passes

Measures for mitigation of withdrawal of lands are described in the Report on introduction of actions for resettlement, but it is important to emphasize that it is necessary to finish withdrawal of the remained sites as soon as possible according to procedures and with AWMI. Any of discontent and the complaint have to be registered according to the Mechanism of satisfaction of complaints in AWMI for process of withdrawal of the land and for the period of construction. The problem of cattle passes and journey of agricultural equipment is also considered in AWMI.

7.7 PHYSICAL CULTURAL RESOURCES IMPACT MITIGATION

All historic sites and memorial monuments found during preliminary archaeological inspection of sites along the alignment will be protected. The memorial monuments will be moved in consultation and coordination with local government. Borrow pits and other infrastructure should be placed taking into account location of objects of PCR and at distance of at least 200 m from object of PCR.

Carrying out all types of works which can create threat to existence of objects of historical and cultural heritage is forbidden.

For any finds of PCR during construction works, the procedures described in point 2 of article 39 of the Law about "Protection and use of objects of historical and cultural heritage of RK" have to be applied: "In case of detection of the objects having historical, scientific, art and other cultural value, natural and legal entities are obliged to suspend further conducting works and to report about it to authorized body".

However the law on "Protection and use of objects of historical and cultural heritage of RK" doesn't regulate temporary parameters of carrying out research works. The term of carrying out research works is determined by the expert in each separate object depending on the sizes and amount of works. The archaeological report and chance finds procedure is contained in Appendix 2. The detailed plan of management of PCR on Uzynagash-Otar road section will be developed upon completion of the working draft on all sites of the road.

7.8 ROAD TRAFFIC SAFETY AND AESTHETICS IMPACT MITIGATION

Road safety

Design of road reconstruction under Ib technical category with limited access, with a dividing strip was carried out with introduction of requirements for safety which are absent on the existing road. The project of the offered road includes the following:

- i. Separate carriageways;
- ii. Limited access and access way;
- iii. Good horizontal and vertical profile and visibility;
- iv. Accurate marking of the road;
- v. Strips of the emergency braking and zone of the emergency parking;
- vi. Good lighting on the main traffic intersections and in other places;
- vii. The accurate warning and information signs;
- viii. Protective barriers according to the international practice, on adjunctions, high embankments and dredging.

Pedestrian crossings

No specific pedestrian crossing points have been included in the design of the Road Section. Consideration must be given to the provision of pedestrian crossing points where there may be pedestrian movement in Road Section. Pedestrian crossing at the road junction and road 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.

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 operational requirements of the road operators.

7.9 WASTE REDUCTION

Waste during Construction Period

By the project of a preparatory work special places for temporary warehousing of waste with the indication of ways and ways of their export to a place of burial, processing or sale have to be provided. Export of wood and waste from clearing of vegetation has to be carried out during the season felling and the rooting out works (it is preferable in winter time).

Contractors shall to have separate containers for collecting waste: metal, plastic, construction materials. The waste relating to category of secondary raw materials (scrap of metal) has to be stored separately. Waste for processing and a reuse on a construction site has to be accurately designated. In all cases, storage has to be made in the designated places and are taken out from a site if necessary. On all questions of waste consultations on control of waste have to be carried out. The contractor bears responsibility for garbage removal which has to be carried out according to standards. Harmful waste has to be taken out according to local and national norms. Garbage removal on the neighboring territories with or without the permission of the owner, out of a building site is forbidden until these sites aren't approved as a place for export of waste.

Burning of any waste is forbidden until permission from Regional Department of Ecology is got.

All formed waste in working settlements and mints of an arrangement of office is taken out usually by the contractor on the next site for garbage. Export and burning on a construction site is also forbidden. Temporary places of collecting garbage on a site which have to be noted properly have to be provided. Medical waste is taken out separately to specially taken away places.

Upon completion of construction all waste, and also temporary constructions and installations, unused materials have to be cleaned from a site. Any garbage shouldn't remain on a site from any construction activity.

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 m³ per annum.

Control of garbage removal is under responsibility of akimat. REP will agree on the maintenance of garbage for export on a dump. Export of waste in other places has to be coordinated with regional Akimat. Any dangerous or medical wastes are taken out separately on the coordinated dumps. REP bears responsibility for collecting garbage within the territory of the road and zones of service and its export in defined for this place. The garbage dump on the road and zones of service is forbidden. It is forbidden to burn garbage on the road or in service places if it isn't authorized local and national norms.

The question, concerning places of a stage of cattle and agricultural machinery is also considered in RAP.

8. INSTITUTIONAL REQUIREMENTS

The following section presents a description of the environmental management activities that will be undertaken as part of overall project implementation. The roles and responsibilities of various organizations in carrying out these activities are defined and the institutional strengthening activities that are required to allow those organizations to achieve their nominated roles and responsibilities are determined.

An environmental monitoring program will be prepared and the expenditures, associated with its implementation will be included in the Civil Works Contracts and consultancy supervision service project.

8.1 ORGANIZATIONS INVOLVED IN PROJECT

The institutions to be involved in the environmental management of the project are the following:

- Government of Republic of Kazakhstan(RK)
- Ministry of Investment and Development (MoID)
- Committee for Roads(CfR)
- International Bank for Reconstruction and Development (IBRD)
- Committee of Environmental Protection of the Ministry of Energy of RK
- «KazAvtoZhol NC» JSC – National Operator responsible for management of republican roads
- «KazakhAutoDor» RSE - Enterprise on roads operation and maintenance
- Project Management Consultant (PMC)
- Construction Supervision Consultant (CSC)
- Contractor
- Regional and local administration
- Affected communities

8.2 INSTITUTIONAL OBLIGATIONS

MoID bears responsibility for preparation, implementation and financing of environmental management and monitoring tasks as they pertain to the project. MoID will implement its functions through PMC which will be responsible for general project

execution, and which will be tasked with day-to-day project management activities, as well as monitoring.

Specialist staff will be assigned to the PMC to perform all tasks related environmental assessment. The PMC environment staff will be supported by the CSC (Construction Supervision Consultant). The CSC's team will include environmental specialist and social specialist. At the present time there are no permanent workers in the PMC, assigned to environmental assessment, management or monitoring.

Environmental supervision and monitoring tasks during implementation will be provided by

Environmental specialists, which are part of supervision consultant's and all included into project contracting organization team. The specialists will assist in all aspects of environmental planning and implementation (i.e. compliance with the requirements of the ESIA);

The consultation with Committee of Environmental Protection (CEP) under the Ministry of Energy of RK will be conducted during the feasibility study and detailed designing and also it will be required to confirm the project category. The CEP will be suggested to review the EIA and confirm the project for its environmental importance. Ongoing consultation with CEP will be required during the implementation of the project.

The rural communities and village leaders and organizations will assist in arranging meetings and submit information about affected communities and environmental impacts. An account of the process will be an integral part of the internal monitoring, prepared by PMC.

Responsibilities for the implementation of the monitoring requirements of this EIA are shown in Table 9.1 and Table 9.2 in accordance with the Environmental Management Plan, Monitoring and Institutional Responsibility of Chapter 9.

Implementation of mitigation measures during the construction stage will be the responsibility of the Contractor in compliance with the contract specifications and loan requirements. The Environmental specialists of project supervision consultant will supervise the monitoring of implementing of mitigation measures during the construction stage. The local ecologist will coordinate together with the international environmental specialist for resolving complicated issues that arise in this field and provide continuously updated information in order to submit reports to PMC and WB.

After project completion, MoID will be in charge of the operation and maintenance of the roads. PMC in cooperation with the district/regional administrations will conduct regular and occasional monitoring and sample analysis in CEP's analytical control laboratory in Astana as scheduled in the monitoring plan.

It is desirable that work acceptance after completion should include a full examination of the contractor's compliance with the specified requirements for the protection of the environment. This should include verification of the proper clean-up and restoration of all temporary work sites (quarries, camps, etc.) and of the proper landscaping, planting and draining of all borrow pits and spoil areas.

In the longer term, it is essential that the authorized bodies of road maintenance monitor the effectiveness of the erosion protection measures. The different phases of the implementation of the EIA on separate road sites are as follows:

(a) Planning of the road project with special account being taken of:

- areas with large excavations (cuttings) and embankments, and quarries for construction materials,
- soil reserves for embankments and dumping areas for spoil,
- storage areas for toxic waste and garbage,
- locations of temporary concrete plants and other material processing plants,
- contractors' camps,
- sources of water for construction purposes,
- temporary access roads and other temporary constructions,

(b). Obtain written agreement from local administrative authorities concerning spoil dumps, burial of garbage, contaminated soils and toxic substances.

(c). Obtain written permits (from local authorities, representatives of the environmental protection authority and sanitary inspector) concerning permanent and temporary land acquisition for road construction, quarries, spoil dumps, contractors' camps, concrete plants and other materials processing plant.

(d). Agreement of any changes with local institutions, responsible for irrigation system, if they are touched upon by the project.

(e). Agreement of the planning requirements for bridges and other structures in rivers or other water bodies with the agencies responsible for fisheries and the local representatives of the environmental protection authorities.

(f). Monitor (by measurement) emissions to the atmosphere and discharges into the ground during construction.

(g). Monitor (by measurement) vehicle emissions during the operation of the road.

(h). Monitor (by measurement) noise levels in towns and other settlements during construction, and the subsequent operation of the road.

(i). Monitor effects of construction-related vibrations, contractor to be responsible for any avoidable damage caused by himself. Contractors who do not comply with the legislative requirements must be held responsible for the violations and required to compensate for any damages caused.

9. ENVIRONMENTAL MANAGEMENT, MONITORING PLAN AND INSTITUTIONAL RESPONSIBILITY

9.1 Environmental Monitoring

Environmental monitoring is an essential tool in relation to environmental management as it provides the basis for rational management decisions regarding impact control. The very purpose of constructing the new dual carriage highway project is to contribute to the current and upcoming fast economic development of the country, and also to reduce present and potential traffic congestion and associated adverse impact along the existing Otar – Uzynagash road. In this regard the main objectives of environmental monitoring program are:-

To check whether the proposed environmental and social mitigation measures have actually been adopted, and are effective;

9.2 Monitoring type/forms and institutional responsibility

There are two basic forms of monitoring:-

Compliance monitoring:

It checks whether prescribed actions have been carried out and usually conducted by means of inspection by environmental specialist or enquiries.

Effects monitoring:

It records the consequences of activities on one or more environmental components and usually involves physical measurement of selected parameters or the execution of surveys to establish the nature and extent of induced changes.

In the case of the proposed road project, compliance monitoring is given more emphasis since most of the impact controls take the form of measures incorporated in project designs and contract documents, and the extent to which recommendations on these matters, as set out in the ESIA are complied with. It plays a major part in determining the overall environmental performance of the project. Internal and

The CSC as part of the overall supervision will carry out day to day environmental monitoring activities, in line with the ESIA requirements.

The Project Manager/Resident Engineer (RE) and the environmental supervisor will prepare monthly progress reports which also highlight environmental performances of the project work and submit it to Committee for Roads.

9.3 Monitoring Plan

Monitoring of EMP performance is a very important aspect at project realization taking into account requirements on environment protection to safeguard the environment.

In response to the environmental impacts identified during the study, an environmental monitoring plan has been developed and is presented in Table 9.1 and Table 9.2. The contract will contain a list of all required mitigation measures and a timeframe for the compliance checks. The monitoring will include supervision to check the Contractor's execution of Contract provisions during the construction.

The construction supervision consultant (CSC) in cooperation with MoID during project implementation will be required to:

- Have the Contractor develop site-specific ESMP for concrete lot. The CSC will use this monitoring plan as a basis for supervision of the Contractor's compliance with these ESMPs.
- Regularly control for environment monitoring conducting, and submission of quarterly reports: the main parameters to be monitored are outlined in Table 9.1 and 9.2. Usually the CSC provides an Environmental Specialist as part of the CSC team.
- Regularly prepare and submit quarterly reports based on the monitoring data and laboratory analysis report. The Contractor and the Supervision engineer will be responsible for data collection of environmental monitoring.

A lump sum budget is allocated to cover monitoring cost during construction phase of the project. PMC will hire a consultant for environmental monitoring and ensure that the road is monitored regularly during construction works.

The following measures will be taken to provide an environmental compliance monitoring program during project implementation:

- The contract documents will clearly determinate the contractor's obligations to undertake the environmental mitigation measures as set out in chapter 7 of this EIA and which shall be stipulated as enclosure to specifications;
- The recommended environmental mitigation cost should be included as an item in the Bills of Quantities. It will guarantee of specific environmental mitigation budget available, which will be conducted as required. During the procurement, Contractors will be encouraged to include these costs in their rates and present the mitigation cost as an item in the Bill of Quantities.

During construction, the Construction Supervision Consultant (CSC) in accordance with the Project Management Consultant (PMC) will control the compliance with the requirements of safety, health and environment.

9. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN, MONITORING AND INSTITUTIONAL RESPONSIBILITY: UZYNAGASH – OTAR ROAD SECTION

Table 9.1 PROJECT IMPACT DURING CONSTRUCTION - MITIGATION MEASURES, MONITORING AND RESPONSIBILITY

CATEGORY	POTENTIAL IMPACT	SIGNIFICANCE	LOCAL IMPACTS	MITIGATION	RESPONSIBILITY	MONITORING	RESPONSIBILITY	LONG TERM IMPACT
1. Airquality	<p>Air pollution:</p> <p>emissions from construction machinery and equipment, emissions from cement-concrete, asphalt-concrete plants, crushers, etc.</p> <p>Dust:</p> <p>from construction activity</p> <p>borrow pits and crushers</p> <p>transportationofmat erials</p>	Potentially significant, especially during dry season	<p>Generally in the main area of construction, the existing roads or bypass roads;</p> <p>Potential impact on adjacent villages</p> <p>Local influences on sites in Almaty and Zhambyl aren't predicted</p>	<p>All vehicles and the equipment used in construction have to be modern, be appropriately maintained and used according to recommendations of manufacturers.</p> <p>All access and bypass roads have to be watered.</p> <p>All plants/dust-generating equipment should be in good technical condition and be located at distance from sensitive zones.</p>	<p>The contractorshall bearstheresponsibility for implementation of mitigation measures.</p> <p>Supervision Engineer monitors the compliance with mitigation plan.</p>	<p>Regular (monthly) monitoring by sub-contracted licensed laboratories at designated sampling points and on-site compliance checks by Construction Supervision Consultant (CSC), Engineer and local environmental protection authorities.</p> <p>Parameters to be monitored include: NOx, Inorganic dust of SiO2, SO2, C and CO.</p> <p>Meteorological characteristics during sampling include air temperature, speed/velocity of emissions, atmospheric pressure, and air humidity.</p>	<p>Contractors</p> <p>Construction Supervision Consultant (CSC)/Engineer</p>	Long term impact is limited
2. Noise and vibration	Noise from construction machinery and	Potentiallysignificant	The area of construction, access and	All vehicles and the equipment being in use in construction have to be modern, regularly	The contractor shallbears responsibility for	Regular (monthly) monitoring of noise and vibration in	Contractors (through licensed	Nolongtermi mpact

	<p>equipment</p> <p>Noise from cement-concrete and asphalt concrete plants, crushers, etc.</p> <p>Transport noise on the access roads</p>		<p>bypass roads.</p> <p>Potential impact on nearby residential areas.</p> <p>Potential impact on the settlements and villages</p> <p>Local impacts on Almaty, Zhambyl sections are not predicted.</p>	<p>maintained and used according to recommendations of the manufacturers.</p> <p>All plants/noise making equipment have to be in good technical condition and located at distance from settlements.</p> <p>Any types of works during night time near residential areas of the villages/settlements of on Almaty and Zhambyl should be prohibited.</p> <p>Speed limit of 60 km/h for all construction equipment shall be enforced.</p>	<p>implementation of mitigation measures.</p> <p>Supervision Engineer monitors the compliance with mitigation plan.</p>	<p>specified places of project area undertaken by certified laboratory and Construction Supervision Consultant (CSC), Engineer and local authorities (EP and SES bodies) on-site.</p>	<p>laboratories)</p> <p>Construction Supervision Consultant (CSC)/Engineer</p>	
3. Water, drainage system and floods	<p>Pollution by a runoff from the construction sites in the areas of bridge construction is possible</p> <p>Infiltration of the polluted water in the water-bearing horizons</p> <p>Pollution of underground waters at pits/quarries (accidental spills)</p> <p>Pollution of surface and underground water sewage from camps.</p>	<p>Influence is from moderate to insignificant. Places of water intakes from wells (drinking water and technical water) will be agreed with Committee on Water Resources.</p> <p>Pollution of underground waters is unlikely as deep soil excavation isn't planned.</p> <p>Pollution from rotational camps can be from moderate to significant</p>	<p>Potential impacts in the area of surface water, located along the alignment (bridge construction).</p> <p>Potentially – all alignment</p> <p>Areas of location of the construction camps</p>	<p>CfR, Committee on water resources and Akimats of districts in consultation with contractors. The contractor shall provide water intake only from designated sources.</p> <p>Good management at construction sites.</p> <p>Areas of potential pollution of rivers will be designed to prevent accidental spills and runoff and protected by sedimentation pools.</p> <p>Sewage at construction camps will be collected in septic reservoir and transported/discharged at wastewater treatment plants.</p> <p>Careful organization works in water protected zone</p> <p>The construction of sediment traps</p>	<p>CfR, Regional Departments of the Committee of water resources (permits for water intakes) and Akimats of districts in consultation with contractors.</p> <p>The contractor shall bears responsibility for implementation of mitigation measures.</p> <p>Construction Supervision Consultant (CSC), Engineer monitors the compliance with mitigation plan.</p>	<p>Regular (monthly) monitoring by licensed laboratories at designated sampling points and on-site compliance checks by Construction Supervision Consultant (CSC), Engineer and Regional office of the Committee on Water Resources implement control on site.</p> <p>Parameters monitored include: pH, turbidity, general hardness, solid residue, chlorides, nitrate nitrogen, nitrite nitrogen, fluorine, insoluble matter.</p>	<p>Contractors (through licensed laboratories)</p> <p>Construction Supervision Consultant (CSC)/Engineer</p> <p>Committee of water resources</p>	<p>Long-term impacts are possible in case of not execution of mitigation measures</p>

				/ barriers to prevent stormwater				
4. Erosion and pollution of soils and subsoil layers	Soil erosion (wind and water) due to removal of vegetation and topsoil. Pollution of the soil and subsoil layers as a result of construction and accidental spills.	Potential impacts are low to medium (earthworks on the alignment and operation of borrow pits).	Local impacts are expected only in the areas of borrow pits and earthworks on embankment along the alignment.	All recommended methods on reduction and elimination of an erosion were included in the program of construction Construction methods on reduction or elimination of pollution of soils and subsoil layers. All temporarily used lands have to be restored and returned to agricultural use according to the legislation	The contractor shall bears responsibility for implementation of mitigation measures. Construction Supervision Consultant (CSC)/Engineer monitor the compliance with design impact reduction plan.	Contractors jointly with Construction Supervision Consultant through periodic (bi-weekly) visual checks.	Contractors Construction Supervision Consultant (CSC)/Engineer, the Committee for Roads	Erosion is possible if there is no proper management and prevention during construction.
5. Flora and fauna and the sensitive and protected territories	Impacts on vegetation along the alignment. Disturbance of fauna in the area of influence of the construction works	Potential impacts are Low to Medium Temporary disturbance of birds and animals in the immediate proximity to the construction sites, concrete plants, crushers or borrow pits is possible.	Moderate loss of planting. Illegal hunting is possible	Culverts, cattle underpasses and bridges will serve as crossing points for random wild animals. Hunting by workers around the project area will be prohibited.	The contractor shall bears the responsibility for implementation of the mitigation measures. Construction Supervision Consultant (CSC)/Engineers shall monitors the compliance with design impact reduction plan.	Regular monitoring of proper vegetation and topsoil management shall be carried out by the Contractor. Construction Supervision Consultant (CSC)/Engineer shall monitor the compliance with design impact reduction plan.	Contractors Construction Supervision Consultant (CSC)/Engineer Committee of forest management and wildlife	No significant long-term impact on flora and fauna is expected
6. Social / Economic / Farmers	Land loss/ land acquisition . Possibility of employment during construction Inconvenience for farmers (cattle	Potential impacts are low to moderate Employment opportunities emerge for local population Potential impacts on farmers (animal	There are cases of land (open space land) acquisition along the alignment	Land acquisition will be carried out according to the legislation of Kazakhstan and Resettlement Action Plan (RAP) Encouragement of hiring of local labor Consideration with local population on additional cattle	Contractors Akimats	CfR, Akimats/local authorities and contractors	Regular monitoring of possible impacts on farmers shall be carried out by Construction Supervision Engineer Committee for	Long-term consequences are possible if cattle crossings are not built

	crossing the road) Loss of trade along the road	husbandry)		crossings as required Compensation for loss of income should be paid or other appropriate mechanisms will be put in place according to the legislation of Kazakhstan and RAP			Roads will monitor the compensation payment to the affected persons.	
7. Historical and archaeological monuments	73 objects of historical and cultural heritage are revealed within the boundaries of right-of-way, including: -3 objects of archaeology monuments (## 3, 9, and 27); -1 object is modern cemetery (# 18); -23 objects are modern commemorative monuments.	Potential indirect impacts on burial ground along the road	Potential indirect impacts on archaeological monuments if they are found	During road reconstruction it is necessary to observe protective zone not less than 50 m from objects boundaries. Archaeological monuments should be fenced to secure protection. Memorial place marks will be relocated in coordination with local authorities. Other historic places outside Right of Way, but within 2 km from the route have to be protected from plunder and destruction. Key mitigation measures include avoidance, graphic, photo and video fixation, full archaeological survey/excavation and recovery to museums, if feasible. If the impact cannot be avoided, following the archaeological survey the monuments will be removed from the List of State Registration of Monuments. Contractors shall observe the	The contractors will be responsible for fencing of the archaeological monuments, burial grounds if they are found in the area of construction. In case burial mounds identified by the preliminary survey of PCR can be damaged by works, they will have to undergo full archaeological survey (excavations). Following the completion of the survey, historical and cultural finds obtained during the survey will be preserved and transferred to the possession of state museums.	Construction Supervision Consultant (CSC)/Engineer, local authorities and authorized representatives of the Department of Cultural Heritage and Art of the Ministry of Culture and Sport	Construction Supervision Consultant (CSC)/Engineer and authorized representatives of the Department of Cultural Heritage and Art of the Ministry of Culture and Sport	Provided that all laws will be observed and the specified archaeological sites will be fenced and memorial place marks relocated, long-term influence is not expected.

				appropriate procedures in case of chance finds. According to legislation of Kazakhstan, in case of chance finds during the construction - works will be immediately stopped, for survey, record and excavation. Clauses on “Chance finds procedure” will be included in construction contracts.				
8. Traffic safety	The intensity of traffic on the main road can affect the traffic safety.	Potential impact is from low to medium	Road sections, located close to settlements and places of access/bypass roads joining the main road	<p>Road safety measures will be designed and implemented with input from stakeholders through consultations, paying specific attention to the possible different needs of men and women. The measures will include, but not be limited to:</p> <ul style="list-style-type: none"> • Speed limit enforcement • Correct road marking and signage shall be installed • Organization of additional crosswalks, if necessary. 	Committee of road traffic police	Regular (daily) monitoring and reporting of any accidents and complaints by local population or other actors.	<p>Construction Supervision Consultant (CSC)/Engineer</p> <p>Committee of road traffic police MIA RK</p>	Nolong-term impacts
9. Waste management	Generation of the construction debris and household wastes which are subject to landfill disposal.	Potential impact is low to medium	Potential impacts near construction camps	<p>Construction debris will be used (if technically possible) for construction of embankments.</p> <p>Household waste regularly to be disposed at designated landfills.</p>	Contractor together with local authorities	Construction Supervision Consultant (CSC)/Engineer should carry out regular monthly monitoring of sites and activities on	Construction Supervision Consultant (CSC)/Engineer and local authorities	Provided that all waste will be taken out to designated landfills, long-term impacts aren't expected

				Various waste streams will be separated on construction site or other locations (construction camps, batching plants, etc.).	Contractors and sub-contractors.	waste management		
10. Borrow pits/quarries and access roads	<p>Quarries/Borrow pits:</p> <p>Local violations in environment, especially dust and noise from equipment and vehicles.</p> <p>Inconveniences for agricultural activity</p> <p>Access roads:</p> <p>Inconveniences for agricultural activity</p>	<p>Potential impacts are possible. Existing pits have been already defined, but additional borrow pits will be needed.</p> <p>Location of access roads have to be coordinated with local authorities within 2 weeks after the beginning of works.</p>	Considerable local impacts near pits and access roads are possible.	<p>Location of borrow pits and access roads have to be coordinated prior to commence the works</p> <p>Only approved pits can be used, together with the plan of works on closing and reclamation</p>	<p>Contractors</p> <p>Territorial administration Committee for construction, housing and utilities infrastructure and land management of RK</p>	Regular monthly and special monitoring of any influences, cases and complaints	Construction Supervision Consultant (CSC/Engineer), and local authorities	Provided that impacts are mitigated properly, long-term influences aren't expected.
11. Health and Safety	Air pollution, noise, risks of working environment	Medium	<p>Generally in the main area of construction, the existing roads or bypass roads;</p> <p>Potential impact on adjacent villages</p>	<p>Compliance with Health and safety requirements according to legislation of the RK and the World Bank Group Environment, Health and Safety Guidelines (EHSGs). In case the World Bank requirements and Kazakhstan national laws/standards differ, the more stringent requirements will prevail. This includes application of the EHSGs for noise, air quality</p>	Contractors	Regular (daily) monitoring of personal safety of workers	Contractors Construction Supervision Consultant (CSC)/Engineer	No long term impact

				and other parameters as referred to in OP 4.01.				
12. Construction Workers Camps	Increased public & workforce health problem, especially transmittable diseases such as HIV/AIDS and STD	Medium	Generally in the main area of construction, the existing roads or bypass roads; Potential impact on adjacent villages	<p>Issue workers code of conduct, training and awareness creation campaigns on the spread and transmission of STDs and HIV/AIDS for construction workers and local communities living close to the construction camp sites.</p> <p>Provide free distribution and provision of condoms to construction workers by the Contractor to avoid the spread of STDs and HIV/AIDS</p> <p>Put educational posters and flyers on HIV/AIDS, using local languages at public gathering locations, bus terminals, schools and by road sides to minimize the spread of HIV/AIDS.</p> <p>Sanitation, and any training requirements of construction workers in accordance with the Kazakhstan laws</p> <p>Monitoring and Evaluation HIV/AIDS Program:</p> <p>Proper storage and handling of hazardous substances and provision of protective clothing for workers.</p> <p>The construction contract must include a clause to the</p>	Contractors	Regular (daily) monitoring of personal safety of workers	Contractor, Construction Supervision Consultant (CSC)/Engineer and local authorities Specialist in HIV/AIDS & STD program	No long term impact

				effect that the contractor must provide a first-aid post at the base-camp, and is staffed on a full-time basis by a fully qualified paramedical attendant. Simple first aid materials, suitable for dealing with minor injuries should be available at all times, at all worksites; etc.				
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Table 9.2: IMPACT DURING OPERATION; MITIGATIONS MEASURES, MONITORING AND RESPONSIBILITY

CATEGORY	POTENTIAL IMPACT	SIGNIFICANCE	LOCAL IMPACTS	MITIGATION	RESPONSIBILITY	MONITORING	RESPONSIBILITY
1. Air quality	Emissions on road from transport Emissions from activity of repair and road maintenance	Insignificant provided that vehicles are in good condition	Potential impact on adjacent sections in Almaty and Zhambyl oblasts; Other local effects are not expected	All vehicles shall correspond to emission standards All technique for repair and road maintenance corresponds to emission standards Regular monitoring close to living zone for determination of requirement of additional measures on mitigation	Committee for Roads, Environmental Regulation and Supervision Committee of Almaty and Zhambyl oblasts	Monitoring of air quality (N2, NOx, CO2, CO, C, hydrocarbons) near residential areas and other areas if necessary. Monitoring frequency will be determined based on monitoring data on traffic intensity.	The Contractor during guarantee period
2. Noise	Emissions on road from transport Emissions from activity of repair and road maintenance	Insignificant provided that vehicles are in good condition	Potential impact on adjacent sections in Almaty and Zhambyl oblasts; Other local effects are not expected	All vehicles shall correspond to noise standards Old and disabled vehicles shall not be on the road Compliance with minimum and maximum speed limits All technique for repair and road maintenance corresponds to noise	Committee for Roads, Ecology department of Environmental Regulation and Supervision Committee and SES of Almaty and Zhambyl oblasts	Monitoring near residential areas and other areas if necessary. Monitoring frequency will be determined based on monitoring data on traffic intensity.	The Contractor during guarantee period

				standards			
3. Water, drainage and flooding	<p>Sustainability of water sources for operation</p> <p>Flood</p> <p>Pollution of surface and underground waters because of activity on road and rest/service places</p>	<p>Potential local impact</p> <p>Pollution will not be significant, if the road is in effective management.</p>	No specific local impacts	<p>Maintain the drainage system in operating condition</p> <p>Good management and maintenance of the road will provide the normal flow of watercourses.</p>	<p>Committee for Water Resources</p> <p>«Kazakhstanotor» RSE</p> <p>Local executive bodies</p>	<p>Monitoring of underground waters and drainage within the right of way of the alignment</p>	Committee for Water Resources
4. Flora and Fauna on and natural protected territories	<p>Long-term effects on animals, especially on migration and movement routes</p> <p>Disruption dispersion of flora and fauna from use of salt and chemicals for snow and ice melting</p> <p>Increase of illegal hunting because of large availability is possible</p>	Low impact	No specific local impacts	<p>Cattle passes will serve for wild animals crossing (will be included into the project)</p> <p>To study the requirement of additional crossings through pipes and under bridges for large mammals.</p> <p>To control and prohibit the illegal hunting</p>	<p>Oblast territorial inspection of Forestry Department and animal world</p>	<p>Committee for Roads, Committee for Forestry and Fauna, as well as oblast administration will monitor the situation based on information on numbers of accidents associated with wild animals.</p>	<p>Oblast territorial inspection of Forestry Department and animal world</p> <p>«Kazakhstanotor» RSE together with region administration monitors the requirement in additional points of road crossing for mammals.</p>
5. Social and economic farmers	<p>Increase of economic activity due to road improvement.</p> <p>Opportunity for permanent work in road maintenance</p> <p>Opportunity for business and employment in zones of roadside service</p> <p>Some disruption of the farmers activity who got in under the land acquisition for the road construction.</p>	<p>Significant economic and social profits</p> <p>Some adverse effects on farmers activity due to use of overpasses for cattle pass crossing and agriculture technique.</p>	<p>No specific local impacts, except agriculture and ranchland.</p> <p>Villages along the existing road</p>	<p>To conduct informative events for local community, about how to get a benefit from improved highway</p> <p>To consider additional cattle passes and passages for agriculture technique as necessary and at the request (see mitigation measures)</p>	<p>Local executive bodies and «Kazakhstanotor» RSE at necessary considers additional points of crossings (bridges) together with local community, if it is necessary</p> <p>Akimat/local executive bodies</p>	<p>Monitoring of adverse impacts on local community and farmers</p> <p>Communication with affected people will be supported for checking of compensation payment or other compensations form.</p>	Administration of regions and Zhambyl and Almaty oblasts

6. Road traffic safety / Aesthetic	Increase of disastrous occurrences Danger for pedestrians, insufficient of cross walks	Low /average level of influence	Usual crosswalks, crossing road highway	Special measures in the project will reduce the risk of accidents: dividing strip, good visible, limited access exit, warning signs and etc.. There will be several settlements not far from the road and small amount of pedestrians crosswalks near the road or road intersection.	It will be included into the project.	Monitoring and registration of all road accidents	«Kazakhautodor» RSE
7. Waste management	Waste from road maintenance and from rest/service areas / problems of collection and waste removal	Weak impact	In rest and service zones	Committee for Roads shall provide regular cleaning and collection of all liquid and hard wastes and utilization in accordance with accepted rules and procedures .Company on road operation will bear responsibility for waste collection from rest and service areas.	«Kazakhautodor» RSE and Environmental Regulation and Supervision Committee	Regular monthly monitoring of the sections and collection and waste reduction.	«Kazakhautodor» RSE

10. DISCLOSURE OF INFORMATION, CONSULTATION AND PUBLIC HEARINGS. PARTICIPATION OF PARTIES AND GRIEVANCE MECHANISM

In the settlements, located along passing of road section, public hearings and consultations of stakeholders have to be held for the purpose of studying with the general details of the project and to discuss the effective points, concerning ecology and social aspects, to learn wishes and recommendations of stakeholders, which subsequently have to be included in ESIA and RAP. Public hearings had been carried out on March 31, 2015 in Samsy and Targap villages of Zhambyl region of Almaty oblast.. On a site of the road in Almaty oblast in Sarybastau settlement designers conducted public hearing on July 21,2015.

Additional public hearings and consultations of Stakeholders will be held on the basis of ESIA with participation of people from the nearby settlements and local settlements, located along a site of the road. Thus, upon completion of the ESIA updating (and also after comments of Bank), the document (ESIA) will be necessary to publish and organize public hearings.

Consultation at a stage of preparation was carried out in the form of interview with local residents, discussions and meetings. The following persons were involved in process of consultations during preparation of the project:

- a. Head of households likely to be affected
- b. Householdmembers
- c. Community
- d. LocalAkimat
- e. Major project stakeholders such as women, highway user groups, health workers

During public hearings information brochures weredistributed. Brochures were developed by PMC consultant and it includes the general description of the project, the general explanation of processes, the rights of owners and land users, the list of category of compensation, payment and grievance mechanism, and also contact information. These brochures and other information, concerning the project, will be available in all oblast and regional akimats where each stakeholder can visit and receive the information of interest.

At a design stage and project implementation more informal consultations will be held by:

- The preparation and distribution of brochures both in Kazakh and Russian, with project description, worksand supposed timing of works execution; and
- Setting up a formal Grievance Redress Committee with a representation from the local community. The Project supervision Consultant in association with the Contractor will be responsible for managing the effective grievance redress program.

At the designing stage, the Committee for Road of MoID RK and Akimats of Almaty and Zhambyl oblasts and the PMC consultant will consult with the potential affected land owners of the various villages along the proposed route of Uzynagash - Otar.

During the consultations of designers with local habitants all technical parameters of the road, drawing of the proposed works, the expected benefits, expected impacts, including the expected mitigation measures, the number of underpasses, design solutions for abutment design of bypasses, junctions and underpasses for the needs of owners of land and farms, the placement of production base and a testing ground for debris removal is determined, the possibility of the use of water for

technological needs of the nearest water bodies, information on land set aside for farms within the area of construction of the road have been considered.

Upon completion of design on road sites taking into account design decisions the Environmental Management Plan (EMP) will be developed for separate sites / lots. EMP will determine terms, frequency, duration and cost of actions for mitigation of impacts on environment in graphics of realization and will unite these actions with the full plan of project work. EMP will include the Plan of monitoring by means of which control of impacts on environment and introduction of measures for mitigation during construction will be executed. EMP on each of sites/lots will be translated both into Russian and Kazakh languages and are published on the website of the project, Committee for Roads and the relevant regional akimats. EMP will be published in English on the WB site. Also, on each EMP public consultations in the region of the project will be organized.

10.1 INSTITUTIONAL RESPONSIBILITY AND GRIEVANCE MECHANISM

The Project Management Consultant (PMC) will play a key role in the organizational setup for Resettlement and Lands Acquisition Management during Project implementation. According to the PMC's Terms of Reference (TOR) there will be two social safeguards specialists (One International and one National) working in the PMC for the duration of the Project. Part of their duties and responsibilities will be the management of implementation of this ESIA and RAP.

The PMC will carry out an independent assessment of the land acquisition process to inform the Committee for Roads and World Bank and prepare one final report on external monitoring and evaluation of resettlement and submit to the World Bank.

10.2 GRIEVANCE REDRESS MECHANISMS INCLUDING GRIEVANCE DURING CONSTRUCTION

Guideline on Grievance Redress Mechanism (GRM Guideline) is designed and approved in 2014 by Committee for Roads MoID RK for all road sector projects. GRM Guideline is intended to be used as a guidance document for stakeholders involved in design, preparation and implementation of road projects, and complements grievance redress requirements incorporated in the loan agreements, as well as environmental and social safeguard documents (in case of projects funded by IFIs).

The overall objective of the GRM Guideline is to establish an effective communication channel among the stakeholders for providing a timely and efficient two-way feedback mechanism to address any complaints made about the project, including those from members of the communities, local businesses and other stakeholders, as well as raising public awareness on the projects and on the availability of a GRM mechanism. The Grievance redress procedure suggests resolution of grievances in the spirit of mediation between the parties, and should comply with the spirit of IFI standards and practices.

The GRM will be available for those living or working in the areas impacted by the project activities. Any person impacted by or concerned about the project activities will have the right to participate in the GRM, will have easy access to it, and will be encouraged to use it. The proposed GRM does not replace the public mechanisms of complaint and conflict resolution envisaged by the legal system of the RK, but attempts to minimize use of it to the extent possible.

10.3 GRIEVANCE REGISTRATION

Complainants or stakeholders may visit Akimats, call or send a letter or e-mail or fax to grievance focal point, at CSC, GRC Coordinator and CfRMoID RK to register their grievances related to road sector projects. Receipt of grievances received through a letter or e-mail or fax shall also be acknowledged through

a letter / e-mail / fax within 3 working days upon receipt by GRC coordinator at regional level. Receipt of grievances lodged in person or via phone will be acknowledged immediately.

Complainants or stakeholders may visit, call or send a letter or e-mail or fax to community Akimat, grievance focal point at CCs and CSCs, GRC Coordinator at CoRMoID RK to register their grievances related to road sector projects. Receipt of grievances received through a letter or e-mail or fax shall also be acknowledged through a letter / e-mail / fax within 3 working days upon receipt by GRC coordinator at regional level. Receipt of grievances lodged in person or via phone will be acknowledged immediately.

Each project level party participating in the GRC at regional level shall maintain a record-book to register the complaints, and regularly share the grievance details with GRC coordinator at regional level, in order to keep the track of grievances and the status of their resolution. The GRC coordinator at the regional level shall coordinate with each member of the GRC on a weekly basis, collect relevant documents, maintain a consolidated registry of complaints received, follow-up on the status of resolution of each complaint received, maintain an up-to-date grievance database and provide relevant reporting.

Whichever method is used for receiving the grievance (e.g. e-mail, mail, fax, call, etc.), its registration will be made by the GRC coordinator at the regional level, who will acknowledge receipt and follow up with the grievance investigation and consideration by the GRC at regional level. All the grievances will be recorded in a standard format, which will include but not limited to the following details:

- Contact information of the affected party;
- Date, time, and place where the complaint was received;
- Name of the person who received the grievance;
- Details of the grievance.

The project will pursue a participatory approach in all stages of planning and implementation. This is expected to ensure that the affected people have nothing or little to complain about. However, some people may still remain dissatisfied for some reason or the other. Many grievances arise due to inadequate understanding project policies and procedures, and can be promptly resolved by properly explaining the situation to the complainant.

In case the complainant refuses to provide contact details or no contact information is available in the grievance received by e-mail / mail / fax, the GRC at the regional level will consider the anonymous complaint. In such cases, the printed response will be posted at the information board of the KazAutoZhol's respective regional branch, as well as at the information board of the relevant Akimat, so as the complaining party can approach and get familiarized with the feedback.

The GRC coordinator at regional level will collect the data on grievances and centralize the grievance registry to assure that every affected person, group or community has an individual registry number and that follow-up and corrective actions are implemented as per resolution provided, or if the issue was not resolved at regional level, it is passed for consideration at the central level. The grievance database will be maintained and updated on a bi-monthly basis by the GRC coordinator at regional level for each project. The database will be designed to make it simple and easy to input data, provide information on grievance and status of its resolution, timeline for resolution and level at which the issue was considered and resolved, track individual grievances, etc. The grievance database will specify details of grievance resolution and include information on satisfaction of complaining party by the resolution provided (excluding the cases of grievance lodged anonymously). Where it will not be possible to resolve grievances to the satisfaction of both parties, appropriate information will be reflected in the database. The GRC coordinator at regional level for each project will share the grievance database with the safeguard specialist of KazAutoZhol central office / GRC coordinator at central level, who will maintain and update the centralized grievance database for all road sector projects.

10.4 GRIEVANCE PROCESSING

Depending on the nature of grievance, this step may include verification, investigation, negotiation, mediation or arbitration, coordination with appropriate agencies and decision-making. Verification includes gathering of documents, proofs and facts, as well as clarifying background information in order to have a clear picture of the circumstances surrounding the grievance case. Verification will be undertaken by members of the GRC at the regional level, and overall coordination of activities will be ensured by the GRC coordinator on regional level. Results of verification or fact-finding activities will be presented at the meeting of the GRC at regional level, where the issue will be considered and resolution will be sought.

The GRC at regional level will discuss the grievance case within ten working days and recommend its settlement to parties. Meetings of the GRC at the regional level will be held on a bi-monthly basis; however, special ad hoc meetings can be arranged in between of regular meetings as needed. The GRC coordinator at regional level will ensure that actions and decisions are properly documented in order to demonstrate that the GRC at regional level is providing an appropriate attention to the grievance and is actively seeking ways to obtain resolution that could satisfy the parties.

If grievance cannot be resolved by the GRC at the regional level and is passed for consideration by the GRC at the central level, appropriate documents collected during investigation and fact-finding shall be shared with the GRC coordinator at the central level. The GRC coordinator at the central level will circulate such documents among the members of GRC at central level, to ensure that they are aware of all relevant details prior to GRC meeting.

Consideration of grievance case by GRC at central level may require further verification of the issue, including gathering of additional documents, obtaining input from various state stakeholders and project parties in order to have a clear picture of the circumstances surrounding the grievance case. Additional verification will be undertaken by members of GRC at the central level (as needed), and overall coordination of activities will be ensured by the GRC coordinator at central level. Results of verification will be presented at the meeting of GRC at the central level, where the issue will be considered and resolution will be sought.

The GRC at the central level will discuss the grievance case within twenty working days and recommend its settlement to parties. Regular meetings of GRC at central level will be held on a monthly basis; however, special ad hoc meetings can be arranged in between of regular meetings as needed.

If following its consideration by the GRC at central level, the grievance cannot be resolved to the satisfaction of the parties, the recommendation will be made to seek resolution through the courts. Irrespective of the outcome of grievance consideration, documentation regarding the case by the GRCs at regional and central levels will be collected and maintained by GRC coordinator at central level (with input from GRC coordinator at regional level). The GRC coordinator at the central level will keep a separate track of cases, which were not resolved through GRM and were referred to the RK legal system.

10.5 DISCLOSURE OF GRIEVANCE REDRESS PROCEDURE

The grievance redress procedure information for the project will be disseminated through information leaflets and brochures, and presented during the project related meetings and public consultations. During these gatherings, it should be emphasized that the informal GRM is aimed at quick and amicable resolution of complaints and does not substitute the legal process established under national legislation.

At the beginning of each project (commencement of construction at each section of the road) community consultation shall be carried out by CCs and CSCs under the coordination and supervision of the GRC coordinator at regional level to ensure people's awareness of the availability of the GRM, steps of grievance resolution as well as contacts and locations of focal points to be approached in case of grievance. CCs, CSC, PMCs, CfR, MoID RK regional branches and Akimats, as well as NGOs and professional mediators are considered as the key actors of the GRM and play a crucial role in disseminating the information on GRM

and facilitating quick and amicable resolution of complaints. The GRC coordinator at the regional level shall coordinate information dissemination activities on GRM, and ensure that the posters providing details on GRM and contacts of grievance focal points at CCs and CSCs, GRC coordinator at regional level are posted in publicly accessible and visible places at every construction site and in every affected community. In addition, the information on GRM (leaflets, brochures), including contact details grievance focal points at CCs and CSCs, GRC coordinator at regional level, should be available at the offices of CCS, CSCs, PMCs, Akimats, CoR.

In the areas populated by minority groups meetings shall be held and information leaflets shall be provided in the linguistically appropriate manner, if the language used by the minority group is different from official language of RK.

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APPENDICES:

APPENDIX - 1

MINUTES OF PUBLIC HEARINGS

MINUTES

of public hearings on object: "Western Europe – Western China" international transit corridor", "Uzynagash-Otar section" of "Almaty-Kordai-Blagoveschenka-Merke-Tashkent-Termez", Km 63-101, Km 101-143"

Sarybasatuvillage, Almaty oblast

Zhambyl region July 21, 2015

ATTENDED:

- | | |
|-----------------|---|
| Ertas N.E. | - Deputy Akim of Zhambyl region |
| Zhumadilov R.A. | - Mains Specialist of Almaty oblast branch
NC "KazAutoZhol" JSC |
| Anisimov V.V. | - Headman of Road department
"Kazdorproject" PSI" LLP Astana |
| Tylyayev S.V. | - Road department MPI
"Kazdorproject" PSI" LLP Astana |
| Sharipov Zh.S. | - Headman of Road department
"Kazdorproject" Almaty |
| Kulinov I.A. | - Road department MPI
"Kazdorproject" Almaty |
| Daniyarov A.M. | - «Department of passenger transport and road of
Zhambyl region» SE Head |
| Adamin A.S. | - State ecological inspector of Almaty oblast
department |
| Bazarbayev M.E. | - Deputy of oblast maslikhat |

- | | |
|------------------|--|
| Abdizhanov D.D. | - Akim of Akterek rural district |
| Kartambayev E.M. | - Akim of Samsin rural district |
| Abdibayev A. | - Main architect of Zhambyl region |
| Baibamanov D. | - Deputy head of land matters
of Zhambyl region |

Inhabitants of Zhambyl region are also presented (more than 30 people).

Chairman of PH – Ertas N.E.

Secretary of PH – Kloken-Gammer I.V.

AGENDA

Acquaintance of local population with technical characteristics of "Uzynagash-Otar" road of km 63-101, km 101-143.

a. The representative of the Employer of AOB NC "Kazavtozhil" - Zhumadilova R.A. acquainted attendees with "Western Europe-Western China" reconstruction project of "Uzynagash - Otar" section km 63-101, km 101-143 and reported, that in connection with increase of transport stream and because of the insufficient capacity of the road it would be necessary to provide reconstruction of the existing road under Ib category. After it was offered to make the report of representatives of project designers of "Kazdorproject" LLP Astana and "Kazdorproject" LLP of Almaty.

"Kazdorproject" LLP MPE Kulinov I.A. performed with report. Slides of the reduced plan of Otar-Uzynagash of km 101-143 are presented, the approved typical transversal profile of a/r under Ib category, average daily intensity of the traffic by years of "Otar-Uzynagash", "Uzynagash-Otar" roads, access way of "Akterek-Chilbastau", about expediency of broadening of the road on the left side on the road course, site flattening variant on km 101-103, the arrangement of turnback in the form of a bow at access way of "Akterek-Chilbastau", "Kopa-Degeres", the arrangement of rest areas, the arrangement of additional cattle passes, also detail design of roadside service complex of category B on 128 km has been presented.

Also «Kazdorproject PRI» LLP MPE Tyulyaev S.V. performed with report. At public hearings slides of the road passing plan Uzynagash-Otar km 63-101 with bypass of two settlements of Samsy and Targap villages has been presented, approved typical variant of rest areas with their preliminary location, cattle pass arrangement with possibility of agriculture technique passing, turnback areas arrangement in places of settlements bypass, and also Ungurtas junction region, and also detail design of REU complex has been presented. The representative of «Kazdorproject PRI» sounded the main technical characteristics of the road, and also the site and characteristics of elements of road arrangement.

b. Discussion of the questions concerning local population.

1. Question: Whether the cattle pass on section, km 63-101 km 101-143 will be provided?

Answer: In places of cattle passing through the road the additional cattle passes will be arranged.

2. Question: Whether passes for agricultural machinery on km 63-101 will provided, and in which places?

Answer: Yes, passes for agricultural equipment will be arranged on agreement of location with akims of rural districts.

3. Question: What gabarites at a cattle passes, whether will agricultural equipment pass there?

Answer: Width is 8,0 m, height is 5,6 m.

4. Question: In which year construction of the road will begin?

Answer: Beginning of realization is in 2016.

5. Question: What quantity of workplaces will REP provide?

Answer: Approximately 60 workplaces.

6. Question: How entrance and departure will be carried out to the main highway from settlements in bypass region?

Answer: To the designed road adjunctions from existing roads with turnback sites arrangement will be arranged, the existing road will be used for needs of local population.

7. Question: Whether compensation will be paid to land users on a leasehold basis?

Answer: Yes, agricultural production losses will be paid to land users.

8. Question: On what removal from Samsy and Targap villages will be the new road passed?

Answer: Near Samsy village the road will pass on removal of 400-500 meters, and in area of Targap village about 200 meters.

9. Question: Whether it will be possible to organize roadside trade and service on the new road?

Answer: Yes, it is possible. On rest areas, which will settle down in the maximum proximity from settlements, the additional subgrade for construction of facilities of roadside service will be poured out. Areas will be lit and equipped with TS with possibility of connection.

Having discussed and having exchanged with opinions, general meeting of public hearing solved: The road reconstruction is very timely and should start expediently. Local land users and cattle owners have to discuss with rural Akimats the places for cattle underpasses and underpasses for agricultural machinery.

Chairman of public hearings

_____ Ertas N. E.











Secretary of public hearings

_____ Kloken-Gammer I.V.

List of Participants of the Public Consultation for «Otar-Uzinagash» reconstruction of the road,
Road Project «Center-South»

Список участников общественных слушаний участка автодороги «Отар-Узынагаш» по проекту
реконструкции автомобильной дороги "Центр-Юг"
"Отар-Узынагаш" автомобиль жолы бойынша Орталык-Оңтүстік автомобиль жолдарын жанарту жобасы
бойынша қоғамдық тыңдаудың қатысушылардың тізімі

Sarybastaу, May 27, 2016 С. Серымбетов, 27 мамыр 2016 ж. Сарымбетов

№	Name, Surname Ф. И.О. А.Т.Ж.	Occupation Место работы Жұмыс орыны	Contact details (phone, e-mail) Контактные данные (тел. эл. адрес) Байланыс ақпарат (тел., эл. мекен-жайы)	Signature Подпись Қолы
42	Джанбаев М.Т	Беріктес орын	+77772222088	
43	Бағдарбаев Н.И.	Ауыл кеңесі - 4 бөлме	8701296 9292	
44	Усембаев К.Т.	судым жаны қонақ үйімен домей	8777827 1883	
45	Бейбүтенов А.Е.	саяхаттасушы	87017253070	
46	Камсаметова Н.Р	Сарымбетов	87714942805	
47	Аманова Н.Р	Сарымбетов	87776891915	
48	Аманбаева Ч.Б.	Сарымбетов с.м.	87051308993	
49	Семанов Ж.	Сарымбетов с.м.	87074394049	
50	Саманов Ж.И. Картобаев	Саманов	87014140677	
51	Джамбаев Н.К	Джамбаев	8777666 2973	

APPENDIX - 2

REPORT OF ARCHAEOLOGICAL EXPERTISE

«Archaeological expertise» LLP
Republic of Kazakhstan

ARCHAEOLOGICAL

EXPEDITION

Conclusion of archaeological expertise

No. AEC-26 dated June 17, 2015

This conclusion of archaeological expertise¹ (Hereinafter - Conclusion) is made by results of archaeological expertise, which purpose was identification of archeology monuments, located on the territories, allocated under reconstruction of «Western Europe – Western China» corridor, «Uzynagash-Otar» section of «Almaty-Kordai-Blagoveschenka-Merke-Tashkent-Termez» road of republican value, km 143-159.

Archaeological expertise (Hereinafter – «Expertise») has been carried out in accordance with Law of the Republic of Kazakhstan dated July 02, 1992 «About protection and usage of historical and cultural heritage objects»¹, according to standard Practice of archaeological expertise carrying out, based on input information, received from «SK ENGINEERING» LLP.

Basis for Expertise carrying out:

«Western Europe – Western China» corridor reconstruction, «Uzynagash-Otar» section of «Almaty-Kordai-Blagoveschenka-Merke-Tashkent-Termez» road of republican value, km 143-159 (Hereinafter – «Road»).

Employer: «SK ENGINEERING» LLP.

Originator: «Archaeological expertise» LLP.

Expertise territory:

Expertise has been carried out in Zhambyl oblast within right-of-way of lands, allocated under Road reconstruction, making 70 m to the right and 70 m to the left from axis of an existing road (Hereinafter – «Right-of-way»).

Expertise purpose:

Determination of existence or absence of historical and cultural heritage objects on expertise Territory and preparation of recommendations on protective measures with respect to revealed archeology monuments.

¹Article 39 of the Law of RK dated July 2, 1992 No. 1488-XII «About protection and use of historical and cultural heritage»:
C.1. Research works on reveal of historical and cultural heritage objects have to be performed at territory development before right-of-way of land plots. C.3. Works carrying out, which can create a threat of existence of historical and cultural heritage objects is forbidden.

Conclusion:

During expertise carrying out on expertise Territory historical and cultural heritage Objects have not been revealed.

Recommendations:

In connection with concealment of some archeology monuments in earth, and consequently objective impossibility of their reveal during archaeological expertise, at Road construction, in accordance with Law of RK dated July 02, 1992 «About protection and usage of historical and cultural heritage objects»², it is necessary to exercise vigilance and caution; in case of finding out remains of ancient structures, artifacts, bones and other evidences of ancient material culture, it is necessary to stop all construction works and inform about findings the local executive bodies or «Archaeological expertise» LLP.

From Originator:

*Director, magister
of Historical Sciences*

(Signature) Umarhodzhiyev A.A.

Scientific Coordinator

Zaibert V.F., d.h.s., prof. of archeology (Stamp)

Originators:

Magzumov A.M., *bachelor of history, ecology*
Ilderyakov N.N., *magister of archeology and ethnology*
Fofonov K.A., *bachelor of architecture*

¹Conclusion of archaeological expertise No. AEC-26 dated June 17, 2015, prepared by «Archaeological expertise» LLP by order of «SK ENGINEERING» LLP, according to contract conditions no.5 dated June 15, 2015 Conclusion is made on two pages, in Russian

²Article 39 of Law of RK dated July 2, 1992 No. 1488-XII «About protection and use of historical and cultural heritage». C.2. In case of findings of objects, having historical, scientific, artistic and other cultural values, physical and juridical bodies are obliged to stop further works conducting and inform the authorised body.

«Archaeological expertise» LLP

Republic of Kazakhstan

ARCHAEOLOGICAL

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Conclusion of archaeological expertise

No. AEC-24 dated June 12, 2015

This conclusion of archaeological expertise¹ (Hereinafter - Conclusion) is made by results of archaeological expertise, which purpose was identification of archeology monuments, located on the territories, allocated under reconstruction of «Western Europe – Western China» corridor, «Uzynagash-Otar» section of «Almaty-Kordai-Blagoveschenka-Merke-Tashkent-Termez» road of republican value, km 101-143 (Hereinafter – «Road»).

Archaeological expertise (Hereinafter – «Expertise») has been carried out in accordance with Law of the Republic of Kazakhstan dated July 02, 1992 «About protection and usage of historical and cultural heritage objects»¹, according to standard Practice of archaeological expertise carrying out, based on input information, received from «Kazdorproject» LLP.

This Conclusion includes «Scientific report» No. AESR-8 dated June 12, 2015. (Hereinafter - «Scientific report»), being integral part of Conclusion. Scientific report contains appendices: «Monuments table», «Drawing documentation», «Photo report», (Hereinafter - «Appendices»).

Basis for Expertise carrying out:

«Western Europe – Western China» corridor reconstruction, «Uzynagash-Otar» section of «Almaty-Kordai-Blagoveschenka-Merke-Tashkent-Termez» road of republican value, km 101-143 (Hereinafter – «Road»).

Employer: «Kazdorproject» LLP.

Originator: «Archaeological expedition» LLP.

Expertise territory:

Expertise has been carried out in Almaty and Zhambyl oblasts within right-of-way of lands of Road, making 70 m to the right and 70 m to the left from axis of an existing road (Hereinafter – «Right-of-way»).

Expertise carried out on the territory with total length of 42,0 km with acquisition of a territory 200 m to the right and 200 m to the left from axis of existing Road (Hereinafter – «expertise Territory»).

¹Article 39 of the Law of RK dated July 2, 1992 No. 1488-XII «About protection and use of historical and cultural heritage»:
C.1. Research works on reveal of historical and cultural heritage objects have to be performed at territory development before right-of-way of land plots. C.3. Works carrying out, which can create a threat of existence of historical and cultural heritage objects is forbidden.

Expertise purpose:

Determination of existence or absence of historical and cultural heritage objects on expertise Territory and preparation of recommendations on protective measures with respect to revealed archeology monuments.

Conclusion:

1. During Expertise carrying out on expertise Territories 28 objects of historical and cultural heritage have been revealed (Hereinafter – «PCR Objects»), from them:

- 3 Objects of PCR are archeology monuments (Objects No. 3, 9, 27);
- 24 Objects of PCR are modern commemorative monument (Objects No. 1, 2, 4-8, 10-17, 19-26, 28);
- 1 Object of PCR is modern cemetery (Object No. 18).

2. From 28 Objects of PCR, revealed on Expertise territory, 27 Objects of PCR are located on Road right-of-way, including:

- 3 archeology monuments (Objects No. 3, 9, 27);
- 24 modern commemorative monument (Objects No. 1, 2, 5-8, 10-17, 19-26, 28);
- 1 modern cemetery (Object No. 18).

3. In accordance with Rules of definition of protected zones², 3 Objects of PCR, provided by burial mound barrow (Object No.9) and single burial mound (Objects No. 3,27) have been recognized as emergency archeology monuments, e.g. pertaining to emergency excavation in connection with threat of its safety at Road reconstruction.

Recommendations:

For the purpose of protection of PCR Objects, revealed on expertise Territories, it is recommended:

1. With respect to Object No.9 (*burial mound barrow*): To perform complex of research work (Hereinafter – «RW») on its full scientific study and documentation with subsequent carrying out of historical and cultural expertise³ (Hereinafter - «HCE») with purpose of exclusion emergency archeology monument from State list of monuments of local value. After RW and HCE carrying out, in connection with full study of emergency archeological monument, Road construction can be continued without restriction.

2. With respect to Objects No. 3, 27 (*single burial mounds*): To perform complex of research works (Hereinafter – «RW») on their full scientific study and documentation with subsequent carrying out of historical and cultural expertise (Hereinafter - «HCE») with purpose of exclusion emergency archeology monuments from State list of monuments of local value. After RW and HCE carrying out, in connection with full study of emergency archeological monument, Road construction can be continued without restriction.

²Article 2. Governmental decree of RK dated October 28, 2011 No. 1218 «About adoption of regulations of definition of protective zones, zones of building regulations and zones of protected natural landscapes of historical and cultural heritage objects and regime of their usage». C.5. Archeology monument is skirted by protective zone of 50 meters from its borders, at monuments group – from external boundaries of outer objects. For archeology monument, to whom visibility have to be provided, radius of protective zone have to be equal to 200 meters from its centre. C.6. Protective zone around of historical and cultural heritage object is marked out by protective signs or ploughed up strip, or guard rails, or brushwoods on line of their boundaries. From four sides of historical and cultural heritage objects the protective zones are installed, on which object name, protective zone square are specified.

³ Ministry of Culture and Information of RK dated August 20, 2007 No. 219 «About adoption of regulations of historical and culture expertise carrying out».

To Conclusion of archaeological expertise
No. AEC-24 dated June 12, 2015

«Kazdorproject» LLP

Originator:

«Archaeological expedition» LLP

(Stamp)_____ Umarhodzhiyev A.A.

SCIENTIFIC REPORT AESR-8 dated June 12, 2015
about archeological expertise carrying out
on territories, allocated under reconstruction of
«Western Europe-Western China» corridor, «Otar-Uzynagash» section of
«Almaty-Kordai-Blagoveschenka-Merke-Tashkent-Termez» road
of republican value, km 101-143

Scientific coordinator

Zaibert V.F., *d.h.s., prof. of archeology*

Originators:

Magzumov A.M., *bachelor of history, ecology*

Ilderyakov N.N., *magister of archeology and ethnology*

Fofonov K.A., *bachelor of architecture*

Almaty, 2015

ARCHEOLOGICAL

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Annotation

In this Scientific report AESR-8 dated June 12, 2015 the results of archaeological expertise (hereinafter – «Expertise») are submitted, performed according to Contract No.2 dated May 22, 2015, concluded between «Kazdorproject» LLP (hereinafter - «Employer») and «Archeological expedition» LLP (Hereinafter - «Originator»), on carrying out of scientific archaeological expertise (hereinafter - «Expertise») according to information, submitted by the Employer on territories, allocated under reconstruction of «Western Europe – Western China» corridor, «Uzynagash - Otar» section of «Almaty-Kordai-Blagoveschenka-Merke-Tashkent-Termez» road of republican value, km 101-143.

Expertise has been performed within Right-of-way according to map and Bill of Road axis coordinates (See «Appendix»), study length of 42,0 km with acquisition of territory 200 m to the left and 200 m to the right from Road axis (hereinafter - «Expertise territory»).

During Expertise carrying out on expertise Territory 28 objects of historical and cultural heritage have been revealed (Hereinafter – «PCR Objects»), including:

- 3 Objects of PCR are archeology monuments (Objects No. 3, 9, 27);
 - 24 Objects of PCR are modern commemorative monument (Objects No. 1, 2, 4-8, 10-17, 19-26, 28);
 - 1 Object of PCR is modern cemetery (Object No. 18).
- Objects No. 3,9,27 have been recognized as emergency monuments.

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Archaeological expertise carrying out procedure

Archaeological expertise of lands(«*Expertise*») – it is special scientific research, carried out by qualified specialists-archeologists with purpose of fact-finding of existence or absence of archaeological monuments (historical and cultural heritage objects) on territories, allocated under economic development («*Territory Expertise*»). Expertise is carried out on the base of Law of RK «About protection and usage of historical and cultural heritage»¹.

Result of Expertise is objective and sufficient Conclusion of archaeological expertise («*Conclusion*»), confirming fact of existence or absence of historical and cultural heritage objects on expertise Territory. In case of existence of archaeological monuments on studied territory, conclusion includes the Scientific report with description of found out monuments and recommendations on protective measures with respect to them.

Expertise is carried out according to generally accepted «Archaeological expertise carrying out procedures» and includes complex of the following obligatory measures:

Preliminary stage:

- Preliminary work with historical and scientific sources, corpus of the monuments and with state register, place map, space images, schematic map of land plot, index of coordinates etc. study.

Field stage:

- Visual inspection of land plot and adjoining place within expertise Territory, according to information (site schematic map, index of coordinates, right-of-way and etc.);
- Photo fixation, documentation, description of all found out PCR Objects in context of adjoining place;
- Collection of archaeological material, findings description;
- Determination of condition of fixed archeology monuments;
- In case of need filling dug pits (size 1,0m x 1,5m) for determination of cultural layer;
- Fixation and analysis of stratigraphical situation.

Final stage:

- cameral treatment of received data;
- preparation of scientific report, including description of fixed PCR Objects, drawings and photo report;
- preparation of archeological expertise Conclusion;
- preparation of recommendations on protective measures with respect to fixed PCR Objects;
- transfer of Expertise results to the Employer.

¹Article 39 of the Law of RK dated July 2, 1992No. 1488-XII «About protection and use of historical and cultural heritage»:
C.1. Research works on reveal of historical and cultural heritage objects have to be performed at territory development before right-of-way of land plots. C.3. Works carrying out, which can create a threat of existence of historical and cultural heritage objects is forbidden.

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Table 1. Monuments of historical and cultural heritage (PCR Objects),

Revealed in the course of archaeological expertise carrying out on lands, allocated under reconstruction of «Western Europe – Western China» corridor,

«Uzynagash-Otar» section of «Almaty-Kordai-Blagoveschenka-Merke-Tashkent-Termez» road of republican value

No.	PCR Object	Geographic coordinates UTM	Location relative to highway axis	Object location scheme (appendix 2)	Photo	PCR Object Description
	<i>Section start point</i>	43 T 565416.00 4796897.00	Km 101 of «Uzynagash-Otar» highway	1		
1	Modern commemorative monument	43 T 564663.51 4796562.93	32 m to the right from «Uzynagash-Otar» highway	1	1,2	Monument to Mahmudullayev Bagdat Gizat uly 1986-2010 yrs. and Dyusembina Asemgul Serik kzy 1986-2010 yrs.
2	Modern commemorative monument	43 T 564340.89 4796404.48	13 m to the left from «Uzynagash-Otar» highway	1	3	Monument to Kasken Sauyryk uly, Bakyt Kanapiya uly and Azharbobe Syrgabai kzy.
3	Single burial mound	43 T 563557.08 4796035.34	95m to the right from «Uzynagash-Otar» highway	1,2	4	Burial mound with earth hemispheric embankment. Burial mound is round shape in the plan. Burial mound diameter is 20m, height is 1,0m.
4	Modern commemorative monument	43 T 563503.27 4796005.07	85m to the right from «Uzynagash-Otar» highway	1,2	5	Monument to (2008) Bakirov Kanat Serikbai uly and Skakov Galymzhan Gnaken uly.

5	Modern commemorative monument	43 T 559994.35 4796629.80	44 m to the right from «Uzynagash-Otar» highway	1	6	Monument to (2003) Dmitriy, Tatyana and Lisa Gromovs.
6	Modern commemorative monument	43 T 557126.47 4796980.94	24 m to the left from «Uzynagash-	1	7	Monument to Kiseleva Elina Vladimirovna 1969-1987 yrs., Viktorovich

			Otar» highway			Nadezhda Vasilyevna 1954-1987 yrs. And Serov Yurii Nikolayevich 1954-1987 yrs.
7	Modern commemorative monument	43 T 554929.32 4797318.83	20 m to the left from «Uzynagash-Otar» highway	1	8	Monument to Daryn Erik uly 1979-2010 yrs. and Aidar Taubaldy uly 1981-2010 yrs.
8	Modern commemorative monument	43 T 554845.28 4797343.13	9 m to the right from «Uzynagash-Otar» highway	1	9	Monument to Abishev Ernuhambet Kozhahan uly 1980-2010 yrs.
9	Burial mound barrow	43 T 552888.44 4797724.05	68 m to the right from «Uzynagash-Otar» highway	1,2	10,11	Consists of 2 burial mounds with hemispheric embankments from earth and stone. Burial mound is round shape in the plan. Burial mounds diameter are 15 and 30 m, height is 0,6m and 1,0 m accordingly. Burial mounds' embankments have been damaged at cable laying.
10	Modern commemorative monument	43 T 551787.96 4797857.26	35 m to the right from «Uzynagash-Otar» highway	1	12	Monument to Grigoryev Andrei Valeryevich 1976-1990 yrs.
11	Modern commemorative monument	43 T 551543.70 4797865.50	6 m to the right from «Uzynagash-Otar» highway	1	13	Monument to (2006) Dzhunusov Edilzhan and Madina, Kaldybayev Amandyi, Dosmahanbetova Aibota and Yurdanidze Saatdin.

12	Modern commemorative monument	43 T 550135.89 4798135.36	61 m to the right from «Uzynagash-Otar» highway	1	14	Monument to Kurmangaliyev Makat Mendiali uly 1967-2002 yrs.
13	Modern commemorative monument	43 T 548321.08 4798360.94	13 m to the right from «Uzynagash-Otar» highway	1	15	Monument to Pogozhev Vladimir Fedorovich 1974-1998 yrs.
14	Modern commemorative monument	43 T 547380.58 4798461.57	16 m to the left from «Uzynagash-Otar» highway	1	16	Monument to (2000) Kashkenuly-kyzy Zhanbolat Saule Zhanerke, Keneskyzy Almagul
15	Modern commemorative monument	43 T 545212.84 4798834.67	15 m to the right from «Uzynagash-Otar» highway	1	17	Monument to (2000) Yunusov Gaukhar, Ramazanov Asyl and Elnar.
16	Modern commemorative monument	43 T 542559.89 4799239.16	20 m to the right from «Uzynagash-Otar» highway	1	18	Monument to Kochkorbayev Kulubek Mustapayevich 1951 – 2000 yrs.
17	Modern commemorative monument	43 T 541349.73 4799414.46	14 m to the right from «Uzynagash-Otar» highway	1	19	Monument to Ismailov Nurlan Abesovich 1965-1995 yrs., Tursunbekov Zair 1971-1995 yrs.

18	Modern cemetery	43 T 540746.02 4799514.30	21 m to the right from «Uzynagash-Otar» highway	1	20,21	Consists of two Islamic burial and stone stele, dedicated to reprisal sacrifices. It is located on the right from Almaty-Taraz highway, in 2 km to turn into Shilibastau village.
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19	Modern commemorative monument	43 T 536106.19 4800216.72	22m to the right from «Uzynagash-Otar» highway	1	22	Monument to (2013) Kudaibergen Alibai uly, Amantai Alibai uly, Bauyrzhan Meldesh uly
20	Modern commemorative monument	43 T 535423.94 4800319.17	20 m to the right from «Uzynagash-Otar» highway	1	23	Monument to Kuat Muratbek uly 1973-2008 yrs.
21	Modern commemorative monument	43 T 535272.61 4800292.39	17 m to the left from «Uzynagash-Otar» highway	1	24	Monument to Frolav Dmitriy Vladimirovich 1975-1997 yrs.
22	Modern commemorative monument	43 T 534698.31 4800444.68	36 m to the right from «Uzynagash-Otar» highway	1	25	Monument to Kylyshbayev Talgat Kondybai uly 1974-2009 yrs.
23	Modern commemorative monument	43 T 533096.32 4800616.12	19 m to the left from «Uzynagash-Otar» highway	1	26	Monument to (2003) Zhantursunov Zhasulan Berikzhan uly, Kozhak tegi Darhan Dauletkerim uly and Kulmeshanov Ashat Sailauhan uly.
24	Modern commemorative monument	43 T 532789.20 4800664.49	21 m to the left from «Uzynagash-Otar» highway	1	27	Monuments to (2005) Tanayeva Nellya Rafikovna and Pazilov Muhitdin Mirkurvanovich
25	Modern commemorative monument	43 T 531128.31 4800908.85	22 m to the left from «Uzynagash-Otar» highway	1	28,29,30	Monument to (2010) Usubaliyev Turatbek Kenesh uly and Rosa Zholdas kzy. Mursakanova Nazigul Sulaimankulovna 1971-2010 yrs. Bayan Abdrahman kzy 1974-2011 yrs., and Bahyt Ermekbai uly 1974-2011 yrs.

26	Modern commemorative monument	43 T 528631.33 4801344.27	22 m to the right from «Uzynagash-Otar» highway	1	31	Monument to Hushnazari Anvar zod 1971-1997 yrs.
27	Single burial mound	43 T 525181.33 4801752.89	76 m to the left from «Uzynagash-Otar» highway	1,2	32	Burial mound with hemispheric embankment from earth and stone. Burial mound is round shape in the plan. Burial mound diameter is 30 m, height 0,9 m accordingly.

						Burial mound embankment has been damaged during economic activity on earth plowing.
28	Modern commemorative monument	43 T 524911.80 4801856.06	18 m to the left from «Uzynagash-Otar» highway	1,2	33	Monuments to Mordovin Sergei Vasilyevich 1957-1996 and Moldazhanov Kairat Altai uly 1957-1996 yrs.
	Section end point	43 T 523510.00 4802096.00	Km 143 of «Uzynagash-Otar» highway	1	34	

ARCHEOLOGICAL

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Table 2. Recommendations on protective measures with respect to emergency PCR Objects,
located on right-of-way under reconstruction of «Western Europe-Western China» corridor, «Uzyanagash-Otar» section of «Almaty-Kordai-Blagoveshenka-Merke-Tashkent-Termez» road of republican value, km 101-143

Object No.	Monument type	Recommendations
9	Burial mound barrow	Key mitigation measures include avoidance, graphic, photo and video fixation, full archaeological survey/excavation and recovery to museums, if feasible. If the impact cannot be avoided, following the archaeological survey the monuments will be removed from the List of State Registration of Monuments.
3,27	Single burial mounds	
18	Modern cemeteries	To coordinate protective measures with respect to them during Road reconstruction in local executive body
1,2, 5-8, 10-17, 19-26, 28	Modern commemorative monuments	

Glossary

Archeological expertise – special scientific research, the purpose of which is to reveal archeology monuments on territories, pertaining to allotment under different types of construction, road reconstruction, laying of oil and gas lines, field development. **A.E.** is carried out by qualified specialists-archeologists on the base of State license for the right to carrying out of archaeological works. The results of **A.E.** are documented by expert conclusion, confirming fact of existence or absence of archeology monuments on studied territory and containing recommendations on protective measures with respect to revealed archeology monuments.

Images from space – collective name of data, received through space vehicle (SV) in different diapasons of electro-magnetic spectrum, then visualisable on specific algorithm. They are incurred on special decipherment with purpose of revealing archeological objects characteristics.

Scientific report – is form of report documentation. S.r. contains full results of scientific research, including description of historical and cultural heritage objects, research work progress, revealed artifacts, investigation overall results, photos, full drawing documentation. S.r. can be annotative, interim, final (conclusive).

Historical and cultural heritage objects – objects of immovable property with connected with them artwork, sculpture, applied art, science and technique and other cultural items, originated as a result of historical events, are represented importance in terms of history, archeology, architecture, urban construction, art, science and technique, aesthetic, ethnology or anthropology, social culture.

Protective zone – territory, within which special regime of land use, restricting economic activity and prohibitive the construction, except for applying the special measures, directed at conservation and regeneration of historical and urban construction or natural environment of cultural heritage object is installed with purpose of providing cultural heritage object safety in its historical landscape environment.

Archeology monuments – objects of material culture, implements, structures or ancient entombment, survived on ground surface, under earth or under water, coming laden with definite volume of information about past and acting as object of archeological investigation. Main types of A.m. are settlement monuments (ancient settlements, settlements, sites) and burial monuments (burial mounds, mausoleum, ground graves, stone boxes). Also there are ritual structures (sanctuaries, sacrificial places), buried treasures, legacy of economic activity (irrigation structures and etc.)

АРХЕОЛОГИЯЛЫК
★ ЭКСПЕДИЦИЯ ★

Автомобильная дорога «Западная Европа - Западный Китай»,
участок «Узынагаш - Отар» автомобильной дороги республиканского
значения «Алматы-Кордай-Благовещенка-Мерке-Ташкент-Термез»,
км 101-143



Фото 1. Объект № 1.
Современный поминальный памятник.



Фото 2. Объект № 1.
Современный поминальный памятник.



Фото 3. Объект № 2.
Современный поминальный памятник.



Фото 4. Объект № 3.
Одиночный курган.



Фото 5. Объект № 4.
Современный поминальный памятник.



Фото 6. Объект № 5.
Современный поминальный памятник.

АРХЕОЛОГИЯЛЫК
★ ЭКСПЕДИЦИЯ ★



Фото 7. Объект № 6.
Современный поминальный памятник.

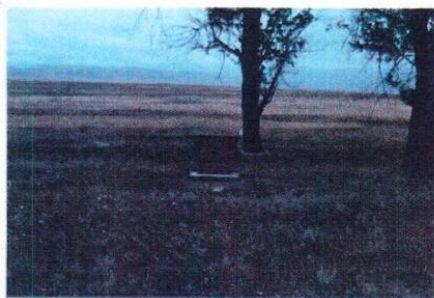


Фото 8. Объект № 7.
Современный поминальный памятник.



Фото 9. Объект № 8.
Современный поминальный памятник.

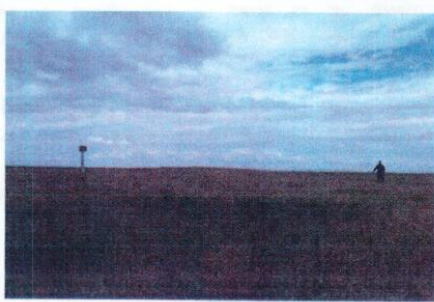


Фото 10. Объект № 9.
Курганный могильник. Курган №1.



Фото 11. Объект № 9.
Курганный могильник. Курган №2.



Фото 12. Объект № 10.
Современный поминальный памятник.

АРХЕОЛОГИЯЛЫҚ
★ ЭКСПЕДИЦИЯ ★



Фото 13. Объект № 11.
Современный поминальный памятник.



Фото 14. Объект № 12.
Современный поминальный памятник.



Фото 15. Объект № 13.
Современный поминальный памятник.



Фото 16. Объект № 14.
Современный поминальный памятник.



Фото 17. Объект № 15.
Современный поминальный памятник.

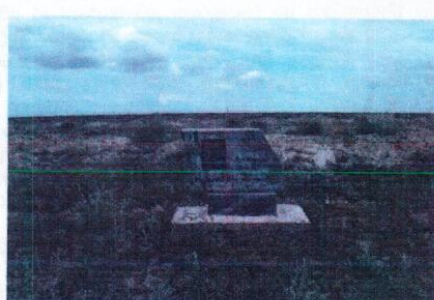


Фото 18. Объект № 16.
Современный поминальный памятник.

АРХЕОЛОГИЯЛЫҚ
★ ЭКСПЕДИЦИЯ ★



Фото 19. Объект №17.
Современный поминальный памятник.



Фото 20. Объект №18.
Современное мусульманское кладбище.

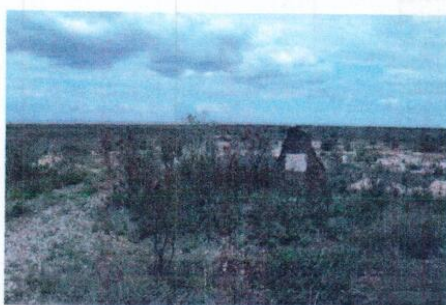


Фото 21. Объект № 18.
Современное мусульманское кладбище.

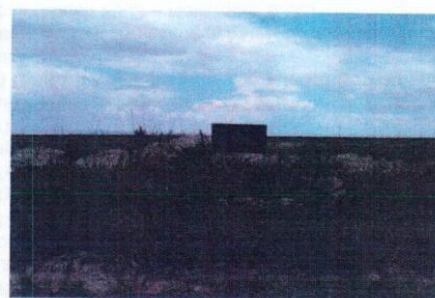


Фото 22. Объект № 19.
Современный поминальный памятник.

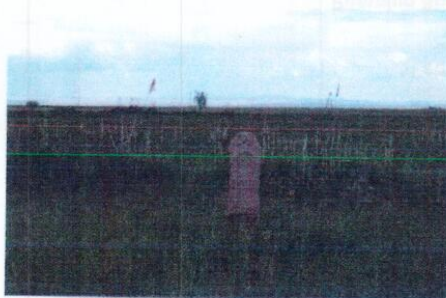


Фото 23. Объект № 20.
Современный поминальный памятник.



Фото 24. Объект № 21.
Современный поминальный памятник.

АРХЕОЛОГИЯЛЫҚ
★ ЭКСПЕДИЦИЯ ★



Фото 25. Объект № 22.
Современный поминальный памятник.



Фото 26. Объект № 23.
Современный поминальный памятник.



Фото 27. Объект № 24.
Современный поминальный памятник.



Фото 28. Объект № 25.
Современный поминальный памятник.



Фото 29. Объект № 25.
Современный поминальный памятник.



Фото 30. Объект № 25.
Современный поминальный памятник.

АРХЕОЛОГИЯЛЫҚ
★ ЭКСПЕДИЦИЯ ★



Фото 31. Объект № 26.
Современный поминальный памятник.



Фото 32. Объект № 27.
Одиночный курган.



Фото 33. Объект № 28.
Современный поминальный памятник.

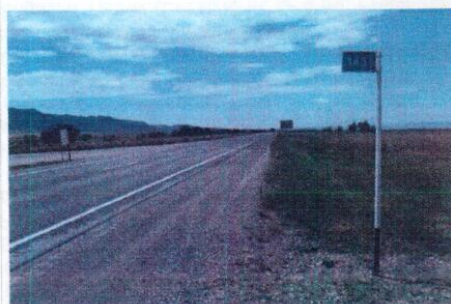


Фото 34.
Конечная точка участка.

APPENDIX - 3

CALCULATION OF CONCENTRATION OF HAZARDOUS SUBSTANCES DURING ROAD RECONSTRUCTION ON "UZYNAGASH-OTAR" SECTION

1. Maximum permissible emissions calculations, MPE

Calculation of hazardous substances concentration, contained in burned gases, with taking into account traffic intensity on 2038 year – 7550 cars/days were used in this FS.

At pollution calculation the maximum single concentration has been accepted in accordance with SanPiN «Sanitary and epidemiological requirements to atmospheric air in urban and rural settlements, soils and their safety, urban and rural settlements territories maintenance, works conditions with sources of physical factors, having an impact on the person» No. 168 dated January 25, 2012, confirmed by Government Regulation of RK.

In accordance with the «Sanitary and epidemiological requirements for the establishment of the sanitary protection zone of production facilities» №93 dated January 17, 2012, at road design as a result of made calculations of emissions 3B from vehicle work, SPZ was made - the distance from the source of adverse effect, beyond which the factors of impacts do not exceed the maximum permissible concentration of residential areas. According to functional purpose the SPZ is a protective barrier, providing safety level of population at the object operation in normal mode.

SPZ size is justified by calculation of atmospheric air expected pollution in «CREDO» program for roads.

Calculation of pollutant ventilation in atmosphere is carried out with taking into account maximum single emissions of polluting substances from internal-combustion engine of moving sources with purpose of atmospheric air impact assessment.

Calculation of atmospheric air pollution was determined according to concentration of polluting substances: nitrogen dioxide, carbon oxide, hydrocarbons, sulphur dioxide, black pigment, as well as lead compounds.

Based on the calculations, concentrations of exhaust gases, except nitrogen dioxide NO₂, does not exceed the maximum permissible concentrations already at the distance of 3,5 meters from the axis of last road strip. Nitrogen dioxide NO₂ does not exceed maximum permissible concentration at distance of 20-30 meters. Lead fouling in the soil of an adjacent strip within established standard of 32 mg/kg is noted at distance of 20 meters.

As a result of the accepted calculations of emission dispersion in the atmosphere for PS, the size of a roadside clear zone for this highway, which makes 30 meters is established. The analysis of calculations of EG emissions concentration in the air and lead deposits in the soil, taking into account placement of a housing estate along the reconstructed road showed, that requirement of development of nature protection actions is not required.

Below calculations of atmospheric air and the soil pollution, which were made on the ECM are attached.

Calculation of air gas contamination level is defined according to formula:

$$C = \frac{2q}{\sigma x U x 2 \sqrt{\pi}}$$

where: C – concentration of TS (toxic substance), glm³;
q – intensity of TS emission, g/cm;
U – wind speed, vertical to road axis, m/sec;

σ - standard dispersion of Gaussian dispersal in vertical direction

Emission intensity q is composed of q_1 - intensity of TS emission at vehicle traffic on up-grade and q_2 - at moving on down grade.

$$q = (N_1 \sum p_i T_{1i} + N_2 \sum p_i T_{2i}) \cdot 2,8 \cdot 10^{-7}$$

where: p_i - part (in fractions of unit) of cars of i types in assembly with traffic flow:

T_{1i} – emission of TS of specific group at vehicle traffic of i type on up-grade;

T_{2i} – the same, on down grade:

«Uzynagash-Otar» road

Calculation for road reconstruction period (2015)

Parameter name	Unit of measure	Quantity
Intensity of transport flow in 2015 for prediction on soil pollution by lead	cars/days	6 794
Flow intensity rate of increase	%	4
Azimuth of wind direction	degree	180
Transport flow intensity for prediction period 2038	cars/days	16 780
Wind speed, accepted by expert	m/sec	2,5
Thickness of soil layer in the calculation on lead	m	0,4
Soil layer density	m	1,60
Background pollution level has not been established		
Maximum permissible concentration CO	t/cu.m	5,00
Maximum permissible concentration NO _x	mg/cu. m	0,2
Maximum permissible concentration CmHn	mg/cu. m	1,00
Maximum permissible concentration Pb in the air	mg/cu. m	0,001
Maximum permissible concentration Pb in the soil	mg/kg	32
Maximum permissible level of noise	dBa	70

Cover characteristics for transport noise calculation

Cover type	Planeness	Strip quantity
CSMA	good	4

Type of surface of adjoining strip to road: grass vegetation

Calculation results

Zonal boundary of maximum permissible concentration of hazardous substances and noise from transport flow at poor incoming solar

Section location		Distance from road jointing edge to MPC ambit on substances and noise, m									
From km	To km	On the left					On the right				
		CO – carbon oxide	NOx – nitrogen oxides	CmHn-hydrocarbon	Pb - plumbum	NOISE	CO – carbon oxide	NOx – nitrogen oxides	CmHn-hydrocarbon	Pb - plumbum	NOISE
74	80	< 10	>2 50	< 4	< 12	< 12	< 11	> 250	<4	< 19	< 12

Zonal boundary of maximum permissible concentration of hazardous substances and noise from transport flow at poor incoming solar

Section location		Distance from road jointing edge to MPC ambit on substances and noise, m									
From km	To km	On the left					On the right				
		CO – carbon oxide	NOx – nitrogen oxides	CmHn-hydrocarbon	Pb - plumbum	NOISE	CO – carbon oxide	NOx – nitrogen oxides	CmHn-hydrocarbon	Pb - plumbum	NOISE
74	80	< 4	> 144	< 4	< 9	< 12	< 4	> 207	< 4	< 11	< 12

Toxic substances concentration distribution, mg/m³ (Pb divide 1000) at poor incoming solar (Samsy v.)

Toxic substances	Concentrations (mg/m ³) at distance from carriageway																	
	On the left									On the right								
	5	0	0	0	0	00	50	00	50	,5	0	0	0	0	00	50	00	50
CO	0,00	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	4,75	0,95	0,48	0,32	0,24	0,19	0,14	0,11	0,09
NOx	0,00	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	4,11	0,82	0,41	0,27	0,21	0,16	0,12	0,09	0,07
CmH	0,00	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,55	0,11	0,05	0,04	0,03	0,02	0,02	0,01	0,01
Pb	0,00	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,41	0,24	0,12	0,08	0,06	0,04	0,03	0,02	0,02

Toxic substances concentration distribution, mg/m³ (Pb divide 1000) at poor incoming solar (Samsy v.)

Toxic substances	Concentrations (mg/m ³) at distance from carriageway																	
	On the left									On the right								
	,5	0	0	0	0	00	50	00	50	,5	0	0	0	0	00	50	00	50
CO	0,00	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	1,90	0,48	0,32	0,24	0,19	0,15	0,10	0,08	0,06
NOx	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	1,65	0,41	0,27	0,21	0,16	0,13	0,09	0,07	0,05
CmH	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,22	0,05	0,04	0,03	0,02	0,02	0,01	0,01	0,01
Pb	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,0 0	0,28	0,12	0,08	0,06	0,04	0,03	0,02	0,02	0,01

Equivalent transport noise from vehicle (dBA) (Samsy v.)

	Distance from neighbour traffic lane, m							
	7 ,5	2 5	5 0	1 00	2 00	3 00	5 00	1000
Noise level, dBA	8 0,4	6 8,3	6 6,0	6 0,2	5 7,0	5 5,0	5 2,5	49,2

Lead fouling on surface and soil pollution for 20 years

Distance from neighbor traffic lane, m	On the left							
	1 0	2 0	4 0	6 0	8 0	1 00	1 50	2 00
Lead fouling, g/m ²	9 ,00	2, 28	0, 93	0, 46	0, 23	0, 12	0, 02	0 ,00
Soil pollution by lead, mg/kg	1 4,0	3, 56	1, 45	0, 73	0, 36	0, 19	0, 04	0 ,01

Distance from neighbor traffic lane, m	On the right							
	1 0	2 0	4 0	6 0	8 0	1 00	1 50	2 00
Lead fouling, g/m ²	9 ,00	8, 35	3, 41	1, 71	0, 85	0, 44	0, 09	0 ,02
Soil pollution by lead, mg/kg	5 2,6	1 3,4	5, 45	2, 73	1, 43	0, 71	0, 14	0 ,03

Analyzing indicators of toxic substances emissions of exhaust gases, specified in calculations, we note, that concentration of toxic substances in a roadside strip at distance of 20 meters from an axis of the carriageway does not exceed the maximum permissible concentration.

At the solution of the environmental monitoring questions, connected with road construction and other structures, the requirement of prediction of gross emissions of the polluting substances into the atmosphere is arisen. To assess damages from traffic, at project documentation developing, it is necessary to know the quantity and regularity of exhaust gases distribution of automobile engines in the adjacent territory. Number of emissions (emission), as well as fuel consumption depends on power setting. Operation of automobile engines is considered for the optimum traffic mode, in the absence of any obstacles.

Traffic speed significantly influences on emission rate. Toxic substances emission shortly increases from 3 to 10 times at the engine operation in the «speed-up-slowdown» modes.

Change of toxic gases emissions depending on the traffic speed and vehicle fuel consumption is visually reflected in below attached schedules. It is obviously from the attached schedules, that the smallest emissions are characteristic for the average speed of the free traffic.

Standards of specific emissions into atmospheric air are established for state regulation of harmful effects on environment. Specific emissions of the polluting substances into the atmosphere (carbon oxide, nitrogen oxides, hydrocarbons, sulphurous gas, black pigment, lead, benzapyrene) are the most adverse indicators for the vehicle.

Specific emissions of toxic substances by separate cars

EG emissions	Cars types						
	VAZ g/km	Ikarus g/km	ZIL-130 g/km	KazAZ g/km	KrAZ g/km	MAZ g/km	Truck-tractors g/km
Particulate matters		0,41		0,41	1,36	1,59	1,61
CO ₂	164,4	1012,7	850,3	913,7	1608,3	1628,1	1654,2
CO	23,0	30,25	68,47	3,73	5,89	14,74	28,98
NO _x	3,1	22,0	21,28	12,42	20,56	22,4	22,4
SO ₂	0,12	0,73	0,51	2,09	5,53	6,06	6,06
CmHn	1,0	3,3	3,97	1,96	2,75	8,97	12,33
Pb	0,02	0,121	0,085	-	-	-	-
Total:	191,6	1069,5	944,6	934,3	1644,4	1681,8	1725,6

At load carrier traffic speed increasing (average cargo capacity with carburetor engine) from 20 to 60 km/h the quantity of toxic substances decreases: CO from 83 to 27 g/km, and CH from 10 to 5,8 g/km.

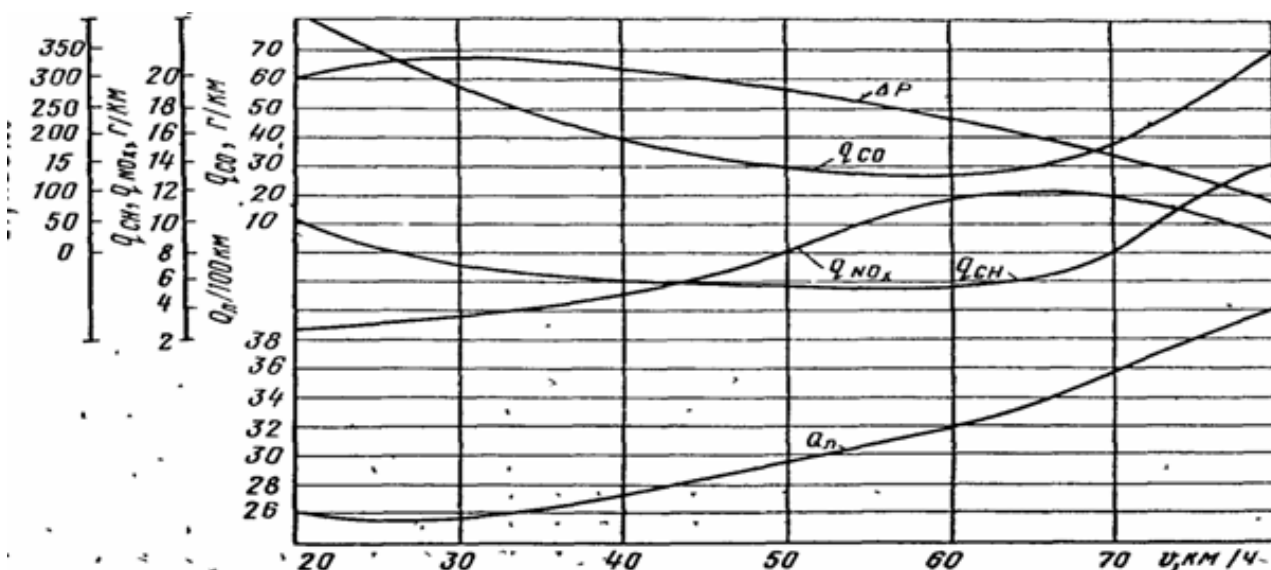


Рис.1. Dependence of emissions of toxic substances from ZIL-130 vehicle traffic speed.

ΔP - reduced pressure in induction pipe;

q_{CO} - CO emission, g/kg;

q_{NOx} - NO_x emission, g/kg;

q_{CH} - CH emission, g/km

Calculation of maximum-permissible emissions according to MADI formula, considering emissions for each passing car and summarizing all emissions from separate vehicles, taking into account traffic intensity and transport types was made in this FS.

$$M_j = \sum m_{ji} \times L_i \times \Pi R_{ji} \text{ t/year}$$

Where: i - number of the allocated groups of vehicles;

m - specific emission of j - substance of the vehicle of i group for calculated period, g/km;

L - vehicle operational kilometers of i group for calculated period, km/year;

ΠR_{ji} - product of influence coefficient of n factors.

At MPE calculation the number of specific emissions of hazardous substances by separate vehicles were accepted in accordance with data of MADI, which are provided in the table. The specific emissions, given in the table, are considered for automobile engines at an optimum operating mode. Compliance of vehicle traffic conditions to optimum operation of the engine is defined by a technological level and a transport and operational condition of roads.

Therefore constructive measures for toxic substances emissions reduction are based on improvement of road design. Reduction of longitudinal slopes, ensuring of visibility of horizontal and vertical curves, increase of their radiuses leads to ensuring the required traffic speed and reduction of toxic emissions.

MPE standards are determined as the mass of the polluting substance, discharged in unit of time. Annual values of MPE (tons per year) for each source and in general for object are established for the operational purposes for performance of design estimates of emissions decrease rates, which are carried away by air-gas mix, hazardous substances.

Calculations of maximum permissible emissions (MPE) of toxic substances into atmosphere on «Uzynagash-Otar» road section.

Indicators name	Motor cars	Buses	Load carrier				Tuck tractor with semi-trailer	Totall
			To 5 tons	5-10 tons	Above 10t	Full-trailer		
Average daily Intensity on 2038	11818	1560	861	665	77	1610	189	16780
Quantity of vehicle passage in the year	4313570	569400	314265	242725	28105	587650	68985	
OK km in the year on the road 100km	431357000	56940000	31426500	24272500	2810500	58765000	6898500	
Summary specific emission CO, CO ₂ , NO _x , CmHn, SO ₂ , Pb, г/км	191,6	1069,5	944,6	934,3	1644,4	1681,8	1725,6	
MPE tons/year	82648,00	60897,33	29685,47	22677,80	4621,59	98830,98	11904,05	311265,21

The annual maximum-permissible emission (MPE) of toxic substances (emission) into atmosphere from transit vehicle, taking into account traffic intensity growth on 2038 year ("Uzynagash-Otar" road) which makes 311 265, 21 tons/year is determined by result of calculation.

Besides, the calculation of polluting substances emissions into atmosphere at REP (Road exploitation point) work at designed road operation was made in the FS. Data of emissions calculation is specified in the table.

2. Calculation of polluting atmospheric substances from REP emissions sources

The site under construction of REP (road exploitation point) production base is located in the region of Samsy settlement. The facility territory is situated on the left side at the distance of 100 m from the highway.

The main kind of activity of road management is - maintenance, running repairs and operation of a road section of the international and republican value.

Primary activity of an industrial base is the parking and repair of motor transportation equipment, warehousing of raw products and materials, auxiliary works.

It is assumed to design the following buildings and structures:

ASB - single-floor - Includes two single-shift and two double-shift rooms, common toilet facilities with shower cabins, a kitchen-dining room, reception and a spacious corridor.

Entrance office - check-point.

Gas station with warehouse of fuels and lubricants with the gas stations ("Nara 41"), equipped with 4 reservoirs: volume - 3 m³ for diesel oil, of 10 m³ - for gasoline, of 10 m³ - for diesel fuel.

Reservoir park also includes:

- the drain device for hermetic discharge from water lorry into TU 640-PK-03485200-19-98 reservoirs;

- fuelling pipeline Du 80 GOST 10705-80;
- pipeline with pressure-and vacuum valve Du 100 GOST 3262-80;
- conduit channel.

IH warehouse is a warehouse of inventory holdings.

Lavatory on 2 toilets with opening in a bin -a wooden structure from two compartments with a sinkhole on 15 m 50 m.Drains unloading is provided by cars for application of liquid organic fertilizers of MGT type with a loading capacity from 4 to 16 t or RGU-3,6.

Sand and salt storage is intended for the temporary storage of sand and salt, intended for roads filling in ice period.

The repair shop is intended for repair of road equipment.

Warm boxes for large-size equipment is intended for the parking of large-size road equipment;

Cold boxes for large-size equipment is intended for the parking of large-size road equipment;

The shop of road signs repair is intended for repair of road signs, their painting, aligning etc.

Shelter for the equipment is intended for temporary storage of automotive equipment;

The boiler house is planned to equip by 2 heating boilers on liquid fuel of «Mert» brand (one of which is in a reserve). The period of boiler work is 181 days in a year (4344 hours). Polluting substances emissions happens through a chimney of 22 m high.

The house with two three-room apartments is intended for housing

Bitumen storage is intended for temporary storage and heating of bitumen.

Data on equipment

No.	Equipment name	Quantity of units	Annual background of work time (hour)	Used material	Information about clearance
Boiler house					
1	«Mert» heating boiler	2(1 in reserve)	181	Liquid fuel	Is not stipulated
A3C					
2	Reservoir with volume of 10 m ³	1	8760	Petrol	
3	Reservoir with volume of 10 m ³	1	8760	Diesel	Is not
4	Reservoir with volume of 10 m ³	1	8760	fuel	
	Reservoir for oil with volume				
5	of 3 m ³	1	8760		
	Gas station dispenser	2			
6	Chain grinder	3	300	metal	
7	Drilling machine	1	100	metal	
8	Screw-cutting lathe	1	100	metal	
9	Milling machine	2	200	metal	
10	Vertical-boring	2	200	metal	

Calculation of emissions Pollution source N0001,

Chimney flue Emission source N001, Heating boiler

List of references:

"Collection of method on calculation of hazardous substances emissions into atmosphere by various manufactures". Almaty, KazECO EKSP, 1996 c.2. Calculation of hazardous substances emissions at fuel consumption in boilers with evaporative capacity to 30 t/hour.

Fuel type , $KZ = \text{Liquid other (Diesel gas oil etc.)}$

Fuel consumption, t/year , $BT = 111.9$

Fuel consumption, g/s , $BG = 7.156$

Fuel brand, $M = \text{NAME} = \text{Diesel gas oil}$

Lower heating value, kcal/kg(appendix. 2.1) , $QR = 10210$ Calculation in MJ , $QR = QR * 0.004187 = 10210 * 0.004187 = 42.75$

Average fuel ash, %(appendix. 2.1) , $AR = 0.025$ Maximum fuel ash, % not more (appendix. 2.1) , $AR = 0.025$ Average sulfur content in fuel, %(appendix 2.1) , $SR = 0.3$ Maximum sulfur content in fuel, % not more (appendix. 2.1) , $SIR = 0.3$

CALCULATION OF EMISSIONS OF NITROGEN OXIDE

Additive agent:0301 Nitrogene (IV) oxide (Nitrogene dioxide)

Rated thermal power of boiler unit, kW , $QN=2785$

Actual power of boiler unit, kW , $QF=2506$

Quantity of nitrogene oxide, kg/1 GJ of heat (figure. 2.1 or 2.2) , $KNO=0.0966$

Coefficient of decrease of nitrogene emissions as result of technical decisions, $B=0$

Quantity of nitrogen oxides, kg/1 GJ of warm (f-la 2.7a) , $KNO = KNO * (QF/QN)^A$

$$0.25 = 0.0966 * (2506 / 2785)^{0.1} \quad 0.25 = 0.094$$

$$\text{Emissions of nitrogen oxides, t/year (f-la 2.7) , } \underline{M} = 0.001 * BT * QR * KNO * (1-B) = 0.001 * 111.9 * 42.75 * 0.094 * (1-0) = 0.45$$

$$\text{Emissions of nitrogen oxides, g/s (f-la 2.7) , } \underline{G} = 0.001 * BG * QR * KNO * (1-B) = 0.001 * 7.156 * 42.75 * 0.094 * (1-0) = 0.0287$$

CALCULATION OF EMISSIONS OF SULFUR OXIDE

Additive agent:0330 Sulfur dioxide (sulphur dioxide)

Share of sulfur dioxide, connected by fuel light ash (c. 2.2) , $NSO2 = 0.02$ Content of hydrogen sulfide in fuel, %(appendix 2.1) , $H2S=0$ Emissions of sulphur oxide, t/year (f-la 2.2) , $\underline{M} = 0.02 * BT * SR * (1-NSO2) + 0.0188 * H2S * BT = 0.02 * 111.9 * 0.3 * (1-0.02) + 0.0188 * 0 * 111.9 = 0.658$ Emissions of sulphur oxide, g/s (f-la 2.2) , $\underline{G} = 0.02 * BG * SIR * (1-NSO2) + 0.0188 * H2S * BG = 0.02 * 7.156 * 0.3 * (1-0.02) + 0.0188 * 0 * 7.156 = 0.0421$

CALCULATION OF EMISSIONS OF CARBON OXIDE

Additive agent:0337 Carbon oxide

Thermal loss from physical incompleteness of combustion, %(table 2.2) , $Q4 = 0$ Combustor type: Chamber furnace

Thermal loss from chemical incompleteness of combustion, %(table 2.2) , $Q3 = 0.5$ Coefficient, taking into account share of thermal loss, $R=0.65$ Emission of carbon oxide in kg/tons or kg/thousand m (f-la 2.5) , $\underline{CCO} = Q3 * R * QR = 0.5 * 0.65 * 42.75 = 13.9$

$$\text{Emissions of carbon oxide, t/year (f-la 2.4) , } \underline{M} = 0.001 * BT * CCO * (1-Q4 / 100) = 0.001 * 111.9 * 13.9 * (1-0 / 100) = 0.0155$$

$$\text{Emissions of carbon oxide, g/s (f-la 2.4) , } \underline{G} = 0.001 * BG * CCO * (1-Q4/100) = 0.001 * 7.156 * 13.9 * (1-0 / 100) = 0.00099$$

CALCULATION OF EMISSIONS OF PARTICULATE MATTERS

Additive agent:0328 Carbon (Black pigment)

Coefficient (table 2.1) , $F=0.01$ Combustor type: Chamber furnace

$$\text{Emissions of particulate matters, t/year (f-la 2.1) , } \underline{M} = BT * AR * F = 111.9 * 0.025 * 0.01 = 0.028$$

$$\text{Emissions of particulate matters, g/s (f-la 2.1) , } \underline{G} = BG * AIR * F = 7.156 * 0.025 * 0.01 = 0.00179$$

Total:

<u>Code</u>	<u>Additive agent</u>	<u>Emissionsg/s</u>	<u>Emissionst/year</u>
0301	Nitrogen (IV) oxide (Nitrogen dioxide)	0.02876	0.45
0328	Carbon (Black pigment)	0.00179	0.028
0330	Sulfur dioxide (sulfur dioxide)	0.0421	0.658
0337	Carbon oxide	0.00099	0.155

Pollution source N0002, Respiratory valve

Release source N002, Tank with the capacity of 10 cu.m (Ai-93 petrol)

Bibliography:

Methodical indications for the determination of the emission of pollutants in the atmosphere from the RND tanks 211.2.02.09-2004. Astana, 2005 Calculation based on p. 9

Oil product: high-octane motor petrol (90 and higher)

Calculation of emissions from the tanks

Tank construction: sunken

Climatic area: third – southern oblasts of the RK (annex 17)

Maximum concentration of oil products vapors in the tank, g/m³ (App. 15) , **C_{MAX}=580**

Amount of oil pumped into the tank in the autumn-winter period, m³, **Q_{OZ}=7.4**

Concentration of oil products vapor when filling tanks in the autumn-winter period, g/m³ (App. 15),
C_{OZ}=260.4

Amount of oil products pumped into the tank in the spring and summer period, m³, **Q_{VL}=7.4**

Concentration of oil products vapor when filling tanks in the spring and summer period, g/m³ (App. 15),
C_{VL}=308.5

Volume of the discharged oil product from the tanker into the tank, m³/h, **V_{SL}**

12.6

Maximum of single emissions, g/s (9.2.1), **G_R = (C_{MAX}* V_{SL}) /3600 = (580 * 12.6) / 3600 = 2.03**

Emissions for injection into tanks, tons/year (9.2.4), **M_{ZAK} = (C_{OZ}* Q_{OZ}+ C_{VL}* Q_{VL}) * 10⁻⁶ = (260.4 * 7.4 + 308.5 * 7.4) * 10⁻⁶ = 0.00421**

Estimated emission in spills, g/m³ , **J=125**

Emissions of oil product vapors in spills, t/year (9.2.5) , **M_{PRR} = 0.5 * J* (Q_{OZ}+ Q_{VL}) * 10⁻⁶ = 0.5 * 125 * (7.4 + 7.4) * 10⁻⁶ = 0.000925**

Total emissions, t/year (9.2.3) , **M_R = M_{ZAK}+ M_{PRR}=0.00421 + 0.000925 = 0.00514**

Admixture: 0415 saturated hydrocarbon mixture C1-C5

Concentration of pollutants in vapors, % of masses (App. 14) , **C_I=67.67**

Total emissions, t/year (5.2.5) , **M = C_I* M_R/100 = 67.67 * 0.00514 / 100 =**

0.00348

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 67.67 * 2.03 / 100 = 1.374$

Admixture:0416 Saturated hydrocarbon mixture C6-C10

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=25.01$ Total emissions, t/year (5.2.5) , $\underline{M} = CI * M/100 = 25.01 * 0.00514 / 100 = 0.001286$

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 25.01 * 2.03 / 100 = 0.508$

Admixture:0501 Pentylenes (amylenes - isomeric mixture)

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=2.5$

Total emissions, t/year (5.2.5) , $\underline{M} = CI * M/100 = 2.5 * 0.00514 / 100 =$

0.0001285

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 2.5 * 2.03 / 100 = 0.0508$

Admixture:0602 Benzene

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=2.3$ Total emissions, t/year (5.2.5) , $\underline{M} = CI * M/100 = 2.3 * 0.00514 / 100 = 0.0001182$

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 2.3 * 2.03 / 100 = 0.0467$

Admixture:0621 Methylbenzene (Toluol)

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=2.17$

Total emissions, t/year (5.2.5) , $\underline{M} = CI * M/100 = 2.17 * 0.00514 / 100 =$

0.0001115

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 2.17 * 2.03 / 100 = 0.04405$

Admixture:0627 Ethylbenzene

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=0.06$

Total emissions, t/year (5.2.5) , $\underline{M} = CI * M/100 = 0.06 * 0.00514 / 100 =$

0.000003084

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 0.06 * 2.03 / 100 = 0.001218$

Admixture:0616 Xylene (o-, m-, p- isomeric mixture)

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=0.29$

Total emissions, t/year (5.2.5) , $\underline{M} = CI * M/100 = 0.29 * 0.00514 / 100 =$

0.0000149

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 0.29 * 2.03 / 100 = 0.00589$

<u>Code</u>	<u>Admixture</u>	<u>Emission g/s</u>	<u>Emission t/year</u>
0415	Saturated hydrocarbon mixture C1-C5	1.374	0.00348
0416	Saturated hydrocarbon mixture C6-C10	0.508	0.001286
0501	Pentylenes (amylenes - isomeric mixture)	0.0508	0.0001285
0602	Benzene	0.0467	0.0001182
0616	Xylene (o-, m-, p- isomeric mixture)	0.00589	0.0000149
0621	Methylbenzene (Toluol)	0.04405	0.0001115
0627	Ethylbenzene	0.001218	0.0000031

Pollution source N0003, Respiratory valve

Release source N003, Tank with the capacity of 10 cu.m (Ai-80 petrol)

Bibliography:

Methodical indications for the determination of the emission of pollutants in the atmosphere from the RND tanks 211.2.02.09-2004. Astana, 2005 Calculation based on p. 9

Oil product: high-octane motor petrol (90 and higher)

Calculation of emissions from the tanks

Tank construction: sunken

Climatic area: third – southern oblasts of the RK (annex 17)

Maximum concentration of oil products vapors in the tank, g/m³ (App. 15) , $\underline{C_{MAX}} = 580$

Amount of oil pumped into the tank in the autumn-winter period, m³ , $\underline{Q_{OZ}} = 7.4$

Concentration of oil products vapor when filling tanks in the autumn-winter period, g/m³ (App. 15) , $\underline{C_{OZ}} = 260.4$

Amount of oil products pumped into the tank in the spring and summer period, m³ , $\underline{Q_{VL}} = 7.4$

Concentration of oil products vapor when filling tanks in the spring and summer period, g/m³ (App. 15), $\underline{C_{VL}} = 308.5$

Volume of the discharged oil product from the tanker into the tank, m³/h, $\underline{V_{SL}} =$

12.6

Maximum of single emissions, g/s (9.2.1) , $\underline{GR} = (C_{MAX} * V_{SL}) / 3600 = (580 * 12.6) / 3600 = 2.03$

Emissions for injection into tanks, tons/year (9.2.4), $\underline{M_{ZAK}} = (C_{OZ} * Q_{OZ} + C_{VL} * Q_{VL}) * 10^{-6} = (260.4 * 7.4 + 308.5 * 7.4) * 10^{-6} = 0.00421$

Estimated emissions in spills, g/m³, $\underline{J} = 125$

Emissions of oil product vapors in spills, t/year (9.2.5) , $\underline{M_{PRR}} = 0.5 * J * (Q_{OZ} + Q_{VL}) * 10^{-4} (-6) = 0.5 * 125 * (7.4 + 7.4) * 10^{-1} (-6) = 0.000925$ Total emissions, t/year (9.2.3) , $\underline{M_{R}} = \underline{M_{ZAK}} + \underline{M_{PRR}} = 0.00421 + 0.000925 = 0.00514$

Admixture: 0415 Saturated hydrocarbon mixture C1-C5

Concentration of pollutants in vapors, % of masses (App. 14) , $\underline{CI} = 75.47$

Total emissions, t/year (5.2.5) , $\underline{M} = CI * M/100 = 75.47 * 0.00514 / 100 =$

0.00388

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 75.47 * 2.03 / 100 = 1.532$

Admixture:0416 Saturated hydrocarbon mixture C6-C10

Concentration of pollutants in vapors, % of masses (App. 14) , $\underline{CI} = 18.38$

Total emissions, t/year (5.2.5) , $\underline{M} = CI * M/100 = 18.38 * 0.00514 / 100 =$

0.000945

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 18.38 * 2.03 / 100 = 0.373$

Admixture:0501 Pentylenes (amylenes - isomeric mixture)

Concentration of pollutants in vapors, % of masses (App. 14) , $\underline{CI} = 2.5$

Total emissions, t/year (5.2.5) , $\underline{M} = CI * M/100 = 2.5 * 0.00514 / 100 =$

0.0001285

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 2.5 * 2.03 / 100 = 0.0508$

Admixture:0602 Benzene

Concentration of pollutants in vapors, % of masses (App. 14) , $\underline{CI} = 2$ Total emissions, t/year (5.2.5) ,
 $\underline{M} = CI * M/100 = 2 * 0.00514 / 100 = 0.0001028$

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 2 * 2.03 / 100 = 0.0406$

Admixture:0621 Methylbenzene (Toluol)

Concentration of pollutants in vapors, % of masses (App. 14) , $\underline{CI} = 1.45$

Total emissions, t/year (5.2.5) , $\underline{M} = CI * M/100 = 1.45 * 0.00514 / 100 =$

0.0000745

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 1.45 * 2.03 / 100 = 0.02944$

Admixture:0627 Ethylbenzene

Concentration of pollutants in vapors, % of masses (App. 14) , $\underline{CI} = 0.05$

Total emissions, t/year (5.2.5) , $\underline{M} = CI * M/100 = 0.05 * 0.00514 / 100 =$

0.00000257

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 0.05 * 2.03 / 100 = 0.001015$

Admixture:0616 Xylene (o-, m-, p- isomeric mixture)

Concentration of pollutants in vapors, % of masses (App. 14) , $\underline{CI} = 0.15$

Total emissions, t/year (5.2.5) , $\underline{M} = CI * M/100 = 0.15 * 0.00514 / 100 =$

0.00000771

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 0.15 * 2.03 / 100 = 0.003045$

<i>Code</i>	<i>Admixture</i>	<i>Emission g/s</i>	<i>Emission t/year</i>
0415	Saturated hydrocarbon mixture C1-C5	1.532	0.00388
0416	Saturated hydrocarbon mixture C6-C10	0.373	0.000945
0501	Pentylenes (amylenes - isomeric mixture)	0.0508	0.0001285
0602	Benzene	0.0406	0.0001028
0616	Xylene (o-, m-, p- isomeric mixture)	0.003045	0.0000077
0621	Methylbenzene (Toluol)	0.02944	0.0000745
0627	Ethylbenzene	0.001015	0.0000026

Pollution source N0004, Respiratory valve

Release source N004, Tank with the capacity of 10 cu.m (diesel fuel)

Bibliography:

Methodical indications for the determination of the emission of pollutants in the atmosphere from the RND tanks 211.2.02.09-2004. Astana, 2005 Calculation based on p. 9

Oil product: high-octane motor petrol (90 and higher)

Calculation of emissions from the tanks

Tank construction: sunken

Climatic area: third – southern oblasts of the RK (annex 17)

Maximum concentration of oil products vapors in the tank, g/m³ (App. 15) , $\underline{CMAX} = 1.88$

Amount of oil pumped into the tank in the autumn-winter period, m³ , $\underline{QOZ} = 50.4$

Concentration of oil products vapor when filling tanks in the autumn-winter period, g/m³ (App. 15) , $\underline{COZ} = 0.99$

Amount of oil products pumped into the tank in the spring and summer period, m³ , $\underline{QVL} = 50.4$

Concentration of oil products vapor when filling tanks in the spring and summer period, g/m³ (App. 15), $\underline{CVL} = 1.33$

Volume of the discharged oil product from the tanker into the tank, m³/h, $\underline{VSL} =$

12.6

Maximum of single emissions, g/s (9.2.1) , $\underline{GR} = (CMAX * VSL) / 3600 = (1.88 * 12.6) / 3600 = 0.00658$

Emissions for injection into tanks, tons/year (9.2.4), $\underline{MZAK} = (COZ * QOZ + CVL * QVL) * 10^{-6} = (0.99 * 50.4 + 1.33 * 50.4) * 10^{-6} = 0.000117$

Estimated emissions in spills, g/m³, $\underline{J} = 50$

Emissions of oil product vapors in spills, t/year (9.2.5) , $\underline{MPRR} = 0.5 * J * (QOZ + QVL) * 10^{-6} = 0.5 * 50 * (50.4 + 50.4) * 10^{-6} = 0.00252$ Total emissions, t/year (9.2.3) , $\underline{MR} = MZAK + MPRR = 0.000117 + 0.00252 = 0.002637$

Admixture:2754 Dissolvent RPK-265P

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=99.72$

Total emissions, t/year (5.2.5) , $\underline{M} = CI * M/100 = 99.72 * 0.002637 / 100 =$

0.00263

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 99.72 * 0.00658 / 100 =$

0.00656

Admixture:0333 Hydrogen sulfide

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=0.28$

Total emissions, t/year (5.2.5) , $\underline{M} = CI * M/100 = 0.28 * 0.002637 / 100 =$

0.00000738

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G/100 = 0.28 *$

0.00658 / 100 = 0.00001842

<u>Code</u>	<u>Admixture</u>	<u>Emission g/s</u>	<u>Emission t/year</u>
0333	Hydrogen sulfide	0.0000184	0.0000074
2754	Dissolvent RPK-265P	0.00656	0.00263

Pollution source N0005, Filler of the petrol tank in a vehicle

Release source N005, Tank with the capacity of 10 cu.m (oil)

Bibliography:

Methodical indications for the determination of the emission of pollutants in the atmosphere from the RND tanks 211.2.02.09-2004. Astana, 2005 Calculation based on p. 9

Oil product: oils

Calculation of emissions from the tanks

Tank construction: sunken

Climatic area: third – southern oblasts of the RK (annex 17)

Maximum concentration of oil products vapors in the tank, g/m3 (App. 15) , $\underline{C_{MAX}}=0.19$

Amount of oil pumped into the tank in the autumn-winter period, m3 , $\underline{Q_{OZ}}=2.85$

Concentration of oil products vapor when filling tanks in the autumn-winter period, g/m3 (App. 15) ,

$\underline{COZ}=0.12$ Amount of oil products pumped into the tank in the spring and summer period, m3 ,

$\underline{QVL}=2.85$

Concentration of oil products vapor when filling tanks in the spring and summer period, g/m3 (App. 15),

$\underline{CVL}=0.12$

Volume of the discharged oil product from the tanker into the tank, m3/h, $\underline{VSL}=$

12.6

Maximum of single emissions, g/s (9.2.1) , $\underline{GR} = (C_{MAX} * VSL) / 3600 = (0.19 * 12.6) / 3600 =$

0.000665

Emissions for injection into tanks, tons/year (9.2.4), $MZAK = (COZ * QOZ + CVL * QVL) * 10^{-6}$
 $= (0.12 * 2.85 + 0.12 * 2.85) * 10^{-6} = 0.000000684$

Estimated emissions in spills, g/m3, $J = 12.5$

Emissions of oil product vapors in spills, t/year (9.2.5), $MPRR = 0.5 * J * (QOZ + QVL) * 10^{-6}$
 $= 0.5 * 12.5 * (2.85 + 2.85) * 10^{-6} = 0.0000356$ Total emissions, t/year (9.2.3), MR
 $= MZAK + MPRR = 0.000000684 +$

0.0000356 = 0.0000363

Admixture: 2735 Mineral black oil (spindle, engine, cylinder and other)

Concentration of pollutants in vapors, % of masses (App. 14), $CI = 100$

Total emissions, t/year (5.2.5), $M = CI * M/100 = 100 * 0.0000363 / 100 =$

0.0000363

Maximum of single emissions, g/s (5.2.4), $G = CI * G/100 = 100 * 0.000665 / 100 =$

<u>Code</u>	<u>Admixture</u>	<u>Emission g/s</u>	<u>Emission t/year</u>
2735	Mineral black oil (spindle, engine, cylinder and other)	0.000665	0.0000363

0.000665

Pollution source N6007

Release source N006, Fuel Dispensing Unit (petrol)

Bibliography:

Methodical indications for the determination of the emission of pollutants in the atmosphere from the RND tanks 211.2.02.09-2004. Astana, 2005 Calculation based on p. 9

Oil product: high-octane motor petrol (90 and higher)

Climatic area: third – southern oblasts of the RK (annex 17)

Calculation of emissions from the fuel dispensing units (FDU)

Maximum concentration of oil products vapors in filling tanks of vehicles, g/m3 (App.12),

$CMAX = 1176.12$

Amount of the released oil product in autumn and winter period, m3, $QOZ =$

7.4

Concentration of oil products vapors in filling tanks of vehicles in autumn and winter period, g/m3

(App.15), $CAMOZ = 520$

Amount of the released oil product in spring and summer period, m3, $QVL =$

7.4

Concentration of oil products vapors in filling tanks of vehicles in spring and summer period, g/m3

(App.15), $CAMVL = 623.1$

Productivity of one FDU arm (taking into account the minimum programmable movement of operation), m3/hour, $VTRK = 0.4$

Amount of FDU arms that operate simultaneously, releasing the selected oil product type, $\underline{NN}=1$

Maximum of single emissions in filling the tanks, g/s (9.2.2) , $\underline{GB}= \underline{NN}$

$$* \quad \underline{C_{MAX}} * \underline{V_{TRK}/3600} = 1 * 1176.12 * 0.4 / 3600 = 0.1307$$

Emissions in injection into the tanks of vehicles, t/year (9.2.7), $\underline{MBA} = (\underline{CAMOZ} * \underline{QOZ} + \underline{CAMVL} * \underline{QVL}) * 10^{-6} = (520 * 7.4 + 623.1 * 7.4) * 10^{-6} = 0.00846$

Estimated emissions in spills, g/m3, $\underline{J}=125$

Выбросы паров нефтепродукта при проливах на ТРК, т/год (9.2.8) , $\underline{MPRA}= 0.5$

$$* \quad \underline{J} * (\underline{QOZ} + \underline{QVL}) * 10^{-6} = 0.5 * 125 * (7.4 + 7.4) * 10^{-6} = 0.000925 \text{ Total emissions, t/year (9.2.6) , } \underline{MTRK} = \underline{MBA} + \underline{MPRA} = 0.00846 + 0.000925 = 0.00939$$

Admixture:0415 Saturated hydrocarbon mixture C1-C5

Concentration of pollutants in vapors, % of masses (App. 14) , $\underline{CI}=67.67$

Total emissions, t/year (5.2.5) , $\underline{M} = \underline{CI} * \underline{M}/100 = 67.67 * 0.00939 / 100 =$

0.00635

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = \underline{CI} * \underline{G}/100 = 67.67 * 0.1307 / 100 = 0.0884$

Admixture:0416 Saturated hydrocarbon mixture C6-C10

Concentration of pollutants in vapors, % of masses (App. 14) , $\underline{CI}=25.01$

Total emissions, t/year (5.2.5) , $\underline{M} = \underline{CI} * \underline{M}/100 = 25.01 * 0.00939 / 100 =$

0.00235

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = \underline{CI} * \underline{G}/100 = 25.01 * 0.1307 / 100 = 0.0327$

Admixture:0501 Pentylenes (amylenes - isomeric mixture)

Concentration of pollutants in vapors, % of masses (App. 14) , $\underline{CI}=2.5$

Total emissions, t/year (5.2.5) , $\underline{M} = \underline{CI} * \underline{M}/100 = 2.5 * 0.00939 / 100 =$

0.0002348

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = \underline{CI} * \underline{G}/100 = 2.5 * 0.1307 / 100 = 0.00327$

Admixture:0602 Benzene

Concentration of pollutants in vapors, % of masses (App. 14) , $\underline{CI}=2.3$ Total emissions, t/year (5.2.5) , $\underline{M} = \underline{CI} * \underline{M}/100 = 2.3 * 0.00939 / 100 = 0.000216$

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = \underline{CI} * \underline{G}/100 = 2.3 * 0.1307 / 100 = 0.003006$

Admixture:0621 Methylbenzene (Toluol)

Concentration of pollutants in vapors, % of masses (App. 14) , $\underline{CI}=2.17$

Total emissions, t/year (5.2.5) , $\underline{M} = \underline{CI} * \underline{M}/100 = 2.17 * 0.00939 / 100 =$

0.0002038

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = \underline{CI} * \underline{G}/100 = 2.17 * 0.1307 / 100 = 0.002836$

Admixture:0627 Ethylbenzene

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=0.06$

Total emissions, t/year (5.2.5) , $\underline{M} = CI * M / 100 = 0.06 * 0.00939 / 100 =$

0.00000563

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G / 100 = 0.06 * 0.1307 / 100 = 0.0000784$

Admixture:0616 Xylene (o-, m-, p- isomeric mixture)

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=0.29$

Total emissions, t/year (5.2.5) , $\underline{M} = CI * M / 100 = 0.29 * 0.00939 / 100 =$

0.00002723

Maximum of single emissions, g/s (5.2.4) , $\underline{G} = CI * G / 100 = 0.29 *$

0.1307 / 100 = 0.000379

<u>Code</u>	<u>Admixture</u>	<u>Emission g/s</u>	<u>Emission t/year</u>
0415	Saturated hydrocarbon mixture C1-C5	0.0884	0.00635
0416	Saturated hydrocarbon mixture C6-C10	0.0327	0.00235
0501	Pentylenes (amylenes - isomeric mixture)	0.00327	0.0002348
0602	Benzene	0.003006	0.000216
0616	Xylene (o-, m-, p- isomeric mixture)	0.000379	0.0000272
0621	Methylbenzene (Toluol)	0.002836	0.0002038
0627	Ethylbenzene	0.0000784	0.0000056

Pollution source N6008, Filler of the petrol tank in a vehicle

Release source N002, Fuel Dispensing Unit (petrol)

Bibliography:

Methodical indications for the determination of the emission of pollutants in the atmosphere from the RND tanks 211.2.02.09-2004. Astana, 2005 Calculation based on p. 9

Oil product: high-octane motor petrol (90 and higher)

Climatic area: third – southern oblasts of the RK (annex 17)

Calculation of emissions from the fuel dispensing units (FDU)

Maximum concentration of oil products vapors in filling tanks of vehicles, g/m³ (App.12) ,

C_{MAX}=1176.12

Amount of the released oil product in autumn and winter period, m³ , Q_{OZ}=

7.4

Concentration of oil products vapor when filling tanks in the autumn-winter period, g/m³ (App. 15),

C_{AMOZ}=520

Amount of the released oil product in spring and summer period, m³ , Q_{VL}=

7.4

Concentration of oil products vapor when filling tanks in the spring and summer period, g/m³ (App. 15),

C_{AMVL}=623.1

Productivity of one FDU arm (taking into account the minimum programmable movement of operation), m³/hour, $VTRK=0.4$

Amount of FDU arms that operate simultaneously, releasing the selected oil product type, $NN=1$

Maximum of single emissions in filling the tanks, g/s (9.2.2) , $GB=NN$

$$* \quad CMAX * VTRK/3600 = 1 * 1176.12 * 0.4 / 3600 = 0.1307$$

Emissions in injection into the tanks of vehicles, t/year (9.2.7), $MBA = (CAMOZ * QOZ + CAMVL * QVL) * 10^{-6} = (520 * 7.4 + 623.1 * 7.4) * 10^{-6} = 0.00846$

Estimated emissions in spills, g/m³, $J=125$

Estimated emissions in spills to FDU, t/year (9.2.8) , $MPRA=0.5$

$$* \quad J * (QOZ + QVL) * 10^{-6} = 0.5 * 125 * (7.4 + 7.4) * 10^{-6} = 0.000925 \quad \text{Total emissions, t/year (9.2.6) , } MTRK = MBA + MPRA = 0.00846 + 0.000925 = 0.00939$$

Admixture:0415 Saturated hydrocarbon mixture C1-C5

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=75.47$

Total emissions, t/year (5.2.5) , $M = CI * MTRK / 100 = 75.47 * 0.00939 / 100 = 0.00709$

Maximum of single emissions, g/s (5.2.4) , $G = CI * GTRK / 100 = 75.47 * 0.1307 / 100 = 0.0986$

Admixture:0416 Saturated hydrocarbon mixture C6-C10

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=18.38$

Total emissions, t/year (5.2.5) , $M = CI * MTRK / 100 = 18.38 * 0.00939 / 100 = 0.001726$

Maximum of single emissions, g/s (5.2.4) , $G = CI * GTRK / 100 = 18.38 * 0.1307 / 100 = 0.024$

Admixture:0501 Pentylenes (amylenes - isomeric mixture)

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=2.5$

Total emissions, t/year (5.2.5) , $M = CI * MTRK / 100 = 2.5 * 0.00939 / 100 = 0.0002348$

Maximum of single emissions, g/s (5.2.4) , $G = CI * GTRK / 100 = 2.5 * 0.1307 / 100 = 0.00327$

Admixture:0602 Benzene

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=2$

Total emissions, t/year (5.2.5) , $M = CI * MTRK / 100 = 2 * 0.00939 / 100 = 0.0001878$

Maximum of single emissions, g/s (5.2.4) , $G = CI * GTRK / 100 = 2 * 0.1307 / 100 = 0.002614$

Concentration of pollutants in vapors, % of masses (App. 14) , $CI=1.45$

Total emissions, t/year (5.2.5) , $\underline{M}_- = CI * M/100 = 1.45 * 0.00939 / 100 =$

0.0001362

Maximum of single emissions, g/s (5.2.4) , $\underline{G}_- = CI * G/100 = 1.45 * 0.1307 / 100 =$

0.001895

Admixture:0627 Ethylbenzene

Concentration of pollutants in vapors, % of masses (App. 14) , $\underline{CI}=0.05$

Total emissions, t/year (5.2.5) , $\underline{M}_- = CI * M/100 = 0.05 * 0.00939 / 100 =$

0.000004695

Maximum of single emissions, g/s (5.2.4) , $\underline{G}_- = CI * G/100 = 0.05 * 0.1307 / 100 =$

0.0000654

Admixture:0616 Xylene (o-, m-, p- isomeric mixture)

Concentration of pollutants in vapors, % of masses (App. 14) , $\underline{CI}=0.15$

Total emissions, t/year (5.2.5) , $\underline{M}_- = CI * M/100 = 0.15 * 0.00939 / 100 =$

0.00001409

Maximum of single emissions, g/s (5.2.4) , $\underline{G}_- = CI * G/100 = 0.15 * 0.1307 / 100 =$

0.000196

<u>Code</u>	<u>Admixture</u>	<u>Emission g/s</u>	<u>Emission t/year</u>
0415	Saturated hydrocarbon mixture C1-C5	0.0986	0.00709
0416	Saturated hydrocarbon mixture C6-C10	0.024	0.001726
0501	Pentylenes (amylenes - isomeric mixture)	0.00327	0.0002348
0602	Benzene	0.002614	0.0001878
0616	Xylene (o-, m-, p- isomeric mixture)	0.000196	0.0000141
0621	Methylbenzene (Toluol)	0.001895	0.0001362
0627	Ethylbenzene	0.0000654	0.0000047

Pollution source N6008

Release source N002, Fuel Dispensing Unit (diesel fuel)

Bibliography:

Methodical indications for the determination of the emission of pollutants in the atmosphere from the RND tanks 211.2.02.09-2004. Astana, 2005 Calculation based on p. 9

Oil product: diesel fuel

Climatic area: third – southern oblasts of the RK (annex 17)

Calculation of emissions from the fuel dispensing units (FDU)

Maximum concentration of oil products vapors in filling tanks of vehicles, g/m³

(App.12) , $\underline{CMAX}=3.92$

Amount of the released oil product in autumn and winter period, m³ , $\underline{QOZ}=$

50.4

Concentration of oil products vapor when filling tanks in the autumn-winter period, g/m³ (App. 15),

$$\underline{CAMOZ=1.98}$$

Amount of the released oil product in spring and summer period, m³, $\underline{QVL=}$

50.4

Concentration of oil products vapor when filling tanks in the spring and summer period, g/m³ (App. 15),

$$\underline{CAMVL=2.66}$$

Productivity of one FDU arm (taking into account the minimum programmable movement of operation), m³/hour, $\underline{VTRK=0.4}$

Amount of FDU arms that operate simultaneously, releasing the selected oil product type, $\underline{NN=1}$

Maximum of single emissions in filling the tanks, g/s (9.2.2), $\underline{GB=NN}$

$$* \quad \underline{CMAX * VTRK / 3600 = 1 * 3.92 * 0.4 / 3600 = 0.0004356}$$

Emissions in injection into the tanks of vehicles, t/year (9.2.7), $\underline{MBA= (CAMOZ*}$

$$\underline{QOZ+ CAMVL * QVL) * 10^{-6} = (1.98 * 50.4 + 2.66 * 50.4) * 10^{-6} = 0.000234}$$

Estimated emissions in spills, g/m³, $\underline{J=50}$

Emissions of oil products in spills to FDU, t/year (9.2.8), $\underline{MPRA=0.5}$

$$* \quad J * (QOZ + QVL) * 10^{-6} = 0.5 * 50 * (50.4 + 50.4) * 10^{-6} = 0.00252 \text{ Total emissions, t/year (9.2.6), } \underline{MTRK = MBA + MPRA = 0.000234 + 0.00252 = 0.002754}$$

Admixture:2754 Dissolvent RPK-265P

Concentration of pollutants in vapors, % of masses (App. 14), $\underline{CI=99.72}$

Total emissions, t/year (5.2.5), $\underline{M_ = CI * M/100 = 99.72 * 0.002754 / 100 =}$

$$\underline{0.002746}$$

Maximum of single emissions, g/s (5.2.4), $\underline{G_ = CI * G/100 = 99.72 * 0.000436 / 100 = 0.000435}$

Admixture:0333 Hydrogen sulfide

Concentration of pollutants in vapors, % of masses (App. 14), $\underline{CI=0.28}$

Total emissions, t/year (5.2.5), $\underline{M_ = CI * M/100 = 0.28 * 0.002754 / 100 =}$

$$\underline{0.00000771}$$

Maximum of single emissions, g/s (5.2.4), $\underline{G_ = CI * G/100 = 0.28 *}$

$$\underline{0.000436 / 100 = 0.00000122}$$

<u>Code</u>	<u>Admixture</u>	<u>Emission g/s</u>	<u>Emission t/year</u>
0333	Hydrogen sulfide	0.0000012	0.0000077
2754	Dissolvent ППК-265П	0.000435	0.002746

Pollution source N6001, Ventilation Pipe

Release source N003, Charging Post for a Storage Battery

Bibliography:

1. Methodology of inventorization of pollutants emissions in the atmosphere from the motor transport enterprises (calculation method)

M., Scientific Research Institute for Motor Transport, 1991, taking into account Additions to the Methodology, 1992, p.3.7. Calculation of pollutants emissions from the storage battery site

Technical process operations: Charging of the storage batteries

Electrolyte type: sulfuric acid

Nominal capacity of storage batteries of this type, A/h, $QN=55$

Number of charging for the batteries of relevant capacity per year, $AN=50$

Maximum amount of the above-specified batteries that are connected to all the charging devices simultaneously, $N1 = 1$ Charging cycle per day, hours, $M=10$

Admixture: 0322 Sulfuric acid

Estimated emission of pollutants, mg/A/h, $G=1$

Total emissions, t/year (f-la 3.7.1), $M = 0.9 * G * QN * AN / 10^9 = 0.9 * 1 * 55 * 50 / 10^9 = 0.000002475$

Maximum single emission, g/s (f-la 3.7.3), $G = 0.9 * G * QN * N1 * 10^{-3} / 3600 / M = 0.9 * 1 * 55 * 1 * 10^{-3} / 3600 / 10 = 0.000001375$

<u>Code</u>	<u>Admixture</u>	<u>Emission g/s</u>	<u>Emission t/year</u>
0322	Sulfuric acid	0.0000014	0.0000025

Bibliography:

1. Methodology of inventorization of pollutants emissions in the atmosphere from the motor transport enterprises (calculation method)

M., Scientific Research Institute for Motor Transport, 1991, taking into account Additions to the Methodology, 1992, p.3.7. Calculation of pollutants emissions from the storage battery site

Technical process operations: Charging of the storage batteries

Electrolyte type: sulfuric acid

Nominal capacity of storage batteries of this type, A/h, $QN=190$

Number of charging for the batteries of relevant capacity per year, $AN=50$

Maximum amount of the above-specified batteries that are connected to all the charging devices simultaneously, $N1 = 1$ Charging cycle per day, hours, $M=10$ Estimated emission of pollutants, mg/A/h, $G=1$

Total emissions, t/year (f-la 3.7.1), $M = 0.9 * G * QN * AN / 10^9 = 0.9 * 1 * 190 * 50 / 10^9 = 0.00000855$

Total emissions of admixture: 0322 (not taking into account cleaning), t/year = 0.0000111
Maximum single emission, g/s (f-la 3.7.3), $G = 0.9 * G * QN * N1 * 10^{-3} / 3600 / M = 0.9 * 1 * 190 * 1 * 10^{-3} / 3600 / 10 = 0.00000475$

Total emissions of admixture: 0322 (not taking into account cleaning), g/S = 6.2e-6

<u>Code</u>	<u>Admixture</u>	<u>Emission g/s</u>	<u>Emission t/year</u>
0322	Sulfuric acid	0.0000062	0.0000111

Pollution source N6001, Door Aperture

Release source N010, Vulcanizer

Bibliography:

1. Methodology of inventorization of pollutants emissions in the atmosphere from the motor transport enterprises (calculation method)

M., Scientific Research Institute for Motor Transport, 1991, taking into account Additions to the Methodology, 1992, p.3.7. Calculation of pollutants emissions from the tire fitting site storage battery site

Technical process operations: Charging of the storage batteries

Electrolyte type: sulfuric acid

Technical process operation: , **TP=Tire vulcanization** Average "clean" time of the machine operation per day, h , **S =1** Number of machines in the site, units , **NS=1** Amount of machines that are operating simultaneously, units , **NSI =1** Number of days of the site operation per year , **N=50**

Repair material: non-vulcanized thread rubber and band slate tire Amount of the material used, kg/year , **B=10**

Admixture:0330 Sulfur dioxide (sulfuric anhydride)

Estimated emission of pollutants, g/kg, of the repair material (Table 3.8.2) , **GB=0.0054**

Total emissions, t/year (f-la 3.8.2) , **M = GB*B* 10⁻⁶ =0.0054 * 10 * 10⁻⁶ = 0.000000054**

Maximum single emission, g/s (f-la 3.8.4) , G = M * 10⁻⁶ * NS/(S * N * 3600) =0.000000054 * 10⁻⁶ * 1 / (1 * 50 * 3600) = 0.0000003

Admixture:0503 Buta -1, 3 diene (1, 3 Butadiene, Divinyl)

Estimated emission of pollutants, g/kg, of the repair material (Table 3.8.2) , **GB=0.213**

Total emissions, t/year (f-la 3.8.2) , **M = GB*B* 10⁻⁶ =0.213 * 10 * 10⁻⁶ = 0.00000213**

Maximum single emission, g/s (f-la 3.8.4) , **G = M * 10⁻⁶ * NS/(S**

*** N * 3600) =0.00000213 * 10⁻⁶ * 1 / (1 * 50 * 3600) = 0.00001183**

Admixture:0516 2-Methylbuta -1, 3 diene (Isoprene)

Estimated emission of pollutants, g/kg, of the repair material (Table 3.8.2) , **GB=0.0162**

Total emissions, t/year (f-la 3.8.2) , **M = GB *B * 10⁻⁶ =0.0162 * 10 * 10⁻⁶ = 0.000000162**

Maximum single emission, g/s (f-la 3.8.4) , **G = M * 10⁻⁶ * NS/(S**

*** N * 3600) =0.000000162 * 10⁻⁶ * 1 / (1 * 50 * 3600) = 0.0000009**

TOTAL, in the site:

<u>Code</u>	<u>Admixture</u>	<u>Emission g/s</u>	<u>Emission t/year</u>
0330	Sulfur dioxide (sulfuric anhydride)	0.0000003	0.00000005
0503	Buta -1, 3 diene (1, 3 Butadiene, Divinyl)	0.0000118	0.0000021
0516	2-Methylbuta -1, 3 diene (Isoprene)	0.0000009	0.00000016

Bibliography:

1. Methodology of inventorization of pollutants emissions in the atmosphere from the motor transport enterprises (calculation method)

M., Scientific Research Institute for Motor Transport, 1991, taking into account Additions to the Methodology, 1992, p.3.7. Calculation of pollutants emissions from the tire fitting site

Technical process operation:

TP=Preparation, application and drying of the adhesive

Repair material: technical rubber, petrol

Amount of the material used, kg/year , $B=10$ Amount of the material used, kg/day , $Bl=0.5$ Time for the preparation, application and drying of the adhesive per day, hour , $S=1$

Admixture:2704 Petrol (black oil, low-sulfur) /in terms of carbon/

Estimated emission of pollutants, g/kg, of the repair material (Table 3.8.2) , $GB=900$

Total emissions, t/year (f-la 3.8.2) , $M = GB * B * 10 \cdot 10^{-6} = 900 * 10 * 10 \cdot 10^{-6} = 0.009$

Maximum single emission, g/s (f-la 3.8.3) , $G = GB * Bl / S / 3600 = 900 * 0.5 / 1 / 3600 = 0.125$

Pollution source N6001, Door Aperture

Release source N011, Turning Machine

Bibliography:

Methodology of calculation of pollutants emissions in the atmosphere in mechanical processing of metals (by values of estimated emissions) RND 211.2.02.06-2004. Astana, 2005

Method of processing: Mechanical processing of iron. Local dust suction is not provided.

Calculation type: without cooling

Technological operation: Processing by cutting of iron spare parts Machines type: Turning machines and automatic turning lathe of small and medium sizes

Actual annual fund of operation time for one unit of equipment, h/year, $T=70$

Number of machines of this type, units, $KOLIV = 1$

Number of machines of this type that are operating simultaneously, units, $NS1 = 1$ Admixture:2902
Suspended materials Estimated emission, g/s (Table 4) , $GV=0.0063$

Coefficient of gravitational settling (p. 5.3.2), $KN = KNAB = 0.2$ Total emissions, t/year (1), $M = 3600 * KN * GV * T * KOLIV / 10^6 = 3600 * 0.2 * 0.0063 * 70 * 1 / 10^6 = 0.0003175$

Maximum of single emissions, g/s (2), $G = KN * GV * NSI = 0.2 * 0.0063 * 1 = 0.00126$

TOTAL:

<u>Code</u>	<u>Admixture</u>	<u>Emission g/s</u>	<u>Emission t/year</u>
2902	Suspended materials	0.00126	0.0003175

Pollution source N6001

Release source N012, Vertical Drilling Machine

Bibliography:

Methodology of calculation of pollutants emissions in the atmosphere in mechanical processing of metals (by values of estimated emissions) RND 211.2.02.06-2004. Astana, 2005

Method of processing: Mechanical processing of metals. Local dust suction is not provided.

Calculation type: without cooling

Type of equipment: Processing of spare parts of Ferodo: Drilling machines

Actual annual fund of operation time for one unit of equipment, h/year, $T = 70$

Number of machines of this type, units, $KOLIV = 1$

Number of machines of this type that are operating simultaneously, units, $NSI = 1$ Admixture: 2902
Suspended materials Estimated emission, g/s (Table 1), $GV = 0.007$

Coefficient of gravitational settling (p. 5.3.2), $KN = KNAB = 0.2$ Total emissions, t/year (1), $M = 3600 * KN * GV * T * KOLIV / 10^6 = 3600 * 0.2 * 0.007 * 70 * 1 / 10^6 = 0.000353$

Maximum of single emissions, g/s (2), $G = KN * GV * NSI = 0.2 * 0.007 * 1 = 0.0014$

TOTAL:

<u>Code</u>	<u>Admixture</u>	<u>Emission g/s</u>	<u>Emission t/year</u>
2902	Suspended materials	0.0014	0.000353

Pollution source N6001

Release source N013, Rough Grinding Machine

Bibliography:

Methodology of calculation of pollutants emissions in the atmosphere in mechanical processing of metals (by values of estimated emissions) RND 211.2.02.06-2004. Astana, 2005

Method of processing: Mechanical processing of metals. Local dust suction is not provided.

Calculation type: without cooling

Equipment type: Non-center grinding machines with a diameter of the grinding disk of 480-600 mm

Actual annual fund of operation time for one unit of equipment, h/year , $T = 50$

Number of machines of this type, units, $KOLIV = 1$

Number of machines of this type that are operating simultaneously, units, $NS1 = 1$

Admixture: 2930 Fly grit (White corundum; Mono-corundum)

Estimated emission, g/s (Table 1) , $GV = 0.009$

Coefficient of gravitational settling (p. 5.3.2) , $KN = KNAB = 0.2$ Total emissions, t/year (1) , $M = \frac{3600 * KN * GV * T * KOLIV}{10^6} = \frac{3600 * 0.2 * 0.009 * 50 * 1}{10^6} = 0.000324$

Maximum of single emissions, g/s (2) , $G = KN * GV * NS1 = 0.2 * 0.009 * 1 = 0.0018$

Admixture: 2902 Suspended materials

Estimated emission, g/s (Table 1), $GV = 0.016$

Coefficient of gravitational settling (p. 5.3.2) , $KN = KNAB = 0.2$ Total emissions, t/year (1) , $M = \frac{3600 * KN * GV * T * KOLIV}{10^6} = \frac{3600 * 0.2 * 0.016 * 50 * 1}{10^6} = 0.000576$

Maximum of single emissions, g/s (2) , $G = KN * GV * NS1 = 0.2 * 0.016 * 1 = 0.0032$

TOTAL:

<u>Code</u>	<u>Admixture</u>	<u>Emission g/s</u>	<u>Emission t/year</u>
2902	Suspended materials	0.0032	0.000576
2930	Fly grit (white corundum; mono-corundum)	0.0018	0.000324

Source of pollution N 6001,

Source of emitting N 014, Vertically-milling

List of reference:

Method of calculation of pollutant emissions in the atmosphere at mechanical metal-working (in sizes of specific emissions). CND 211.2.02.06-2004. Astana, 2005

Processing technology: cast iron mechanical processing. Local exhaust of dust is not carried out.
Calculation type: unrefrigerated

Technological operation: Working by stock removal of cast iron parts. Sort of machine: Milling machines

Actual annual working time fund of one unit of equipment, h/year , $T = 70$

This type machines number, Nos. , $KOLIV = 1$

This type machines number, working at one time, Nos. , $NSI = 1$ **Additive agent:2902**

Suspended materials Specific emission, g/s(table. 4) , $GV = 0.0139$

Gravity sedimentation coefficient (с. 5.3.2) , $KN = KNAB = 0.2$ Gross emission, t/year (1) , $M = 3600 * KN * GV * T * KOLIV / 10^6 = 3600 * 0.2 * 0.0139 * 70 * 1 / 10^6 = 0.0007$

One-time maximum emission, g/s (2) , $G = KN * GV * NSI = 0.2 * 0.0139 * 1 = 0.00278$

Source of pollution N6001,

Source of emitting N015,Drilling machine

List of reference:

Method of calculation of pollutant emissions in the atmosphere at mechanical metal-working (in sizes of specific emissions). CND 211.2.02.06-2004. Astana, 2005

Processing technology: Cast iron mechanical processing. Local exhaust of dust is not carried out. Calculation type: unrefrigerated

Technological operation: Working by stock removal of cast iron parts. Sort of machine: Drilling machines

Actual annual working time fund of one unit of equipment, h/year, $T = 70$

This type machines number, Nos. , $KOLIV = 1$

This type machines number, working at one time, Nos., $NSI = 1$ **Additive agent:2902**

Suspended materials Specific emission, g/c(table 4) , $GV = 0.0011$

Gravity sedimentation coefficient (с. 5.3.2) , $KN = KNAB = 0.2$ Gross emission, t/year (1) , $M = 3600 * KN * GV * T * KOLIV / 10^6 = 3600 * 0.2 * 0.0011 * 70 * 1 / 10^6 = 0.0000554$

One-time maximum emission, g/s (2) , $G = KN * GV * NSI = 0.2 * 0.0011 * 1 = 0.00022$

TOTAL:

<u>Code</u>	<u>Additive agent</u>	<u>Emission2/c</u>	<u>Emissiont/year</u>
2902	Suspended materials	0.00022	0.0000554

Source of pollution N 6001,

Source of emitting N017, Grinding rubbing machine

List of reference:

Method of calculation of pollutant emissions in the atmosphere at mechanical metal-working (in sizes of specific emissions). CND 211.2.02.06-2004. Astana, 2005

Processing technology: Mechanical metal-working. Local exhaust of dust is not carried out Calculation type: unrefrigerated

Equipment type: Grinding-machines, with diameter of grinding wheel disk - 150 mm

Actual annual working time fund of one unit of equipment, h/year, $T = 50$

This type machines number, Nos. , $KOLIV = 1$

This type machines number, working at one time, Nos. , NS1 = 1 Additive agent:2930 Abrasive dust (White corundum; Monocorundum)

Specific emission, g/s (table 1) , $GV=0.006$

Gravity sedimentation coefficient (c. 5.3.2) , $KN = KNAB= 0.2$ Gross emission, t/year (1) , $M = \frac{3600 * KN * GV * T * KOLIV}{10^6} = 3600 * 0.2 * 0.006 * 50 * 1 / 10^6 = 0.000216$

One-time maximum emission, g/s (2) , $G = KN * GV * NSI = 0.2 * 0.006 * 1 = 0.0012$

Additive agent:2902 Suspended materials

Specific emission, g/s (table 1) , $GV=0.008$

Gravity sedimentation coefficient (c. 5.3.2) , $KN = KNAB=0.2$ Gross emission, t/year (1) , $M = \frac{3600 * KN * GV * T * KOLIV}{10^6} = 3600 * 0.2 * 0.008 * 50 * 1 / 10^6 = 0.000288$

One-time maximum emission, g/s (2) , $G = KN * GV * NSI = 0.2 * 0.008 * 1 = 0.0016$

TOTAL:

<u>Code</u>	<u>Additive agent</u>	<u>Emissiong/c</u>	<u>Emissiont/year</u>
2902	Suspended materials	0.0016	0.000288
2930	Abrasive dust (White corundum; Monocorundum)	0.0012	0.000216

Source of pollution N 6001,

Source of emitting N 017,Welding machine

List of reference:

Method of calculation of pollutant emissions in the atmosphere at mechanical metal-working (in sizes of specific emissions). CND 211.2.02.03-2004. Astana, 2005

CALCULATION of emissions 3B from metal welding

Welding type: Steel hand arc welding by manual electrodes. Electrode (welding material): MP-3

Expenditure of welding materials, kg/year , $B=100$ Actual maximum expenditure of welding materials, taking into account discretisation of the equipment work, kg/hour , $BMAX=1$

Specific emission of welding aerosol,

g/kg of expendable material (table 1, 3) , $GIS=11.5$

including:

Additive agent: 0123 Iron trioxide (Iron oxide) /re-calculation on iron/

Specific emission of pollutants,

g/kg of expendable material (table 1, 3) , $GIS=9.77$

Gross emission, t/year (5.1) , $M = GIS * B / 10^6 = 9.77 * 100 / 10^6 =$

0.000977

One-time maximum emission, g/s (5.2) , $G = GIS * BMAX / 3600 = 9.77 * 1 / 3600 = 0.002714$

Additive agent:0143 Manganese and its combinations / re-calculation on manganese (IV) oxide/

Specific emission of pollutants,

g/kg of expendable material (table 1, 3) , $GIS=1.73$

Gross emission, t/year (5.1) , $M = GIS * B / 10^6 = 1.73 * 100 / 10^6 =$

0.000173

One-time maximum emission, g/s (5.2) , $G = GIS * BMAX / 3600 = 1.73 * 1 / 3600 = 0.000481$

Gas:

Additive agent:0342 Fluoride gaseous compounds (hydrofluoride, silicon tetrafluoride) (Fluoride gaseous compounds (fluorine hydride, silicon tetra-fluoride)) /re-calculation on fluorine /

Specific emission of pollutants,

g/kg of expendable material (table. 1, 3) , $GIS=0.4$

Gross emission, t/year (5.1) , $M = GIS * B / 10^6 = 0.4 * 100 / 10^6 =$

0.00004

One-time maximum emission, g/s (5.2) , $G = GIS * BMAX / 3600 = 0.4 * 1 / 3600 = 0.0001111$

TOTAL:

<u>Code</u>	<u>Additive agent</u>	<u>Emissiong/c</u>	<u>Emissiont/year</u>
0123	Iron trioxide (Iron oxide) /re-calculation on iron/	0.002714	0.000977
0143	Manganese and its combinations /re-calculation on manganese (IV) oxide/	0.000481	0.000173
0342	Fluoride gaseous compounds	0.0001111	0.00004

	(hydrofluoride , silicontetrafluoride) (Fluoride gaseous compounds (fluorine hydride , silicon tetra-fluoride)) /re-calculation on fluorine/		
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Source of pollution N6006, Door aperture Source of emitting N016, Paint works

List of reference:

Method of calculation of pollutant emissions in the atmosphere at mechanical metal-working (in sizes of specific emissions). CND 211.2.02.05-2004. Astana, 2005

Processing technology: paint and drying-out Actual annual expenditure PWM, tones , $MS=0.5$
Maximum hour expenditure of PWM, taking into account discretisation of the equipment work, kg ,
 $MSI=2$

Mark of PWM: Enamel PF-115 painting technique: Pneumatic

Share of fugitive part (solvent) in PWM (table 2), % , $F2=45$

Additive agent:0616 Xylol (isomer mixture o-, m p n -)

Share of agent in fugitive part of PWM (table 2), % , $FPI=50$

Share of solvent, at painting and drying-out

for this method of painting (table 3), % , $DP=100$

Gross emission 3B (3-4), t/year, $M=MS * F2 * FPI * DP * 10^{-6}=0.5 * 45$

$* 50 * 100 * 10^{-1} = 0.1125$

One-time maximum emission, g/s 3B (5-6), g/s , $G=MSI * F2 * FPI * DP / (3.6 * 10^6) = 2 * 45 * 50 * 100 / (3.6 * 10^6) = 0.125$

Additive agent:2752 White spirit

Share of agent in fugitive part of PWM (table 2), % , $FPI=50$

Share of solvent, at painting and drying-out

for this method of painting (table 3), % , $DP=100$

Gross emission 3B (3-4), t/year, $M=MS * F2 * FPI * DP * 10^{-6}=0.5 * 45$

$* 50 * 100 * 10^{-1} = 0.1125$

One-time maximum emission, g/s PS (5-6), g/s , $G=MSI * F2 * FPI * DP / (3.6 * 10^6) = 2 * 45 * 50 * 100 / (3.6 * 10^6) = 0.125$

Share of emission of paint aerosol:

Additive agent:2902 Suspended materials

Share of aerosol at painting, for this method of painting (table 3), % , $DK=30$ Gross emission 3B (1),
t/year , $M=KOC * MS * (100-F2) * DK * 10^{-4} = 1 * 0.5 * (100-45) * 30 * 10^{-4} = 0.0825$

Maximum из разовых выброс 3B (2), g/s , $G=KOC * MSI * (100-F2) * DK / (3.6 * 10^6) = 1 * 2 * (100-45) * 30 / (3.6 * 10^6) = 0.0917$

Total:

<u>Code</u>	<u>Additive agent</u>	<u>Emission g/c</u>	<u>Emissiont/year</u>
0616	Xylol (isomer mixture o-, m-, p-)	0.125	0.1125
2752	White spirit	0.125	0.1125
2902	Suspended materials	0.0917	0.0825

Source of pollution N6002, Dusting surface Source of emitting N019, Salt storage depot

List of reference:

"The collection of methods on calculation of pollutant emissions into atmosphere by various productions". Almaty, KszECOEEKSP, 1996 c.9.3. Calculation of emissions of hazardous substances by unorganized sources Note: some auxiliary coefficients for dust materials (except coal) have been taken from: Methodical instructions on calculation of pollution emissions into the atmosphere by the enterprises of the construction industry. Enterprises of nonmetallic materials and porous fillers", Almaty, NGO Amal, 1992

Work types: Calculation of emissions from dusty material depots (c. 9.3.2) Material: Salt

Material moisture content varying: 10 - 100 %

Coefficient, taking into account material moisture content (table 9.1) , $K0 = 0.1$
wind speed varying: 2.0 - 5.0 m/s

Coefficient, taking into account annual average wind speed (table 9.2) , $K1 = 1.2$ Local conditions: depots, open storages on one side, Coefficient., taking into account protection level of the block (table 9.4) , $K4 = 0.1$ material height of drop, m , $GB = 2$

Coefficient, taking into account material height of drop (table 9.5) , $K5 = 0.7$ Specific emission of solid particles solids from tone of material, g/t , $Q = 60$ Efficiency of applied items of dust suppression (is determined experimentally, or accepted on referenced data), unit fraction, $N = 0$

Quantity of material, coming on depot, t/year, $MGOD = 100$ Maximum quantity of material, coming on depot, t/hour, $MH = 5$ Specific blowing away of solid particles solids from surface of dump, $w = 0 * 10^{-6}$ kg / m² * s Coefficient of material crush grinding, $F = 0.002$ Base area of dumps, m² , $S = 10$

Coefficient, taking into account surface profile of stocked material,

$K6 = 1.45$

Additive agent:2902 Suspended materials

Quantity of solid particles solids, produced in the process of depot formation: Gross emission, t/year (9.18) , $M1 = K0 * K1 * K4 * K5 * Q * MGOD * (1-N) * 10^{-6} = 0.1 * 1.2 * 0.1 * 0.7 * 60 * 100 * (1-0) * 10^{-6} = 0.0000504$ One-time maximum emission, g/s (9.19) , $G1 = K0 * K1 * K4 * K5 * Q * MH * (1-N) / 3600 = 0.1 * 1.2 * 0.1 * 0.7 * 60 * 5 * (1-0) / 3600 = 0.0007$
Quantity of solid particles solids, being blew away from depot surface:

Gross emission, t/year (9.20) , $M2 = 31.5 * K0 * K1 * K4 * K6 * W * 10^{-6} * F * S * (1-N) * 1000 = 31.5 * 0.1 * 1.2 * 0.1 * 1.45 * 0.005 * 10^{-6} * 0.002 * 10 * (1-0) * 1000 = 0.0000000548$

Maximum из разовых выброс, г/с (9.22) , $G2 = K0 * K1 * K4 * K6 * W * 10^{-6} * F * S * (1-N) * 1000 = 0.1 * 1.2 * 0.1 * 1.45 * 0.005 * 10^{-6} * 0.002 * 10 * (1-0) * 1000 = 0.0000000017$

Total gross emission, t/year , $M = M1 + M2 = 0.0000504 + 0.0000000548 = 0.0000505$

One-time maximum emission, g/s $G = G1 = 0.0007$ is observed in the process of depot formation

Total emissions:

<u>Code</u>	<u>Additive emissions</u>	<u>Emission/c</u>	<u>Emission/year</u>
2902	Suspended matrixes	0.0007	0.0000505

Source of pollution N6002, Dusting surface Source of emitting N020, Sand storage depot
List of reference:

" The collection of methods on calculation of pollutant emissions into atmosphere by various productions ". Almaty, KszECOESKSP, 1996 с.9.3. of emissions of hazardous substances by unorganized sources Notice: some auxiliary coefficients for dust materials (except coal) have been taken from: " Methodical instructions on calculation of pollution emissions into the atmosphere by the enterprises of the construction industry. Enterprises of nonmetallic materials and porous fillers", Almaty, NGO Amal, 1992

Work types: Calculation of emissions from dusty material depots (с. 9.3.2) Material: Sand

Material moisture content varying: 10 - 100 %

Coefficient, taking into account material moisture content (table 9.1) , $K0 = 0.1$ Wind speed varying:: 2.0 - 5.0 m/s

Coefficient, taking into account annual average wind speed (table 9.2), $K1 = 1.2$ Local conditions: depots, open storages on one side, Coefficient., taking into account protection level of the block (table 9.4) , $K4 = 0.1$ material height of drop, m , $GB = 2$

Coefficient, taking into account material height of drop (table 9.5) , $K5 = 0.7$ Specific emission of solid particles solids from tone of material, g/t , $Q = 540$ Efficiency of applied items of dust suppression (is determined experimentally, or accepted on referenced data), unit fraction, $N = 0$

г/т , $Q = 540$

Quantity of material, coming on depot, t/year, $MGOD = 500$ Maximum quantity of material, coming on depot, t/hour, $MH = 5$ Specific blowing away of solid particles solids from surface of dump, $w = 2 * 10^{-6}$ kg / m² * s

Lump size varying: 3-5 mm

Coefficient, taking into account material size (table 5[2]), $F = 0.7$ Base area of dump, m², $S = 10$

Coefficient, taking into account surface profile of stocked material,

$K6 = 1.45$, $MGOD = 500$ т/час , $w = 2 * 10^{-6}$ кг / м² *

Additive agent: 2908 Inorganic dust: 70-20% silicon dioxide (chamotte, cement, dust of cement production - clay, clay slate, furnace cinder, sand, clinker, ash earth silicon and other)

Quantity of solid particles solids, produced in the process of depot formation: Gross emission, t/year (9.18) , $M1 = K0 * K1 * K4 * K5 * Q * MGOD * (1-N) * 10^{-6} = 0.1 * 1.2 * 0.1 * 0.7 * 540 * 500 * (1-0) * 10^{-6} = 0.00227$ One-time maximum emission, g/s (9.19) , $G1 = K0 * K1 * K4 * K5 * Q * MH * (1-N) / 3600 = 0.1 * 1.2 * 0.1 * 0.7 * 540 * 5 * (1-0) / 3600 = 0.0063$

Quantity of solid particles solids, being blew away from depot surface:

Gross emission, t/year (9.20), $M2 = 31.5 * K0 * K1 * K4 * K6 * W * 10^{-6} * F * S * (1-N) * 1000$
 $= 31.5 * 0.1 * 1.2 * 0.1 * 1.45 * 2 * 10^{-6} * 0.7 * 10 * (1-0) *$

1000 = 0.00767

Maximum из разовых выброс, г/с (9.22), $G2 = K0 * K1 * K4 * K6 * W * 10^{-6} * F * S * (1-N) * 1000$
 $= 0.1 * 1.2 * 0.1 * 1.45 * 2 * 10^{-6} * 0.7 * 10 * (1-0) * 1000 = 0.0002436$

Total gross emission, t/year, $\underline{M} = M1 + M2 = \mathbf{0.00227} + \mathbf{0.00767} = \mathbf{0.00994}$ One-time
 maximum emission, g/s $\underline{G} = G1 = \mathbf{0.0063}$ is observed in the process of depot formation

Total emissions:

<u>Code</u>	<u>Additive agent</u>	<u>Emissionz/c</u>	<u>Emissiont/year</u>
2908	Inorganic dust : 70-20%	0.0063	0.00994

	silicon dioxide (chamotte, cement, dust of cement production - clay, clay slate, furnace cinder, sand, clinker, ash earth silicon and other .)		
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Source of pollution N6004, Movement on the territory Source of emitting N021, ДВС (special technique)

List of reference:

1. Method of calculation of pollutant emissions from motor transport enterprise (section 3) Appendix No.3 to Order of the Minister for the Environment of the Republic of Kazakhstan dated 18.04.2008 No.100-p
2. Method of calculation of pollutant emissions from enterprises of road-building branch (section 4)

Appendix No.12 to Order of the Minister for the Environment of the Republic of Kazakhstan dated 18.04.2008 №100-p

CALCULATION OF POLLUTANT EMISSIONS AT WORK AND VEHICLE MOVEMENT ON THE TERRITORY

Listoftransport

<u>Car vehicle</u>	<u>Fuel specification</u>	<u>Total</u>	<u>Max</u>
<u>Carburetor motor cars with displacement over 1.8 to 3.5 l (to 94)</u>			
UAZ-469	Nonleaded gasoline	2	1
<u>Diesel light buses with overall length from 6 to 7.5m (CIS)</u>		<u>1</u>	
ZIL-32501	Nonleaded gasoline	1	1
<u>Carburetor midibuses with overall length from 8 to 10 m (CIS)</u>			
LAZ-697P	Diesel gas oil	1	1
<u>Carburetor load carrier over 2 t to 5 t (CIS)</u>			
GAZ-52-05	Diesel gas oil	1	1
GZSA-950A	Diesel gas oil	1	1
TOTAL in the group:		2	2
<u>Carburetor load carrier over over 5 t to 8 t (CIS)</u>			
ZIL-130B1 ДС-41А bitumen carrier	Diesel gas oil	1	1
<u>Diesel load carrier over 5 to 8 t (CIS)</u>			
KamAZ-4310	Diesel gas oil	1	1
<u>Diesel load carrier over 8 to 16 t (CIS)</u>			
SB-92B-2 concrete mixing machine (under-carriage KAMAZ-55111)	Diesel gas oil	1	1
<u>Diesel load carrier over 16 t (CIS)</u>			
Fuel truck B1-OTA-20.H (tractive vehicle	Diesel gas oil	1	1

KAMAZ -54115)			
BelAZ-540	Diesel gas oil	2	1
TOTAL in the group:		3	2
<u>Tractor (Gus), NICE to 20 kW</u>			
DU-54A	Diesel gas oil	2	1
<u>Tractor p (Г), NДBC = 161 - 260 kW</u>			
DZ-126V-1	Diesel gas oil	1	1
<u>Tractor (K), NДBC = 36 - 60 kW</u>			
EO-2621V-3	Diesel gas oil	3	2
<u>TOTAL: 18</u>			

Storage period: Cold storage period ($t < -5$)

Air temperature over calculation period, degree C , $T = -25$

Machine type: Diesel load carrier over 16 t (CIS)

Fuel type: Diesel gas oil Quantity of working days in the year, days. , $DN = 160$

Most vehicles, working on the territory during 30 minutes, $NKI = 1$

Total cars number of this group over calculation period, Nos. , $NK = 20$

Consumption factor (coefficient of access track), $A=1$ Ecological control is not carried out
Summary operational kilometers with loading, km/days, $LIN=1$

Summary time of tickover, min/day, $TXS=100$ Maximal range with loading over 30 min, km, $L2N=0.7$

Maximal time of tickover during 30 minutes, min, $TXM=15$

Summary operational kilometers of 1 car without loading along territory c/sc, km, $L1=200$ Maximal operational kilometers of 1 car without loading over 30 minutes, km, $L2=1$

Additive agent:0337 Carbon monoxide

Running exhaust emission 3B, g/km, (table 3.8), $ML=9.3$ Specific emissions 3B at idling conditions, g/min,

(table 3.9), $MXX=2.9$

Emission 3B per day at the movement and work in the territory, g, $MI=ML*L1+1.3$

$$* ML * LIN + MXX * TXS = 9.3 * 200 + 1.3 * 9.3 * 1 + 2.9 * 100 = 2162.1 \text{ Gross emission 3B, t/year, } M = A * MI * NK * DN * 10^L(-6) = 1 * 2162.1 * 20$$

$$* 160 * 10^1(-6) = 6.92$$

Maximum single emission 3B by one car, g during 30 minutes, $M2=ML$

$$* L2 + 1.3 * ML * L2N + MXX * TXM = 9.3 * 1 + 1.3 * 9.3 * 0.7 + 2.9 * 15 = 61.3 \text{ Maximum single emission 3B, g/s, } G = M2 * NK1 / 30 / 60 = 61.3 * 1 / 30 / 60 = 0.03406$$

Additive agent:2732 Burning oil

Running exhaust emission 3B, g/km, (table 3.8), $ML=1.3$ Specific emission 3B at idling conditions, g/min,

(table.3.9), $MXX=0.45$

Emission 3B per day at the movement and work in the territory, g, $MI=ML*L1+1.3$

$$* ML * LIN + MXX * TXS = 1.3 * 200 + 1.3 * 1.3 * 1 + 0.45 * 100 = 306.7 \text{ Gross emission 3B, t/year, } M = A * MI * NK * DN * 10^L(-6) = 1 * 306.7 * 20 * 160 * 10^1(-6) = 0.981$$

Maximum single emission 3B by one car, g during 30 minutes, $M2=ML$

$$* L2 + 1.3 * ML * L2N + MXX * TXM = 1.3 * 1 + 1.3 * 1.3 * 0.7 + 0.45 * 15 = 9.23 \text{ Maximum single emission 3B, g/s, } G = M2 * NK1 / 30 / 60 = 9.23 * 1 / 30 / 60 = 0.00513$$

CALCULATION of emission nitrogen oxide:

Running exhaust emission 3B, g/km, (table 3.8), $ML=4.5$ Specific emission 3B at idling conditions, g/min,

(table 3.9), $MXX=1$

Emission 3B per day at the movement and work in the territory, g, $MI=ML*L1+1.3$

$$* ML * LIN + MXX * TXS = 4.5 * 200 + 1.3 * 4.5 * 1 + 1 * 100 = 1005.9 \text{ Gross emission 3B, t/year, } M = A * MI * NK * DN * 10^L(-6) = 1 * 1005.9 * 20$$

$$* 160 * 10^L (-6) = 3.22$$

Maximum single emission 3B by one car, g during 30 minutes , $M2 = ML$

$$* L2 + 1.3 * ML * L2N + MXX * TXM = 4.5 * 1 + 1.3 * 4.5 * 0.7 + 1 * 15 = 23.6$$

Maximum single emission 3B, g/s , $G = M2 * NK1 / 30 / 60 = 23.6 * 1 / 30 / 60 = 0.0131$

Taking into account transformation of nitrogen oxides we receive:

Additive agent:0301 Nitrogen (IV) oxide (Nitrogen dioxide)

Gross emission, t/year , $M = 0.8 * M = 0.8 * 3.22 = 2.576$ Maximum single emission, g/s , $GS = 0.8 * G = 0.8 * 0.0131 = 0.01048$

Additive agent:0304 Nitrogen (II) oxide (Nitrogen dioxide)

Gross emission, t/year , $M = 0.13 * M = 0.13 * 3.22 = 0.419$ Maximum single emission, g/s , $GS = 0.13 * G = 0.13 * 0.0131 = 0.001703$

Additive agent:0328 Carbon (Black pigment)

Running exhaust emission 3B, g/km, (table 3.8) , $ML = 0.5$ Specific emission 3B at idling conditions, g/min,

(table 3.9) , $MXX = 0.04$

Emission 3B per day at the movement and work in the territory, g, $MI = ML * LI + 1.3$

$$* ML * LIN + MXX * TXS = 0.5 * 200 + 1.3 * 0.5 * 1 + 0.04 * 100 = 104.7$$

Gross emission 3B, t/year , $M = A * MI * NK * DN * 10^L (-6) = 1 * 104.7 * 20 * 160 * 10^L (-6) = 0.335$

Maximum single emission 3B by one car, g over 30 minutes, $M2 = ML$

$$* L2 + 1.3 * ML * L2N + MXX * TXM = 0.5 * 1 + 1.3 * 0.5 * 0.7 + 0.04 * 15 = 1.555$$

Maximum single emission 3B, g/s , $G = M2 * NK1 / 30 / 60 = 1.555 * 1 / 30 / 60 = 0.000864$

Additive agent:0330 Sulfur dioxide (Anhydride sulphurous)

Running exhaust emission 3B, g/km, (table 3.8) , $ML = 0.97$ Specific emission 3B at idling conditions, g/min,

(table 3.9) , $MXX = 0.1$

Emission 3B per day at the movement and work in the territory, g, $MI = ML * LI + 1.3$

$$* ML * LIN + MXX * TXS = 0.97 * 200 + 1.3 * 0.97 * 1 + 0.1 * 100 = 205.3$$

Gross emission 3B, t/year , $M = A * MI * NK * DN * 10^L (-6) = 1 * 205.3 * 20 * 160 * 10^L (-6) = 0.657$

Maximum single emission 3B by one car, g over 30 minutes, $M2 = ML$

$$* L2 + 1.3 * ML * L2N + MXX * TXM = 0.97 * 1 + 1.3 * 0.97 * 0.7 + 0.1 * 15 = 3.35$$

Maximum single emission 3B, g/s , $G = M2 * NK1 / 30 / 60 = 3.35 * 1 / 30 / 60 = 0.00186$ TOTAL emissions on period: Cold storage period (t<-5) Air temperature over calculation period, degree C , $T = -25$

<i>Machine type:</i>			<i>Diesel load carrier over 16 t (CIS)</i>						
<i>Dn,</i> <i>day</i>	<i>Nk,</i> <i>Nos</i>	<i>A</i>	<i>Nkl</i> <i>Nos</i>	<i>LI,</i> <i>km</i>	<i>Lln,</i> <i>km</i>	<i>Txs,</i> <i>min</i>	<i>L2,</i> <i>km</i>	<i>L2n,</i> <i>km</i>	<i>Txm,</i> <i>min</i>
160	20	1.00	1	200	1	100	1	0.7	15
<i>3B</i>	<i>Mxx,</i> <i>o/min</i>	<i>ML,</i> <i>o/km</i>	<i>z/c</i>		<i>t/year</i>				
0337	2.9	9.3	0.03406		6.92				
2732	0.45	1.3	0.00513		0.981				
0301	1	4.5	0.01048		2.576				
0304	1	4.5	0.001703		0.419				
0328	0.04	0.5	0.000864		0.335				
0330	0.1	0.97	0.00186		0.657				

TOTAL EMISSIONS FROM CAR PARKING

<i>Code</i>	<i>Additive agent</i>	<i>Emissiong/s</i>	<i>Emissiont/year</i>
0301	Nitrogen (IV) oxide (Nitrogen dioxide)	0.01048	2.576
0304	Nitrogen (II) oxide (Nitrogen oxide)	0.001703	0.419
0328	Carbon (B pigment)	0.000864	0.335
0330	Sulfur dioxide (Anhydride sulphurous)	0.00186	0.657
0337	Carbon monoxide	0.03406	6.92
2732	Burning oil	0.00513	0.981

Maximum single emissions have been reached in cold period at temperature -25 degree C

- **bitumen storage** consists of concrete capacity of enclosed type on 500 tons for acceptance and storage of bitumen BND 90/130, and 1 land steel horizontal drums on 437 m³ by lower heating. Annual bitumen distribution is approximately 500 tons. Polluting agent coming to atmosphere - hydrocarbon.

Emissions calculation at acceptance and storage of bitumen and heating oil

Emissions calculation at acceptance and storage of bitumen

Calculation of emission is carried out according to Collection of methods by calculation of emissions into atmosphere by various productions. Almaty. 1996.

1. Emissions of hydrocarbons at storage of bitumen are calculated on the following formula:

hour

where $I_{ub1} = 2.52 \times V \times P_{S(38)} \times m \times (k_{5T} + k_{5X}) \times k_6 \times k_7 \times (1-p) \times 10^9, \text{kg/}$

V - volume of liquid, poured in capacity during the year, m^3/year ($V = 2925 \text{ t}/1.06 \text{ t/m}^3 = 2760 \text{ m}^3$);

$P_{S(38)}$ - pressure of saturated vapour of liquid at a temperature 38°C , HPa; m - molecular mass of liquid vapor, g/mole;

h - efficiency coefficient of gas-handling equipment ($h = 0$); k_{5X} , k_{5T} - coefficient of correction, depending on pressures of saturated vapour and temperature of gas space in cold and warm season accordingly;

k_6 - coefficient of correction, depending on pressures of saturated vapour and annual turnover of reservoirs; k_7 - coefficient of correction, depending on technological infrastructure of reservoir and operating mode.

$P_{S(38)}$ is determined depending on value of equivalent temperature of the beginning of liquid boiling ($t_{\text{эКВ}}$, $^\circ\text{C}$), determined on formula: $t = 1 + \frac{W - t^{\wedge}}{8.8}$

$$t = 1 + \frac{W - t^{\wedge}}{8.8}$$

equ nk 8 8

where W and t^{\wedge} – temperatures of beginning and end of boiling accordingly ($^\circ\text{C}$).

For bitumen $W = 225^\circ\text{C}$, $t^{\wedge} = 360^\circ\text{C}$ (according to example of emissions calculation «Methodical instructions by calculation of emissions of the polluting substances into the atmosphere from asphalt concrete plants», Moscow, 1987, page 33).

$$t_{\text{equ}} = 225 + (360 - 225) / 8.8 = 240^\circ\text{C}$$

Proceeding from this temperature $P_{S(38)} = 0.15 \text{ HPa}$. Table 4.1)

h is determined depending on temperature of beginning and end of boiling. In our case $h = 176 \text{ g/mole}$.

k_{5X} , k_{5T} as work of plant is provided only in the warm period of year, then $k_{5X} = 0$, a k_{5T} is determined in dependence to $P_{S(38)}$ temperature of gas space t_r^p .

t_r^p is determined on the following formula:

$$t_r^p = k_4 (k_{1T} + k_{2T} \times t_{aT} + k_{3T} \times t_{жT})$$

where

$t_{жT}$ - average temperature of oil-product in reservoir over 6 most warm months

(as in our case reservoirs with bitumen heat to 120°C , then $t^{\wedge} = 120^\circ\text{C}$); k_{1T} , k_{2T} , k_{3T} - coefficients over 6 most warm months Table П1.1. ($k_{1T} =$

8.41, $k_{2T} = 0.99$, $k_{3T} = 0.75$) - whichever $t^{\wedge} = 120^\circ\text{C}$); t_{aT} - average temperature of atmosphere air for 6 most warm months

$t_{aT} = 12.7^\circ\text{C}$ ($(11.4 + 16.8 + 18.8 + 16.6 + 1.6 + 1.8)/6$); k_{4T} - coefficient, depending on painting of reservoir and climatic zone, table 1.2 ($k_{4T} = 1.22$) – black colour, average climatic zone. Then t_r^p will be equal:

$$1\Gamma T^P = 1.22 \times (-8.41 + 0.99 \times 12.7 + 0.75 \times 120) = 114.87 \text{ }^{\circ}\text{C}$$

Proceeding from the position, that t_{tr}^P более 100°C и $P_{S(38)} = 0.15 \text{ HPa}$ according to table C.1.6. $\kappa_{5T} = 41.36$.

κ_6 is determined in dependence to pressure of V .
saturated vapour $P_{S(38)}$ and annual turnover of
reservoirs: n -

where

3

V^* - liquid volume, coming to reservoir during the year, m ($V^* = 416$); V_p - reservoir volume, m (on enterprise 1 reservoir on 437 m for bitumen is installed, so $V_p = 105$). $n = 416 / 437 = 0.95$

Then according to table 2.1 $\kappa_6 = 1.39$

As reservoir work mode is «dosage meter» and they unequipped by technical means of loss reduction, so $\kappa_7 = 1.1$.

On the basis of above described calculations it is possible to determine I_{ub1} :

$$I_{ub1} = 2.52 \times 416 \times 0.15 \times 176 \times (41.36 + 0) \times 1.369 \times 1.1 \times (1 - 0) \times 10^{-9} = 0.0018 \text{ kg/hour}$$

$$I_{ub1} = 0.0018 \times 1000 / 3600 = 0.0005 \text{ g/s}$$

$$I_{ub1} = 0.0018 / 1000 \times 170 \times 24 = 0.007344 \text{ t/year}$$

2. Emissions of hydrocarbons at a bitumen transfer from the cistern into capacity is determined by the following formula:

$$I_{ub2} = 0.2485 \times V \times P_{S(38)} \times m \times (\kappa_{5T} + \kappa_{5X}) \times 10^{-9}, \text{ kg / hour}$$

In this case at determination of coefficient κ_{5T} it is necessary to consider, that t_{tr}^P will equal to average temperature of atmosphere air for relevant period of the year. We have $c \ t_{tr}^P = t_{aT} = 12.7 \text{ }^{\circ}\text{C}$. Then according to table. 1.6 $\kappa_{5T} = 0.096$. And emissions will be equal to:

$$I_{ub12} = 0.2485 \times 416 \times 0.15 \times 176 \times (0.096 + 0) \times 10^{-9} = 0.00000026 \text{ кг/ч } I_{ub2} = 0.00000026 \times 1000 / 3600 = 0.00000022 \text{ g/s } I_{ub2} = 0.00000026 / 1000 \times 170 \times 24 = 0.000001 \text{ t/year}$$

Total emissions will make:

$$M_{sec} = 0.0005 + 0.00000022 = 0.0005 \text{ g/s } M_{year} = 0.007344 + 0.000001 = 0.007345 \text{ t/year}$$

3. Calculation of maximum permissible emission for construction period.

The class of hazard of toxic substances emissions during the work of motor transport, road-building cars and mechanisms is established according to the SanPiN No. 168 dated January 25, 2012.

Besides calculations of MPE from transit transport the calculations of maximum-permissible emissions for construction works are given in the FS. The works amount on all road

constructive elements, requirement and types of the road-building mechanisms and motor transport, used at construction, their productivity and fuel consumption were accepted into a basis of calculation.

According to Art. 26 and Art. 27 of "Ecological code of the Republic of Kazakhstan" the established values of technical specific standards of emissions for mobile sources of emissions are used at MPE calculation. In this FS for calculations of MPE at production of construction works the specific emissions of the polluting substances in tons at burning of one ton of auto motor fuel were used. Specific emissions of harmful substances at combustion of fuel were accepted according to "Method of emissions standards calculation from unorganized sources" No. 221 dated June 12, 2014.

Fuel consumption for cars and road-building mechanisms has been accepted according to "Collection of estimate norms and rates on operation of construction cars" by CS RK 8.02-03-2002 with changes and additions, issue 14, the Order of Committee for construction of housing and communal services and management of land resources of the Ministry of national economy of RK. dated October 31, 2014 No. 91-NK.

**Specific emissions of toxic substances at machines and mechanisms working
(in tons on one tone of combustible fuel)**

Harmful component	Specific emissions of harmful substances by ICE	
	carburetor	diesel
Carbonic oxide	0,6t/t	0,1t/t
Hydrocarbon	0,1t/t	0,03t/t
Nitrogen dioxide	0,04t/t	0,01t/t
Black pigment	0,58kg/t 0,002t/t	15,5kg/t 0,02t/t
Sulfur dioxide	0,3kg/t	-

According to a method book the total amount of harmful substances emissions into the atmosphere is made proceeding from the power of the applied types of construction machines and mechanisms and fuel consumption in unit of time, taking into account the established time of staying of construction mechanisms on a construction site with the working engine during the entire period of construction at an operating mode in one-shift work.

MPE (maximum-permissible emissions) given in the FS were considered for automobile engines and engines of road-building equipment at the optimum mode of works.

Calculation was made on the basis of "Method of calculation of emissions standards from unorganized sources" of the Ministry of environmental protection No. 100-P dated April 12, 2008, taking into account changes and additions to the Methodology dated June 12, 2014 No. 221.

Maximum single emissions of gas-air mixture from engines of moving sources (g/sec.) are considered for an atmospheric air impact assessment on construction platform.

Calculation was made according to formula:

$$Q_{g/sec} = Q_T \times 106 / T \times 3600$$

where:

T - time of operation of all vehicle and road-building technique, hour/year;

Q_T - polluting substance emission into atmosphere t/year.

Time of operation of vehicle and road-building technique has been accepted at 40 hours work week (six days) and makes 1979 hours in a year.

The calculation results are given in a table

Substance matter code	Polluting substance name	Emissions into atmosphere	
		tons/year	g/sec
0337	Carbonic oxide CO	2310,40	324,293
0301	Nitrogen dioxide NOx	200,27	28,110
0330	Sulphur dioxide SO2	146,08	20,50
2704	Hydrocarbons CmHn	572,67	80,381
0184	Plumbum in the air Pb	0,47	0,065
0328	Black pigment C	212,27	29,794
	Total:	3442,20	483,143

MPE (maximum-permissible emissions) given in the FS were considered on automobile engines and engines of road-building equipment at the optimum mode of works. Compliance of traffic conditions of optimal operation of the automobile engine is defined by a technological level and compliance of road-construction mechanisms is defined by application of the environmentally appropriate technology of work production.

Calculation of monetary compensation for pollution of the atmosphere by vehicle and mechanisms at construction was not made, in view of withdrawal of compensation for environmental management in a place of registration of each vehicle from the volume of the burned fuel vehicles.

SOURCES OF POLLUTING SUBSTANCES EMISSIONS INTO THE ATMOSPHERE AND NORMS OF MPE

Production name	Number PS	Home IB	Name of source of polluting substances	Time of work of emission source		Name of polluting substances	Code 3B	MPE norms	
				Per day	Per year			t/year	g/sec
1	2	3	4	5	6	7	8	9	10
Transportation of road- building materials	0001	1	Motor transport Engine of road machine	569,21	169056	Carbon monoxide CO	337	712	99,94
	0002					Hydrocarbons CmHn	2704	126,36	17,72
	0003					Nitrogen dioxide NQ	301	49,88	7
	0004					Black pigment C	328	11,4	1,6
	0005					Sulphur dioxide SO ₂	330	16,52	2,28
	0006					Inorganic dust	2908	1811,8	22,25
Разработка грунта	0001	2	Excavator	862,3	256104	Carbon monoxide CO	337	143,76	20,16
	0002					Hydrocarbons CmHn	2704	43,87	6,04
	0003					Nitrogen dioxide NQ	301	14,24	1,96
	0004					Black pigment C	328	21,52	3
	0005					Sulphur dioxide SQ	330	28,72	4,03
	0006					Inorganic dust	2908	57,04	2,33
Устройство земляного полотна	0001	3	Dozers	1115	331160	Carbon monoxide CO	337	223,27	35,8
	0002					Hydrocarbons CmHn	2704	76,02	10,72
	0003					Nitrogen dioxide NQ	301	25,52	3,58
	0004					Black pigment C	328	38,68	5,43
	0005					Sulphur dioxide SQ	330	51	7,15
	0006					Inorganic dust	2908	128,45	57,5
Устройство земляного полотна	0001	4	Road-roller	970,68	288292	Carbon monoxide CO	337	156,1	21,91
	0002					Hydrocarbons CmHn	2704	46,81	6,57
	0003					Nitrogen dioxide NQ	301	16,84	2,36
	0004					Black pigment C	328	24,65	3,46
	0005					Sulphur dioxide SQ	330	32,88	4,62
	0006					Inorganic dust	2908	48,85	4,4

1	2	3	4	5	6	7	8	9	10
Construction of bridges, overpasses, transport interchanges, culverts laying	0001	5	Building cranes	1134,21	336860	Carbon monoxide CO	337	605,56	84,998
	0002					Hydrocarbons CmHn	2704	145,56	20,431
	0003					Nitrogen dioxide NQ	301	51,52	7,231
	0004					Black pigment C	328	52,88	7,422
	0005					Sulphur dioxide SQ	330	41,48	5,822
	0001	6	Drilling, pile-boring machines	132,835	39452	Carbon monoxide CO	337	58,36	8,191
	0002					Hydrocarbons CmHn	2704	17,48	2,453
	0003					Nitrogen dioxide NQ	301	5,8	0,814
	0004					Black pigment C	328	8,72	1,223
	0005					Sulphur dioxide SQ	330	11,68	1,639
Road pavement dismantling	0001	7	Road milling machine	194,72	57832	Carbon monoxide CO	337	68,72	9,64
	0002					Hydrocarbons CmHn	2704	20,6	2,891
	0003					Nitrogen dioxide NO	301	6,88	0,964
	0004					Black pigment C	328	10,28	1,44
	0005					Sulphur dioxide SQ	330	13,6	1,908
Road surface arrangement	0001	8	Asphalt concrete paver	114,95	34140	Carbon monoxide CO	337	12,68	0,444
	0002					Hydrocarbons CmHn	2704	3,76	0,528
	0003					Nitrogen dioxide NQ	301	1,28	0,18
	0004					Black pigment C	328	1,84	1,256
	0005					Sulphur dioxide SQ	330	2,48	0,348
Road pavement arrangement	0001	9	Road-rollers 8-	23,99	7124	Carbon monoxide CO	337	15,08	2,12
	0002		BOMAG			Hydrocarbons CmHn	2704	4,48	0,628
	0003					Nitrogen dioxide NQ	301	6	0,842
	0004					Black pigment C	328	8,24	1,156
	0005					Sulphur dioxide SQ	330	11,24	1,576
Water withdrawal for production and technical needs	0001	10	Hydraulic power station	30,71	9120	Carbon monoxide CO	337	18,37	2,578
	0002					Hydrocarbons CmHn	2704	5,206	0,576
	0003					Nitrogen dioxide NQ	301	1,748	0,245
	0004					Black pigment C	328	2,584	0,362
	0005					Sulphur dioxide SQ	330	3,458	0,485

1	2	3	4	5	6	7	8	9	10
Subgrade slopes strengthening	0001	11	Machine for slope strengthening	96,85	28764	Carbon monoxide CO	337	14,52	2,04
	0002					Hydrocarbons CmHn	2704	4,32	0,608
	0003					Nitrogen dioxide NO	301	1,44	0,2
	0004					Black pigment C	328	2,16	0,304
	0005					Sulphur dioxide SQ	330	2,88	0,404
Construction of bridges, overpasses, transport interchanges	0007	12	Welding works	26,65	7916	Iron oxide (calculated as iron	123	0,0032016	0,00256
	0008					Manganese oxide	143	0,000348	0,00028
	0009					Chrome and its combinations calculated as chrome oxide	203	0,000498	0,0004
	0010					Fluoricgaseous combinations (calculated as fluorine)	342	0,000522	0,00042

4. Noise impact

Along with air pollution, noise becomes a negative factor of impact on the person. Chaotic mix of sounds of various frequency creates noise. Noise level is measured in decibels (dBA). Impact of transport noise on environment, first of all on habitat of the person, became a problem. Systematic impact of noise causes a condition of anger, fatigue, enhance a condition of a stress, a sleep disorder.

Transport factors: movement intensity, structure of cars parking, movement speed, transport and operational road condition have the largest impact on noise level. Noise level depending on type of the car changes significantly. Trucks, especially with diesel engines cause noise levels on all operating modes on 15 dba above, than automobile cars.

The special problem is noise of the heavy-load dump trucks, working on borrow pits, when their high-speed opportunities are limited and specific time of their work on the idling mode is great. Noise level from traffic on the road, and also all road-building machines and mechanisms used at road reconstruction is very high and it is within 75-90 dBA. Especially intense noise is from bulldozers, scrapers, jack hammers, vibrators and other cars. So noise from scrapers makes 83-85 dBA, at unloading of dump truck is 82-83 dBA, from rollers, working at soil compaction is 76-78. Big noise level is formed at the simultaneous operation of several road-building mechanisms. Noise level significantly changes depending on the movement speed and car loading. At movement speed of 75-80 km/h and full loading of the car noise is generally made by the engine, at a speed over 80 km/h noise is made by auto tires.

Traffic intensity and its structure has considerable impact on noise level from traffic flow. In a transport flow noise intensity significantly exceeds the noise level of the separate car. Condition of road paving and the organization of road traffic influences on noise level except type of the engine and speed movement of the car.

At the vehicle movement there are fluctuations, caused by roughnesses of the road, and also unbalanced forces of the engine and transmission. These fluctuations are transferred to a frame, a body of the car and through of road bed on elements of roadside space. In this case impact of vibration can be considered, as noise, in two aspects: impact on the driver and passengers of the car, and impact on surrounding objects. It is established that vibrations can exceed the level, admissible for the person, on distance from the carriageway to 10 meters.

The vibrations, arising in a road paving are caused by its temporary compression at car passing and the subsequent fast load removal. The fluctuations of a road surfacing, arising in such a way, are transferred to soil and further to the buildings and constructions, located in a roadside strip. Transfer of vibration depends on soil, its density, humidity, degree of uniformity and granules of metric structure.

Reduction of vibration depends on technical condition of cars. In the course of work it is necessary to observe an operating mode with the vibrating cars, which vibration meets the sanitary standard. Two regulated breaks are recommended.

It is necessary to use special complexes of production gymnastics, vitamin prevention for increase of protective properties of an organism, working capacity and labor activity.

–Level of transport noise is determined by norms SNIPII-12-77 "Noise protection". Maximum-permissible noise level, made by the motor transport in two meters from the buildings, turned towards noise sources, according to SNIPII-12-77 (tab.1,2) makes 70 dba.

–Maximum-permissible noise level is accepted for the territories adjacent to houses, rest areas of residential districts and groups of houses, sites of schools, platforms of preschool institutions, taking into account amendments:

- On noise, made by motor transport – 10dBA
- On existing housing development -5dBA
- On day time from 7 to 23 hours–10dBA

There are afforestations on the projected road site. Decrease of noise level in the presence of a forest belt from single-row to three-row, at distance of row-spacings to 3 meters makes from 4-5 dBA to 10-12dba.

Calculation of level of noise influence in the settlements, located along the road in the project was made taking into account intensity of traffic on the ECM in the «CREDO» program. Performed calculations allow to establish that noise level on distance from 10m to 50m from the next lane makes from 80,4 to 66,0 dBA that exceeds the established sanitary standards.

5. Surface and ground waters.

The road of the highway crosses a lot of rivers and rivulets. All rivers flow from mountains from the south to the north and they are objects of economic value. Coming from mountains, their drain is strenuously got for hydroeconomic needs, mainly on an irrigation.

Pollution of surface water can result from dumpings of production and household drains, transfer of chemical and mechanical pollutants from the road into the water.

Pollution of ground waters can happen owing to a filtration of drains from an earth surface, and also by waste water disposal without cleaning from highways in the underground horizons.

From the widespread substances, polluting reservoirs, the greatest concern causes transfer of oil products into the water. The first factors in the form of separate color spots appear already at flood of 4 ml/sq.m. Maximum-permissible concentration for oil and oil products is 0,1-0,3 mg/l.

The main pollutants of road drains have a condition of suspensions and emulsions. At transferring into the water, they accumulate at the bottom in seaweed, pass into composition of silt, form the palet on the surface of reservoir, embarrassing ingress of oxygen from air. As a result of anaerobic processes toxic substances in bottom layers can become more active. Heavy metals, other substances, which do not lend itself to biological decomposition, are collected in near-bottom deposits. As a result the biosystem of reservoirs and water currents is broken, the plankton, fish juveniles and fish perish. Concentration of pollution more than 90 mg/l already becomes pernicious for fishes.

The important role in pollution of water objects is played by the suspended substances in the form of suspended particles of sand, clay, silt, etc., and also nitrates, nitrites, plumbum and ether-soluble substances.

From the inorganic polluting materials, capable to make considerable impact on environment, it should be noted various deicing agents, first of all, of salt. In the spring salt is deposited in a right-of-way at snow melting, leaks in the soil or flows down into reservoirs and waterways, polluting them. Concentration of organic substances of a thawed drain fluctuates from 70 to 150 mg/l.

Surface flow, which is forming as a result of loss of an atmospheric precipitation washes away and takes out soluble and insoluble impurity with a flow. Besides, atmospheric waters as a result of a sorbing on a surface of a hydroaerosol of dust, gas particles and other impurities, which are located in the air become contaminated in a ground layer. Storm runoff, as a rule, has some quantity of biogenous elements (combinations of nitrogen and phosphorus) and bacterial pollutants. Except undissolved and dissolved organic impurity the storm runoff drainage contains a significant amount of the mineral dissolved components. Salinity of a storm runoff fluctuates ranging from 20 to 900 mg/l. From anion there are mainly sulphate and chlorides.

Badly strengthened slopes and subgrade excavation, filling shoulders, works on arrangement and repair of artificial structures can promote a water thickening in reservoirs and waterways, forming a suspended matter, which gradually settles at the bottom. As a result the underwater vegetation perishes.

Water discharge after washing-up of mixing basin with concrete remaining residue does the significant damage to reservoirs and waterways. Cleaning water is need to be collected and clarified in special sedimentation research. Dumping in natural reservoirs of a superficial drain is allowed only after its clarification not less, than for 70%.

6. Dust formation calculation

Dust air pollution takes place at performing of many road works, especially it is connected with development and movement of soil and road-building materials. Formation of the respirable dust takes place in the presence of particles in soil smaller than 10 micrometers. Larger particles form dust emissions of insignificant transfer. The most intensive dust formation takes place at sandy loams, silt loam, silty clay development. Humidity of soil has the greatest impact on dust formation. At the correct organization of works on a subgrade construction humidity of soil has to be close to optimal, that will provide good consolidation. The soil, having density close to maximum, practically does not form dust from wind action.

Mineral dust and formed from particles of construction materials belongs to nontoxic materials, and its concentration in air is limited by general sanitary and hygienic requirements.

The established sanitary requirements allow the following indicators of dust content in a working zone at extraction of mineral materials by open way, provided in the table No. 18

No. c/sc	Dust emission types	Maximum permissible concentrations, mg/m ³
1	Settlements (all non-toxic types)	0,15
2	Content of more than 70% SiO ₂ in crystal modification	1,0
3	Content of more than 10% of free SiO ₂ and more than 10% of asbestos	2,0
4	Silicate, containing less than 10% of unbound SiO ₂	4,0
5	Clayish, mineral and mixes, not containing of unbound SiO ₂	6,0
6	Cement, clay, other small fractional minerals and mixes, not containing unbound SiO ₂	6,0

The conducted researches showed, that at a wind speed to 1m/sec. particles with a diameter of 10 mc are transferred to distance to 100 meters, and diameter of 1mc – on 800-900m. Respectively, at big speed of a wind dust particles are transferred to longer distance.

Definition of quantitative structure of the expected emissions into atmospheric air at performing of mining operations in borrow pits was made according to the existing normative and technical documents "Method of calculation of emissions standards from unorganized sources" (at borrow pits development) No. 100-p dated 18.04.2008, of the Ministry of Environmental Protection.

At excavation of rock mass at extraction-and-loading works with use of the excavator at a surface stripping and extraction a dust emission is produced to 250 mg/M³. Material overturning, unloading of dump trucks into earth deposits, and also vehicle works are intensive unorganized sources of dust formation.

The greatest dust emission arises at soil developing by excavator with loading into dump trucks, on dry soils in the summer in borrow pits to 250 mg/M³, at transport operations on temporary dirt roads to 350mg/M³.

At design of highways it is necessary to estimate influence of the dust, which is formed at traffic. Intensity of dust formation is influenced by physicommechanical properties of material, traffic speed, weight, dimensions and types of cars, and also climatic conditions around passing of the road.

The movement of vehicles in working zones is connected with dust emission as a result of interaction of wheels with a roadbed and its blowing-off from a surface of the material transported in a body.

Proceeding from volumes of requirement of road-building materials for road reconstruction, annual (annual) dust emissions will make 2046,14 tons/year, including:

1. at excavation of rock mass (extraction-and-loading works) - 57,04 tones/year
2. at soil overturning and spreading, GSM and crushed-stone - 177,30 tones / year
3. at soil transportation by vehicle - 1811,80 tones / year

7. Pollution and soil erosion

The complex of the technological processes, connected with a construction of a subgrade causes usually the greatest damage to environment. On all earth place, occupied under road reconstruction and structures of a road complex, building sites, first of all pollution of a soil cover is observed.

The complex of the technological processes connected with a construction of a subgrade causes usually the greatest damage to environment. On all earth place, occupied under road reconstruction and structure of a road complex, building sites, first of all pollution of a soil cover is observed.

Soil pollution takes place mainly by atmospheric deposition on a covering of firm finely-divided dusty fractions, particles, brought by wheels of cars from roads and passages with unimproved covering, partial losses of the transported loose freights, products of attrition of tires and coverings, and also toxic components of the burned gases of cars. About 80% of the lead containing in exhaust gases runs into the soil.

It should be noted the stability of lead compounds in the soil and its intensive accumulation in vegetation with the subsequent transition to animals and the person. In roadside space about 50% of lead emissions in the form of microparticles are distributed on a surface of the adjacent territory.

Calculation of concentration in the soil of a roadside strip of lead compounds was made depending on a year of operation (20 years) at the left and to the right of a carriageway edge. Width of a zone within which the content of lead in the soil exceeds its maximum-permissible concentration, is determined by the nomogram.

Basic data for lead definition in the soil are:

H –embankment height, m (at excavations and embankments <1m is allowed to accept 1m);

NO - initial traffic intensity cars/days.

W – indicator on the right and left from road axis

$$W = \sum B_i \times \sin \Theta$$

Where: B_i – wind characteristics of I lateral angle

Θ - angle between road highway direction and I lateral angle

According to data of hydrometeorological services we establish the value of wind characteristics in each 8 lateral angle for 12 months.

$$B = \sum V_i P_j$$

Where: V_i - wind characteristics of I lateral angle

p_j - frequency of wind of this speed, %

Maximum permissible concentration of lead in the soil for the Republic of Kazakhstan is 32 mg/kg.

According to received calculations, lead concentration in a soil at a distance of 20 meters is from 3,56 to 13,4 mg/kg.

It is clear from calculations, that ambit of maximum permissible pollution of the soil does not exceed the limit of width of a reserve and technological strip, of 50 meters width.

At earth works production considerable pollution of soil by fuels and lubricants on the ways of transportation, loading and unloading of soil, in parking places of excavatory and transport and other road-building machines is observed. Road-building machines are characterized by big losses of fuels and lubricants. Loss of exhaust oil for bulldozers is 15-30%.

Deicing materials, especially salts, getting with rainfall and snow melting from the road are dangerous as other toxic materials.

The water and wind erosion of subgrade slopes is especially dangerous. In the course of construction slopes remain not strengthened, therefore in some cases soils can be washed away by water into the lowered relief places (especially in a cross-country terrain), and then its part is taken out in reservoirs and waterways, polluting them. The wind erosion can lead to an exposure of a subsoil layer. In the territory of the projected road site the soils are presented by light-chestnut carbonate and ordinary gray soils, hydromorphous soils, therefore occurrence of a wind erosion on this site is quite admissible. During road operation there can be a pollution of a roadside strip by household garbage from the passing transport.