PROJECT "RECONSTRUCTION OF THE ZESTAFONI – KUTAISI – SAMTREDIA SECTION OF THE E- 60 HIGHWAY"

ENVIRONMENTAL AND SOCIAL ASSESSMENT AND ANALYSIS OF ALTERNATIVES

WORLD EXPERIENCE FOR GEORGIA

CONTENTS

ABBRAVIATION AND ACRONYMS

BP	Bank Procedures
CAS	Center of Archaeological Search of the Ministry of Culture and Sports
CBR	Californian Bearing Ratio
CPS	Country Partnership Strategy
CCP	Contractor Control Plan
CMP	Contractor's Management Plan
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESA	Equivalent Standard Axel
GDP	Gross Domestic Product
GP	Good Practices
GPS	Global Positioning System
HEC – RAS	Hydrologic Engineering Center – River Analysis System
IFI	International Financial Institution
JBIC	Japan Bank for International Cooperation
KP	Kilometer Point
MAC	Maximum Admissible Concentration
MoE	Ministry of Environmental Protection and Natural Resources
MLHSP	Ministry of Labor, Health and Social Protection
MoI	Ministry of Interior
NTRC	National Transport Regulatory Commission
NSFSVPP	The "National Service for the Foodstuffs Safety, Veterinary and Plant Protection" of the Ministry of the Agriculture
OP	Operational Policy
PIU	Project Implementation Unit
RDMED	Roads Department of the Ministry of Economic Development
RDMRDI	Road Department of the Ministry of Regional Development and Infrastructure of Georgia.
RoW	Right of Way
TEM	Trans European Motorway
USC	Unified Soil Classification

1. INTRODUCTION

1.1. PROJECT BACKGROUND

Georgia's geographical location positions the country at the center of East-West (the Black and Caspian Seas) and North-South (between Russia and Turkey) transits. Trade with neighboring countries is also an important feature of Georgia's economy. Transit activities generate a direct turnover estimated more than US$2 billion. The Government of Georgia (which assumed office after the Rose Revolution in 2002) made it a key priority to rehabilitate transport, energy and rural infrastructure, which had deteriorated significantly since 1990. Recognizing the importance of infrastructure to sustainable economic development of the country over the course of the last two years, the Government managed to substantially increase investments in these areas.

One of the Government's top priorities is to develop Georgia's competitiveness as a transit country by improving its East-West Transport Corridor. Recognizing that the full potential of its transit corridor has not materialized yet, the Government decided to carry out the modernization of the itinerary from the Turkish Border in Sarpi to the Azeri Border located at the so-called Red Bridge border crossing.

In the years 2003-2004 Louis Berger and Transprojekt Roads Survey and Design Institute, Georgia has prepared a TACIS funded study on Rehabilitation of Caucasian Roads. This provided a significant amount of data for the existing road and also a possible 'on line' improvement strategy and additional by-pass options to relieve possible traffic congestion and dangers in the urban areas still crossed by the existing M27.

An Economic and Financial Feasibility Report has been carried out by Atkins Consultants Ltd in the year 2005, in response to the Government's requirements for an improvement to the east-west corridor in accordance with the aspirations of the Government of Georgia. This project assumes many of the findings set in the above mentioned Louis Berger study. The summarizing conclusion of the study confirmed: "In general, the social-economic effect resulting from the proposed road modernization project can provide for overall increase in wealth and access to livelihoods for the national population. The main national benefit is: increased quality of the major transport artery which contributes in national economy, better infrastructure, increased government revenues from transit taxes which could contribute to improved social services. The use of local labor will provide inflow of cash into the local economies along the motorway route".

The Japan Bank for International Cooperation (JBIC) and the Government of Georgia, represented by the Ministry of Finance (MOF), Ministry of Economic Development (MOED) and Road Department of MOED agreed to undertake the JBIC Study for Project Formulation for Highway Improvement Project (the Study), which was recorded in the Minutes of Discussion (MD) and signed on 7 August 2007. JBIC commissioned to carry out the Study, based on a competitive bidding procedure, to a consortium formed by EXE-Idea Ltd., PADECO Co. Ltd., and Construction Project Consultant's Inc. the objectives of the Study are: (i) to review in detail current situation in Georgia's transport sector especially in road sectors; (ii) to conduct

feasibility study for highway improvement project; and (iii) to recommend adequate project implementation, operation and maintenance framework for the Japanese ODA Loan Project.

In 2008 the aforementioned Consortium has submitted feasibility study (JBIC Pilot Study for Project Formation For HIGHWAY IMPROVEMENT PROJECT GEORGIA). Several alternatives for reconstruction of the Zestafoni – Samtredia section of the E-60 Highway have been reviewed by Consultants and the preferable option has been proposed. Prior to Bank approval and allocation of funding for preparation of detailed design and implementation of project, the JBIC requested Georgian Government to conduct EIA in accordance with the JBIC Guidelines for Confirmation of Environmental and Social Considerations and to present the EIA report for Bank review. The Road Department of the Ministry of Regional Development and Infrastructure of Georgia commissioned to carry out the EIA Study, based on a competitive bidding procedure, to a consortium formed by Environmental Technologies Ltd and Fund "World Experience for Georgia".

1.2. OBJECTIVES AND SCOPE OF THE ENVIRONMENTAL IMPACT ASSESSMENT

The objective of current assignment according to the ToR of the contract with the Road Department is to prepare the EIA for the project in compliance with the Georgian legislation and with the JBIC Guidelines for Confirmation of Environmental and Social Considerations. The requested SoW comprised following tasks:

1.3. METHODOLOGY OF THE STUDY AND STRUCTURE OF DOCUMENT

Combination of desk studies and site work (sampling; observation; verification of preexisting data etc.) has been applied by the Consultant's team. Most of experts involved in EIA have earlier participated in the Feasibility Study conducted by EXE-IDEA Ltd and were familiar with the local conditions. All available environmental and social information, including data provided in the Feasibility Study has been used for the EIA.

The sections related to geology, hydrogeology and cultural heritage have been slightly revised and updated. Description of ecological receptors and surface water resources has been significantly expended and supplemented by new data related to hydrology of major rivers and water quality, terrestrial and aquatic ecosystems and protected and endangered species of plants and animals. Assessment of surface water baseline contamination has been conducted for 6 major and relatively large river crossing sites. Sampling and analysis has been conducted to asses baseline soil contamination for the 6 selected sites adjacent to the existing Zestafoni – Samtredia road. Baseline noise assessment has been carried out in details for 4 locations (average for 30 min in the morning, noon and evening time) and superficial (once for 20 min) in several areas. Noise impacts are analyzed using common noise regression formulas. Ambient air samples have been taken in the same points as the noise measurements. Background radiation level has been checked along the entire alignment for the proposed route. Emission impacts of the traffic have been analyzed using licensed software "Ecolog – Magistral".

Sensitive environmental and social receptors have been assessed for all alternative routes and the preferable options have been estimated considering anticipated impacts and feasible mitigation measures. For the preferable route more detailed analysis of impacts and mitigation measures is provided. The land acquisition and resettlement issues were of particular interest and related cadastral data and photolog is provided in annex to the RFP, which is submitted as separate document. Mitigation measures have been integrated within the Environmental Management and Monitoring Plan.

The EIA document is structured as main text and annexes. The main body of the text provides more concise and logical description of the relevant sensitivities, relatively severe impacts, potential mitigation and offset measures and EMP. The annexes provide more detailed information regarding particular issues, like: Legal and administrative system; Environmental and Social Baseline; Sampling, analysis and software modeling details; Landuse and cadastral data etc.

1.4. PUBLIC CONSULTATIONS

Meaningful public consultation from the early stages of EIA process is considered as essential prerequisite of successful implementation of the development projects and due consideration of public environmental and social concerns. Public consultations will be carried out in compliance with the Georgian legislation and JBIC requirements. The legal and procedural aspects of the public consultation process is described in chapter 9 of the present report and in annex 1.

2. ENVIRONMENTAL PERMITING PROCESS IN GEORGIA AND ENVIRONMENTAL SCREENING PROCEDURES APPLIED BY IFIs

Introduction

In the annex 1 detailed description of Georgian environmental legislation and environmental and social requirements of IFIs, which should be regarded during the project implementation, is provided. It describes existing in Georgia environmental regulations relevant to the project, provides guidance on the measures required for ensuring consistency with environmental assessment and makes reference to institutions at the local and national levels responsible for issuing permits, licenses, and enforcing compliance of environmental standards. The annex also provides guidance on environmental screening for the international projects financed by IFI's (EBRD/ WB/ADB), and in particular, the environmental guidelines used by JBIC. Other relevant legal acts and sanitary norms of Georgia could be found in the annex. Here below, we present brief description of environmental permitting process in Georgia (p.2.1) and screening requirements according to the IFI's environmental and social safeguards (p.2.2 and 2.3), as well as outcomes of screening exercise applied to the current highway project..

2.1. GEORGIAN LEGISLATION RELATED TO ENVIRONMENTAL PERMITTING

At present, the environmental permitting procedure in Georgia is set out in three laws:

The project proponent, in implementing projects, will comply with (i) The Law on Licenses and Permits (2005); (ii) The Law on Environmental Impact Permits (EIP), and (iii) The Law on Ecological Examination (EE) 2008.

The Law on Licenses and Permits was adopted by Parliament of Georgia, on June 24, 2005. The new Law regulates legally organized activities posing certain threats to human life and health, and addresses specific state or public interests, including usage of state resources. It also regulates activities requiring licenses or permits, determines types of licenses and permits, and defines the procedures for issuing, revising and canceling of licenses and permits (Article 1, Paragraph 1).

The Laws on Environmental Impact Permit and on Ecological Examination have been published on 14.12.2007 and entered in force on 01.01.2008. These new laws integrate all the amendments introduced in legislation of Georgia during recent years. The Law of Georgia on Environmental Impact Permit determines the complete list of the activities and projects subject to the ecological examination (clause 4 p.1) and the legal basis for public participation in the process of environmental assessment, ecological examination and decision making on issuance of an environmental impact permit.

Under the "activities" subject to the ecological examination the law considers construction of new or upgrading of existing facilities imposing change of technology and operational conditions for the projects and activities included into the list. The

routine maintenance works in relation with the same facilities do not require ecological examination and permit.

In case if the activity included into the list given in clause 4 p.1 at the same time requires Construction Permit, the administrative body responsible for issuance of the Construction Permit ensures involvement of MoE, as a separate administrative body, in the administrative procedures initiated for the purpose of issuing Construction Permit, as it is envisaged by the Law on Licenses and Permits. In such cases the MoE is issuing the Conclusion on the Ecological Examination of the project based on the documentation provided to MoE by the administrative body issuing the Permit. The Conclusion on the Ecological Examination is adopted by the administrative (executive) legal act of the MoE and compliance with the conditions of the Conclusion is obligatory for the project proponent. The conditions of the Conclusion on Ecological Examination is a part of conditions of the Construction Permit.

In case if the activity included into the list given in clause 4 p.1 does not require Construction Permit, based on the Conclusion on the Ecological Examination the MoE will issue the Environmental Impact Permit, supported by the administrative (executive) legal act issued by the minister. The ecological examination is carried out in accordance with the law of Georgia on Ecological Examination and the conditions set forth by the Conclusion present the Conditions of the Permit.

The aforementioned laws do not provide details of screening procedure and do not define responsibilities of parties. According to the practice, the screening of project proposals and the preliminary assessment of their environmental impact and proposed mitigation measures (scoping) are being carried out by the project proponent in consultation with the MoE.

Public Consultation Procedures.

The 6th clause of the law of Georgia on the Environmental Impact Permit provides detailed requirements and procedures for conducting public consultations and established timeframes for information disclosure and discussion, namely:

According to article 6 , developer is obliged to carry out public discussion of the EIA before its submission to an administrative body responsible for issuing a permit (in case of activity requiring construction permit before initiating stage 2 procedure for construction permit issuance). The detailed description of Public Disclosure requirements is provided in the chapter 9 of the present EIA.

Official Submission of EIA to MoE

Article 8 of the Law specifies the documents to submit to receive a permit:

(1) An operator, in order to receive a permit, shall submit a written statement to the Ministry. A statement to receive a permit is submitted, considered and processed under the rule established by the ‘Law of Georgia on Licenses and Permits’.

(2) An operator is obliged, in addition to the information specified by the 'Law of Georgia on Licenses and Permits', to submit the following documents:

(a) An EIA report drawn up under the standards specified by the legislation of Georgia (in 5 hard copies and 1 soft copy)
(b) A situation plan of the planned activity (with the indication of distances)
(c) Volume and types of the expected emissions (a technical report of inventory of the stationery sources of pollution and emitted/discharged harmful substances and project of maximum permissible concentrations of emitted/discharged harmful substances (in 4 copies))
(d) A brief description of the activity (as a non-technical summary)
(e) A statement about the confidential part of the submitted statement.

(3) An operator is obliged to submit a full diagram of the technological cycle to the permit issuing body even if the given activity contains a commercial and/or state secret. This part of the statement, according to sub-clause 'e' of clause 2 of the given Article should be submitted separately by the operator.

Issuance of the Permit on Environmental Impact

The article 9 of the law describes the procedures of issuing the Environmental Impact Permit. The same issue is addressed in the laws of Georgia on "Licenses and Permits" (2005) and "on Ecological Examination' (2008).

1. According to the law on "Licenses and Permits," the MoE takes decision on issuing Permit within the 20 days after submission of request on permit by the project proponent.

2. MoE , in accordance with the law on Ecological Examination, ensures expertise of the submitted documentation and issuance of Conclusion on Ecological Examination.

The Permit (Environmental Permit, or Construction Permit when the latest is required) is issued only in case of the positive conclusion of the Ecological Examination.

In accordance with paragraph 1a of the **Decree N 160 of the Georgian Government (08/23/2006)**, in case if the construction is carried out by a Ministry of the Government of Georgia or an entity acting on behalf of Ministry no Permit on Construction is required to be formally issued, although the project documentation and its review procedures should comply with the requirements set forth for phase I, II and III of permitting cycle by the Decree No 140 of the Government of Georgia on the Rules and Conditions for Issuing Construction Permit. This provision is applicable for the projects implemented by RDMED.

2.2. EIA AND ENVIRONMENTAL SCREENING UNDER IFI's GUIDELINES

The IFIs undertakes environmental screening of each proposed project to determine the appropriate extent and type of EA. Screening principles and procedures, as well as other conceptual and procedural details of EIA process, are described in relevant guidelines (e.g. WB BP/OP/GP 4.01 Environmental Assessment or JBIC Guidelines

for Confirmation of Environmental and Social Considerations). The Bank Appraisal Team classifies the proposed project into one of three categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts. The IFIs commonly establish following three categories:

Category A is assigned to a proposed project if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. Full scale EIA and relatively longer period for public discussions (e.g. 120 days for projects implemented by EBRD/ADB/JBIC) is required in this case. EA for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. For a Category A project, the Borrower is responsible for preparing a EIA report.

Category B is assigned to a proposed project if its potential adverse environmental impacts on human environment are less adverse than those of Category A projects (e.g. insignificant impact on sensitive area or medium grade impact on less sensitive area). Like Category A EA, category B EA examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts. The findings and results of Category B EA are described in the project documentation (Project Appraisal Document and Project Information Document). The EA for B category projects could be provided in a form of Environmental Management Plans (EMP) or Environmental Review (ER), which includes EMP.

Category C is assigned to a proposed project if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

As additional criteria in support for screening procedures the IFIs usually provide – "Types of Projects and Their Typical Classifications" (e.g. WB GP-4.01 Annex B) with following comment: "Bank and international experience shows that projects in certain sectors or of certain types are normally best classified as illustrated below. These examples are only illustrative; it is the extent of the impacts, not the sector, that determines the extent of the environmental assessment and, hence, the category".

Detailed review of procedures under Georgian legislation and International Financial Organizations will be discussed in Annex # 1

2.3. THE JBIC ENVIRONMENTAL AND SOCIAL REQUIREMENTS

In making its funding decisions, JBIC conducts screenings and reviews of environmental and social considerations to confirm that the requirements are duly satisfied. JBIC makes the utmost efforts to ensure that appropriate environmental and social considerations are undertaken, in accordance with the nature of the project for

which JBIC provides funding, as stated in the Guidelines, through such means as loan agreements.

The project proponents are responsible for environmental and social considerations for the project. JBIC confirms such considerations in light of the Guidelines. JBIC conducts screening and environmental reviews based principally on information provided by borrowers and related parties (in the case of export finance, including exporters).

Screening

Before starting an environmental review of a project, JBIC classifies the project into one of the following categories. The subsequent environmental review will then be conducted in accordance with the procedures for that category.

JBIC requests the borrowers and related parties to submit the necessary information promptly so that it may perform the screening process at an early stage.

During the screening process, JBIC classifies each project in terms of its potential environmental impact, taking into account such factors as: the sector and scale of the project, the substance, degree and uncertainty of its potential environmental impact and the environmental and social context of the proposed project site and surrounding areas. JBIC may revise the categorization when necessary, e.g., in cases where environmental impact worth considering comes to light even after the screening based on the information provided by the borrowers and related parties is performed.

Category A: A proposed project is classified as Category A if it is likely to have significant adverse impact on the environment. A project with complicated impact or unprecedented impact which are difficult to assess is also classified as Category A. The impact of Category A projects may affect an area broader than the sites or facilities subject to physical construction. Category A, in principle, includes projects in sensitive sectors (i.e., sectors that are liable to cause adverse environmental impact) or with sensitive characteristics (i.e., characteristics that are liable to cause adverse environmental impact) and projects located in or near sensitive areas. An illustrative list of sensitive sectors, characteristics and areas is given in Section 3 of Part 2.

Category B: A proposed project is classified as Category B if its potential adverse environmental impact is less adverse than that of Category A projects. Typically, this is site-specific, few if any are irreversible, and in most cases normal mitigation measures can be designed more readily. Projects funded by Engineering Service Loans that are yen loans for survey and design, are classified as Category B, with the exception of those belonging to Category C.

Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impact. Projects that correspond to one of the following are, in principle, classified as Category C, with the exception of projects with sensitive characteristics and projects located in sensitive areas as indicated in Section 3 of Part 2:

1) Projects for which the JBIC’s share is not above SDR 10 million;

2) Sectors or projects in which no particular environmental impact would be normally expected (e.g., human resources development, support for international balance of payments, maintenance of existing facilities, acquisition of rights and interests without additional capital investment); or 3) . Cases in which there is only minor involvement of the project by the borrower or JBIC, such as the export/import or lease of items of machinery or equipment that is not connected with a particular project, and where there would be little reasonable significance in JBIC's conducting an environmental review.

Category FI: A proposed project is classified as Category FI if it satisfies all of the following: JBIC's funding of the project is provided to a financial intermediary etc.; the selection and assessment of the actual sub-projects is substantially undertaken by such an institution only after JBIC's approval of the funding and therefore the sub-projects cannot be specified prior to JBIC's approval of funding (or assessment of the project); and those sub-projects are expected to have potential impact on the environment.

Category A: Environmental reviews for Category A projects examine the potential negative and positive environmental impact of projects. JBIC evaluates measures necessary to prevent, minimize, mitigate or compensate for potential negative impact, and measures to promote positive impact if any such measures are available. Borrowers and related parties must submit Environmental Impact Assessment (EIA) reports (see Section 2 of Part 2) for Category A projects. For projects that will result in large-scale involuntary resettlement, basic resettlement plans must be submitted. JBIC undertakes its environmental reviews based on the EIA and other reports prepared by the project proponents and submitted through the borrower.

Category B: The scope of environmental reviews for Category B projects may vary from project to project, but it is narrower than that for Category A projects. The environmental reviews for Category B are similar to that of category A in that they examine potential negative and positive environmental impact and evaluate measures necessary to prevent, minimize, mitigate or compensate for the potential negative impact, and measures to promote positive impact if any such measures are available. JBIC undertakes its environmental reviews based on information provided by borrowers and related parties. Where an EIA procedure has been conducted, the EIA report may be referred to, but this is not a mandatory requirement.

Category C: For projects in this category, environmental reviews will not proceed beyond screening.

Category FI: JBIC checks through the financial intermediary etc. to see whether appropriate environmental and social considerations as stated in the Guidelines are ensured for projects in this category

An EIA's scope and level of detail should be decided in accordance with the project's potential impacts. The EIA report should include the following items (not necessarily in the order shown):

- Executive Summary: concisely discusses significant findings and recommended actions.

- Policy, legal and administrative framework: discusses the policy, legal and administrative framework within which the EIA report is to be carried out.

- Project description: describes the proposed project and its geographic, ecological, social and temporal context, including any off-site investments that may be required (e.g. dedicated pipelines, access roads, power plants, water supply, housing, and raw material and product storage facilities). Indicates the need for any resettlement or social development plan.

Normally includes a map showing the project site and the area affected by the project.

- Baseline data: assesses the dimensions of the study area and describes relevant physical, biological and socio-economic conditions, including all changes anticipated before the project commences. Additionally, takes into account current and proposed development activities within the project area but not directly connected to the project. Data should be relevant to decisions about project site, design, operation or mitigatory measures; the section indicates accuracy, reliability and sources of the data.

- Environmental Impacts: predicts and assesses the project's likely positive and negative impacts, in quantitative terms to the extent possible. Identifies mitigation measures and any negative environmental impacts that cannot be mitigated. Explores opportunities for environmental enhancement. Identifies and estimates the extent and quality of available data, essential data gaps and uncertainties associated with predictions, and specifies topics that do not require further attention.

- Analysis of alternatives: systematically compares feasible alternatives to the proposed project site, technology, design and operation including the "without project" situation in terms of their potential environmental impacts; the feasibility of mitigating these impacts; their capital and recurrent costs; their suitability under local conditions; and their institutional, training and monitoring requirements. For each of the alternatives, quantifies the environmental impacts to the extent possible, and attaches economic values where feasible. States the basis for selecting the particular project design proposed and offers justification for recommended emission levels and approaches to pollution prevention and abatement.

- Environmental Management Plan (EMP): describes mitigation, monitoring and institutional measures to be taken during construction and operation to eliminate adverse impacts, offset them, or reduce them to acceptable levels.

- Consultation: Record of consultation meetings, including consultations for obtaining the informed views of the affected people, local non-governmental organizations (NGOs) and regulatory agencies.

2.4. ENVIRONMENTAL SCREENING FOR CURRENT PROJECT

Requirements of Georgian Legislation

According to the law of Georgia on the Environmental Impact Permit (2008) the projects related to construction or rehabilitation of the motor roads of national or international importance require full scale EIA and Environmental Permit.

JBIC Requirements

The project considers substantial upgrading and reconstruction of existing road and facilities and construction of new facilities. Some of alternative routes cross sensitive environmental areas. The project implementation is associated with the need for private land acquisition and physical relocation of certain amount of affected households. Accordingly, the project has been classified as of Category A in Compliance with the JBIC Guidelines for Confirmation of Environmental and Social Considerations.

Full scale EIA should be prepared and public consultations should be conducted in accordance with the requirements set forth in Georgian legislation and JBIC guidelines.

3. PROJECT BACKGROUND

3.1. ECONOMIC AND SOCIAL NEED FOR THE PROJECT

Georgia's geographical location positions the country at the center of East-West (the Black and Caspian Seas) and North-South (between Russia and Turkey) transits. Trade with neighboring countries is also an important feature of Georgia's economy. Transit activities generate a direct turnover estimated more than US$2 billion. The Government of Georgia (which assumed office after the Rose Revolution in 2002) made it a key priority to rehabilitate transport, energy and rural infrastructure, which had deteriorated significantly since 1990. Recognizing the importance of infrastructure to sustainable economic development of the country over the course of the last two years, the Government managed to substantially increase investments in these areas.

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Reconstruction of the Zestafoni – Kutaisi - Samtredia section of the E-60 Highway is essential part of the overall project, aiming upgrading of the whole transport corridor from the Azerbaijan border to the Black Sea terminals of Georgia.

3.2. EXISTING TRAFFIC VOLUMES AND FORECASTS

Table. Traffic Volume Forecast in Each Section (vehicle per day)

Section Year	Rikoti – Zestafoni Km 179	Zestafoni - Kutaisi Km 215	Kutaisi - Samtredia Km 249
2007	5,917	7,039	6,262
2010	7,902	9,382	8,248
2015	11,393	13,490	11,662
2020	15,068	17,802	15,182
2025	18,760	22,124	18,665
2030	23,281	27,406	22,866

Source: JBIC Study Team

Table. Forecast of Bypassing Traffic (vehicle per day)

Section Year	Zestafoni Bypass	Kutaisi Bypass	Zestafoni - Samtredia Motorway
2007	5,026	5,067	3,873
2010	6,699	6,675	5,102
2015	9,632	9,438	7,214
2020	12,710	12,286	9,391
2025	15,796	15,105	11,545
2030	19,568	18,505	14,144

Source: JBIC Study Team

3.3. DESIGN CHARACTERISTICS AND STANDARDS

The Trans-European Motorway (TEM) design standards are applied to all the modernized Zestafoni-Kutaisi section of the roadways. These standards refer to a highway defined as:

- specially designed and built for motor traffic without serving properties bordering on it;
- provided, except at special points or temporarily, with separate carriageways for two directions of traffic with a median divider (central reserve);
- does not cross at level with any roads, railway or tramway track, or foot path;
- specially sign-posted as a motorway.

In addition to above features, the TEM shall:

- be provided with hard shoulders of adequate width for emergency stopping of vehicles;
- have a sufficient distance between the interchanges;
- be provided with its own police and maintenance services.

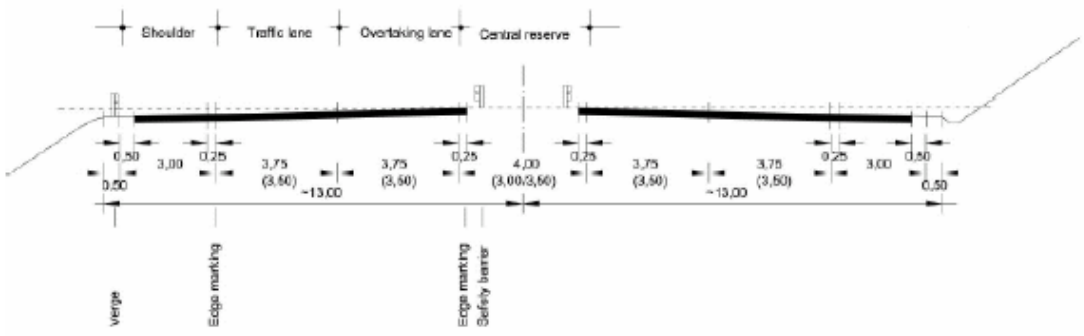
However there are sections where the widening of the existing 2-lane road into 4-lane carriageway is planned between the west end of the Zestafoni Bypass and the west end of the existing Kutaisi Bypass. These sections have been providing access to abutting properties for a long time. In order to modernize these sections which will comply with the TEM standards, the transformation of existing at-grade crossings into grade-separated structures and interchanges would be necessary. These processes will take place gradually in time and space so as to avoid confusion among people along the existing E-60 and to avoid disturbance to traffic taking into account of specific local conditions.

No	Main Parameters	Unit	Flat	Rolling
1	Design speed	km/h	120	100
2	Number of lanes		4	4
3	Lane width	m	3.75	3.75
4	Shoulder width	m	3.5	3.5
5	Minimum width of central reserve	m	4	3.00 - 4.00
6	Hard shoulder width for emergency stop	m	2.5	2.5

7	Verge for central reserve		m	0.25	0.25
8	Maximum longitudinal gradient		%	4	5
9	Minimum horizontal curvature at 7 % cross fall		m	650	450
10	Minimum radius of convex vertical curves		m	12,000	6,000
11	Width of acceleration and deceleration lane		m	3.5	3.5
12	Minimum stopping distance for straight section		m	200	150
13	Normal cross fall of carriageway		%	2	2
14	Maximum gradient of super elevation		%	7	7
15	Design clearance of bridges and overpasses	Horizontal	m	12x2	12x2
		Vertical	m	4.5+ 0.20	4.5+ 0.20
16	Design clearance of tunnels	Vertical	m	4.5	4.5
		Service walkway width	m	0.75	0.75
17	Technical parameters of interchanges and junctions	Design speed	km/h	40	40
		Min. horizontal curves	m	50	40
18	Pavement structure		Cement concrete		

Source: JBIC Study Team

The cross section of the motorway should allow maintenance of the design service level throughout the design life. The cross section has to comprise two one-way carriageways, separated by a median or central reserve of suitable dimensions. Each carriageway should consist of a number of lanes in proportion to traffic volumes forecasted. Along the whole length of the motorway a shoulder of suitable size should be provided; part of the shoulder should be paved so as to accommodate emergency stops. Where it is necessary to omit the emergency stopping lane along the whole stretch due to technical or economic considerations, lay-bys must be provided at suitable intervals. In case of two one-way carriageways, traffic lanes should have a width of 3.75 m. Edge markings must not be calculated as part of the width of the lanes.



Source: TEM Standards and Recommended Practice, Third Edition, Feb. 2002

Figure. Dual 2-lane Carriageway

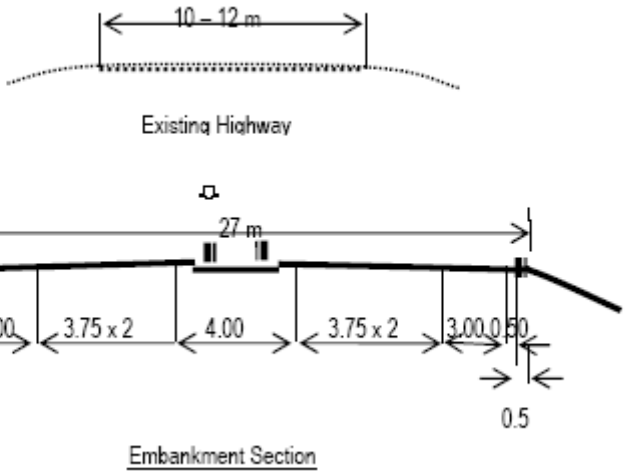
The design speed of the study sections are based on the TEM Standards and shown as the following table.

Section	Topography	Design Speed	Remarks
Zestafoni Bypass	Rolling	100 km/h	Neighboring section of Rikoti mountain
Zestafoni-Kutaisi Entrance	Flat	120 km/h	Design will be practiced based on the 120 km/h design speed. But actual operation speed will be limited due to access from abutting land.
Kutaisi Bypass East	Flat	120 km/h	Section: From the beginning of the Kutaisi Bypass to the Rioni River right bank I.C.
Kutaisi Bypass West	Flat	120 km/h	Section: From the Rioni River right bank I.C. to Samtredia town. All the options including widening section will use the same design speed.

Source: JBIC Study Team

The cross section of completed motorway is based on the TEM Standards with flexible application of the central reserve width. The dimension of the cross section is shown in the *5.3.3 Cross Section.*

Widening (Zestafoni-Kutaisi entrance) is basically done along the existing highway except some sections where improvement is necessary. The cross section of the existing highway varies. Average width of he existing E-60 can be shown in the figure. The cross section of widened roadway is shown in the figure. The widening side depends on the location, geographical conditions and adjacent properties.



Source: JBIC Study Team

Pavement

The existing E-60 roadway is paved by asphalt concrete material, on the other hand the sections recently opened to traffic is paved by cement concrete structure. It is generally understood that asphalt pavement is better riding quality, easier maintenance and cheaper in initial investment, whereas, the concrete pavement lasts longer than asphalt pavement in spite of higher initial construction cost. The asphalt concrete pavement needs maintenance about 10 to 15 years after opening to traffic depending on traffic loading and weather. The concrete pavement is said to be maintenance free for a long time. However, once the small cracks on the concrete pavement develops and repair is necessary it would take longer time before opening to traffic.

The initial const comparison is also influenced by availability of materials for each pavement. It is not difficult to find good aggregates for both asphalt and concrete pavement including base and sub-base. Georgia import asphalt materials and produce cement domestically, which will also influence the determination of the kind of pavement.

Georgian engineers and construction companies have already experienced the construction skills of the concrete pavement. Thus, the kind of pavement for the new highways will be a concrete pavement.

The pavement structures will be determined by the underneath ground conditions and cumulative heavy weight traffic volume for the design period. Given the specified strength of the sub-grade and good drainage, the designed pavement structures will be shown as the followings:

Notes: Cumulative Traffic Volume: 13 – 24 million vehicles/ 20 years)

Source: JBIC Study Team

3.4. GENERAL LAYOUT AND ALIGNMENT ALTERNATIVES

1. Zestafoni Bypass

Zestafoni is located at the exit of the Valley of the Kvirila River joining the Kolkheti Lowland. Therefore the eastern part of the Zestafoni Bypass is located on the mountainous terrain whereas the western part is located in the flat field. Among two alternatives presented by TRACECA Pre-Feasibility Study, JBIC Study Team focused on the recommended alternative by TRACECA Pre-Feasibility Study, i.e. northern route. For the northern alternative, JBIC Study Team has examined two 5-17 alignments as shown in ANNEX. Both routes cross the Kvirila River in the east from a river terrace with an area of 15 ha where a brick factory and a lorry depot operate. The terrace is the only space that offers some space for the construction of an interchange as other sections are wedged by hills on both sides. The routes have to traverse three to four small hills.

In the west the routes join with the existing road that connects Zestafoni and Kutaisi after a winery, bypassing 9.3-9.5 km stretch with a reduced length of approximately 9 km. Two route options differ in two aspects. The first option with tunnels attempts to minimize the dissection of communities. The second option without tunnels attempts to minimize the construction cost. The first option called, "Tunnel Route" cuts through communities at two locations while the second option called. "No Tunnel Route", cuts through communities at three locations. However, the overall difference in the number of estimated resettlement needs is not significant between two options.

1) Major Control Points for Zestafoni Bypass

The major control points for the Zestafoni Bypass are as follows;

- Hospital
- Cemetery
- Steel factory
- Winery
- Communities

2) Tunnel Route

The alignment option crosses the Kvirila River to its right bank at a sharp cliff, which necessitates the construction of tunnels. The tunnel penetrates beneath two ridges and comes out at the second valley then the route will cut as a trench below the hospital and crosses the street and the settlement and veer toward south to reach the another hill where a cemetery is located. After passing beside the cemetery, the route comes out on a flat terrain behind the steel factory, then finally to join the Zestafoni – Kutaisi Road after passing beside the winery.

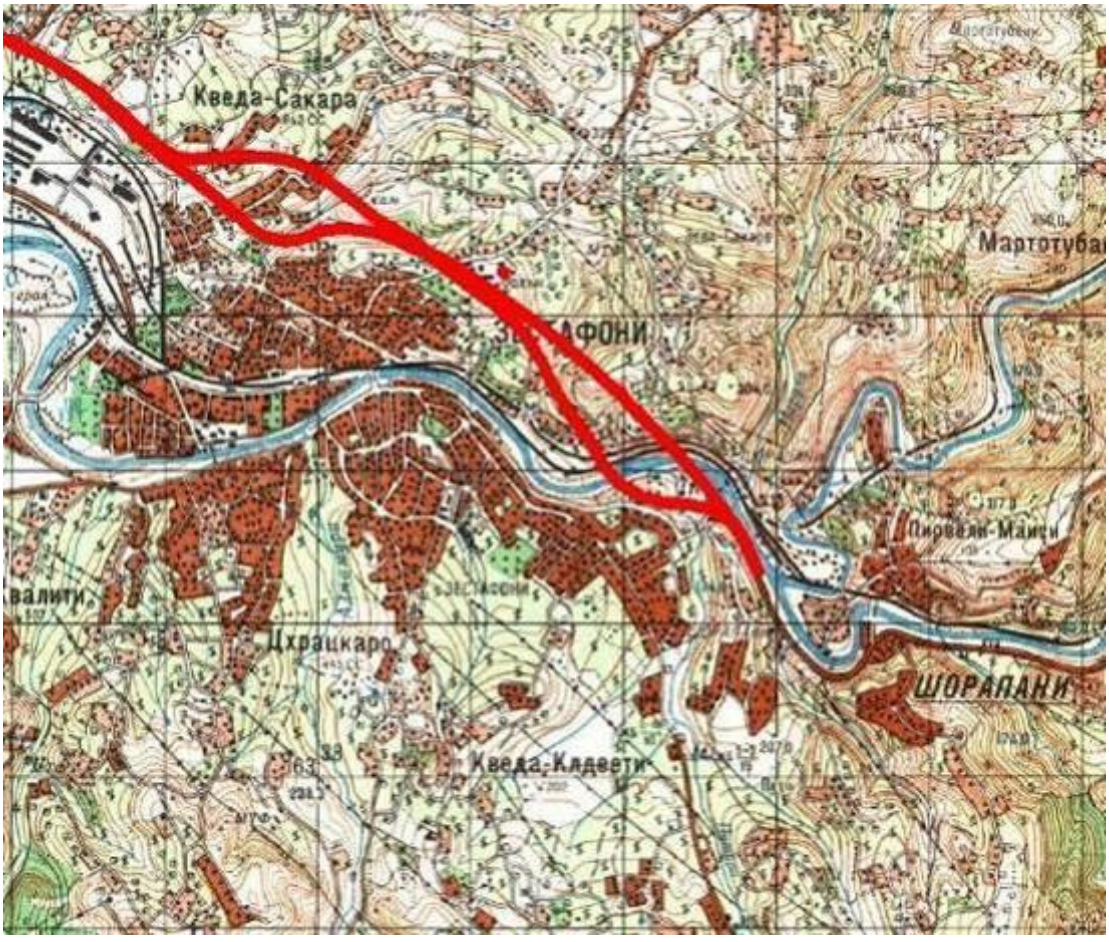
3) No Tunnel Route

The other alignment option is to avoid this sharp cliff at the right bank of the Kvirila River and joins the right bank around the downstream corner of the cliff where there exits a small settlement. The most probable alignment has to cut through the middle of the settlement and the route also comes below the hospital like Tunnel Route. Instead of veering toward the cemetery hill, the route continues straight to span the two adjacent hills to minimize fill earthwork. The route joins the Tunnel Route after the hill.

Staring Point – 190+770
End Point - 200+100
Length of the road section (existing road) –9,330 km
Length of the road section (Designed section) – 8,940 km
Maximum allowed speed at the section - 100 km/hour
Minimum speed at the section – 25 km/ hour
Forecasted traffic capacity:
2007 year - 5026
2030 year - 19568

Year	Passenger cars	Minibus	Light Truck	Large Bus	Medium Truck	Heavy Truck	Articulated Truck	Other	Total
2007	2663.78	1015.252	276.43	185.962	125.65	226.17	502.6	10.052	5026
2030	10371.04	3952.736	1076.24	724.016	489.2	880.56	1956.8	39.136	19568
	53%	20,2%	5,5%	3,7%	2,5%	4,5%	10%	0,2%	

Design Capacity – 44000 vehicle/per day
Max. Capacity - 77000 vehicle/per day
Amount of lanes - 4
Width of lane - 3,75m
Width of sholder - 3,5m



Zestafoni Bypass (Northern option – without tunnel; Southern – with tunnel)

2. Zestafoni – Kutaisi Improvement

This span of 22 km from the western junction of Zestafoni Bypass to the eastern junction of Kutaisi Bypass is a main route that connects the two cities of Zestafoni and Kutaisi.

Kutaisi, being the second largest city in Georgia, is the hub of the regional economy. However, the city has suffered mostly after the collapse of the Soviet Regime. The factories which once contributed to the economic gravity of the city of Kutaisi are now largely abandoned. The city still has a high rate of unemployment. The resurrection of Kutaisi as a regional hub is a key to the recovery of the economy as well.

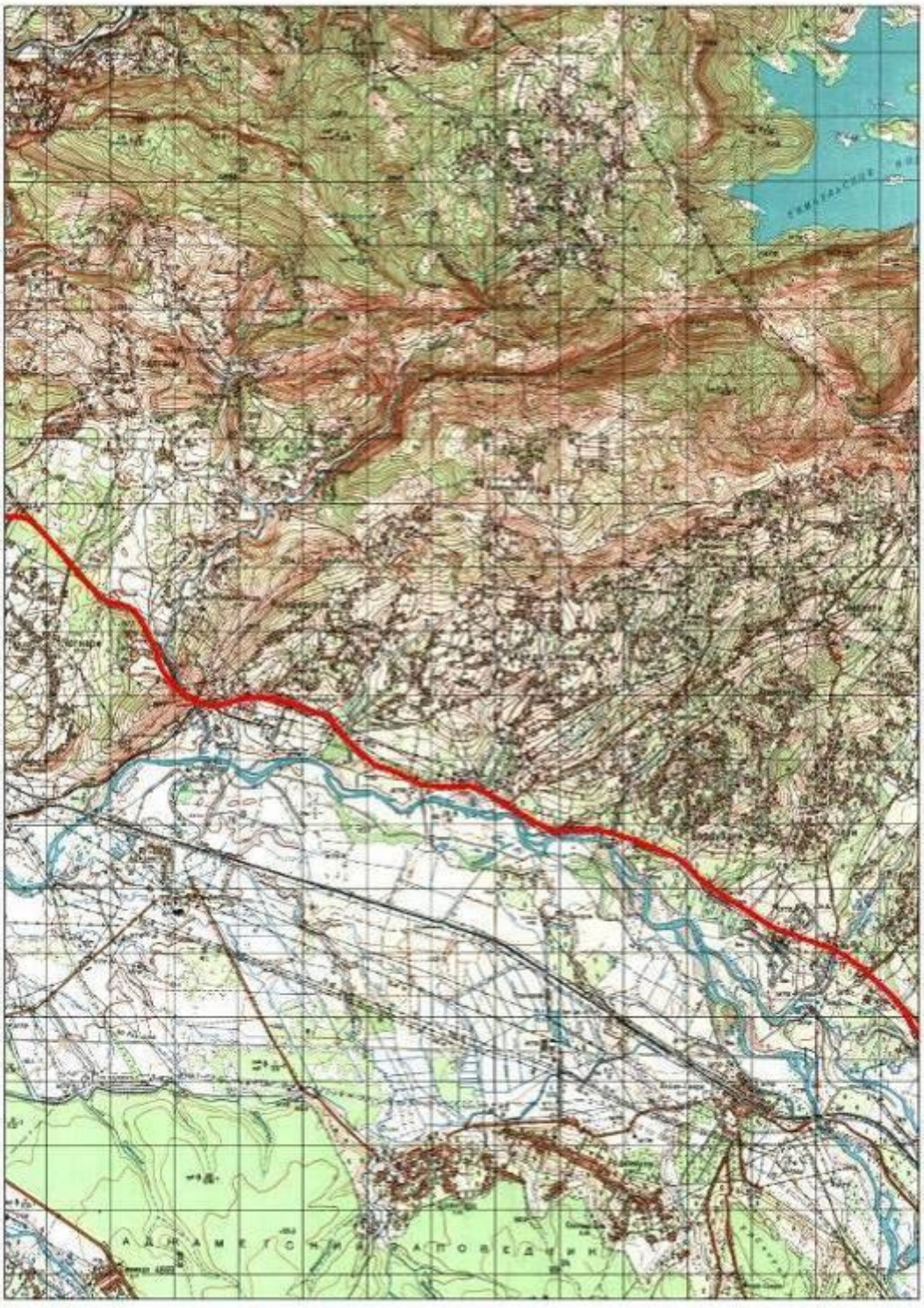
The road runs in parallel to the Kvirila River over 17 km till it crosses the Cheshura River at an area called, "Nakhshireghele." From Zestafoni to Nakhshireghele, the road runs on a flat alluvial plain on the right bank of the Kvirila River. The alignment property of this section of the road in most parts satisfy the TEM design standard for the journey speed of 120 km per hour for the most of the section except for minor alignment changes. There are no major houses or establishments within a buffer of 30 -50 m on either side of the road. Thus there is hardly any resettlement needs for the expansion of this section of the road.

After Nakhshireghele, the road has to pass the Cheshura River which is flanked with two small hills. The passage through this small valley necessitated the winding curvature of the road which does not conform to the TEM Standards. Thus the vehicles travel at slower speed of around 50 km to 70 km per hour at present. Therefore the major design change will take place for the 4km stretch of this section as well as major construction activities. The hills along the Cheshura River may be suited as a borrowing pit for the supply of construction soils to other sections of the Project.

Staring Point – – 200+100
End Point - 222+500
Length of the road section (existing road) –22,440 km
Length of the road section (Designed section) – 22,270 km
Maximum allowed speed at the section - 120 km/ hour
Minimum allowed speed at the section – 25 km/ hour
Forecasted traffic capacity:
2007 year - 7039 vehicle/per day
2030 year - 27406 vehicle/per day

Year	Passenger cars	Minibus	Light Truck	Large Bus	Medium Truck	Heavy Truck	Articulated Truck	Other	Total
2007	3730.67	1421.878	387.145	260.443	175.975	316.755	703.9	14.078	7039
2030	14525.18	5536.012	1507.33	1014.022	685.15	1233.27	2740.6	54.812	27406
	53%	20,2%	5,5%	3,7%	2,5%	4,5%	10%	0,2%	

Design Capacity – 44000 vehicle/per day
Max. Capacity - 77000 vehicle/per day
Amount of lanes - 4
Width of lane - 3,75m
Width of sholder - 3,5m



Zestafoni – Kutaisi Improvement (till Chognari forests)

3. Kutaisi Bypass (East)

A 2-lane bypass was constructed during 1980s to connect the eastern junction on Zestafoni – Kutaisi Road to Baghdadi Road. Baghdadi Road. The bypass was originally planned to provide a complete bypass to the city of Kutaisi by connecting Zestafoni-Kutaisi Road in the east and Kutaisi-Samtredia in the west. However, the construction stopped halfway at the junction of Kutaisi-Baghdadi Road at 4.9km. Therefore, the transit traffic as well as local traffic passes the main east - west road in the city center. Traffic congestion is still tolerable but it is expected to become impediments to local circulation in a few years.

The old road connecting from Zestafoni to Kutaisi winds through residential areas. The road condition of the old road is very poor due to lack of proper maintenance. Thus the traffic travels with an average speed of 30-50 km per hour. As a result currently a number of traffic going to the city center is using the Kutaisi Bypass.

The interchange at the old Kutaisi road and the Kutaisi Bypass is designed as a Y-shaped interchange. The present Kutaisi Bypass is planned and constructed to alleviate traffic congestion in the center of the city. However, as mentioned before, it is constructed only a half of the whole section. Furthermore, a part of the existing bypass alignment does not comply with TEM design standards of 120 km/h design.

In the case of only 2-lane bypass construction, since the major target is to complete the remaining arc of the Kutaisi Bypass in the west, it would be most economical to do nothing to the existing eastern part of the Kutaisi Bypass and only to construct the remaining portion from the junction of Baghdadi Road to the right bank of the Rioni and the rest of western arc of the bypass.

1) Major Control Points for Kutaisi Bypass

The major control points for Kutaisi Bypass are as follows;
- River Tskaltsitela
- Sports Center
- Special Boarding School
- Discharge channel of Rioni Hydropower Station
- Saghoria Forest
- Railway track going south on the left bank of the Rioni River from Kutaisi
- Rioni River
- A large scale apartment building
- Railway track going south on the right bank of the Rioni River from Kutaisi
- Transmission lines
- Communities

The eastern part of bypass is very sparsely built up except for a petroleum station and the rest is mainly used as pasture. Baghdadi Road and the discharge channel passes through the Saghoria Forest north-south with some significant negative environmental effects.

Kutaisi East

The route starts from the Y-shaped junction in the east on a small plateau then the route descends to the River Tskaltsitela in a sharp angle. From an elevation of 135m,

the road drops to an elevation of 100m at the right bank of the river over 800m distance and then again ascends to the level of 155m in a span of 1000m where both crossing street of Baghdadi Road and the power station discharge channel are situated. Thus the cutting of the top of the hill is not the solution. Since there are both sharp descent and ascent, the only solution is to lift the level of the bridge over the Tskaltsitela River at a level around 120m in order to meet the TEM standard.

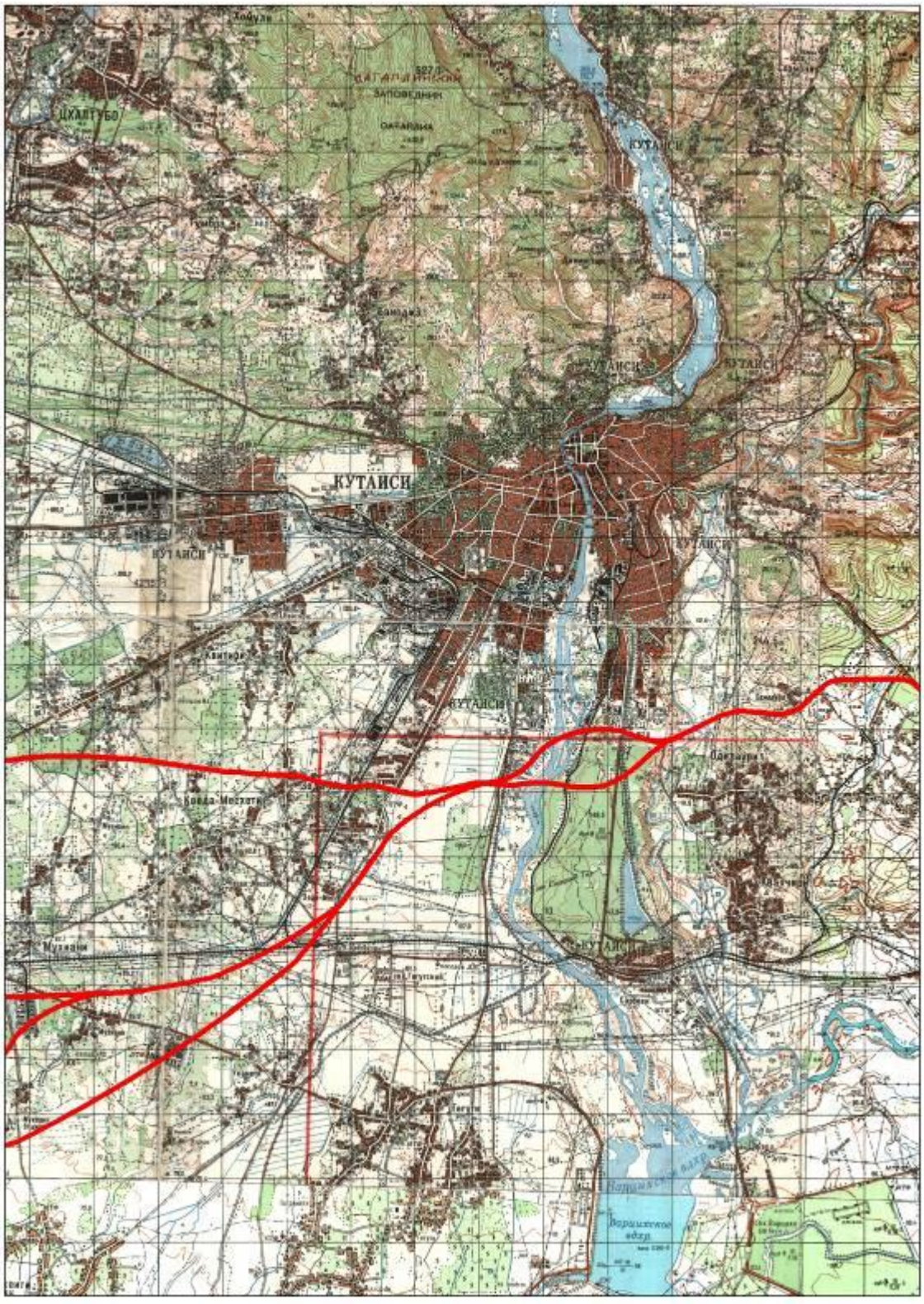
The proposed plan includes a widening of the existing portion of the Bypass and a new alignment instead of using existing roadway and grade separated connection to the Baghdadi Road. The new alignment involves construction of a high embankment and a long bridge, which then will increase construction costs. The canal running along the Baghdadi Road poses planning difficulty which would exclude an under-passing option of the planned motorway. The Bagdadi Road Interchange will be quite complicated due to the existing canal, which may be impossible to be relocated or lowered down to have an easy connection to the Bagdadi Road. The planned highway is obliged to go through the hill on the ground level by lowering down the crossing Bagdadi Road by constructing under-passing structures as retaining walls.

Basic concept of selecting this route is to minimize disturbance to the forest area mainly composed of precious oak trees which are recorded in the Red Data Book. In order to avoid removal of such trees the route will be located about 100 m north of the existing Kutaisi Bypass, continue along the edge of the forest, and reach the right hand bank of the Rioni River. A bridge crossing a railway and the Rioni River will be constructed. The long bridge with long spans will be constructed to pass over meandering nature of the river.

Staring Point – 222+500
End Point - (X)
Length of the road section (existing road) – 7,320km
Length of the road section (Designed section) – 7,190km
Maximum allowed speed at the section - 120km/hour
Minimum speed at the section – 25km/hour
Forecasted traffic capacity:
2007 year - 5067 vehicle/per day
2030 year - 18505 vehicle/per day

Year	Passenger cars	Minibus	Light Truck	Large Bus	Medium Truck	Heavy Truck	Articulated Truck	Other	Total
2007	**2685.51**	**1023.534**	**278.685**	**187.479**	**126.675**	**228.015**	**506.7**	**10.134**	**5067**
2030	**9807.65**	**3738.01**	**1017.775**	**684.685**	**462.625**	**832.725**	**1850.5**	**37.01**	**18505**
	53%	**20,2%**	**5,5%**	**3,7%**	**2,5%**	**4,5%**	**10%**	**0,2%**	

Design Capacity – 44000 vehicle/per day
Max. Capacity - 77000 vehicle/per day
Amount of lanes - 4
Width of lane - 3,75m
Width of sholder - 3,5m



Right – Zestafoni: Kutaisi Improvement (from Chognari to Bagdadi road)
In the Centre: Kutaisi Bypass East (Northern and Southern options)
Left: Kutaisi West – Samtredia (1 Northern and 3 Southern options)

4. Kutaisi West - Samtredia

1) Route North

This route starts from the Rioni River I.C., crosses a railway and goes through mainly farm land with scattered housing area. Topography of the area shows a typical fan shaped alluvial ground made by a meandering movement of the Rioni River for a long time period. Naturally housing density is quite low but it is also impossible to completely avoid relocation of houses along the route. A large amount of soil would be required if the entire structures of the highway was constructed as an embankment. The concept of low embankment is planned except crossing of a railway, which is difficult to relocate or construct a grade separated structure. The Route North ends at the intersecting point to the existing E-60. After the intersection of the existing E-60 toward Samtredia, the existing road will be widened to 4-lane when the traffic volume reaches a certain volume.

2) Route North Extension

This road section is planned to avoid the widening of the densely populated areas along the existing road after the North Route intersection (I.C.). The Route goes over the existing E-60, passes along the farm land and returns to the E-60. The whole Route is composed of the Route North and an additional extension of the Route North. The existing roadway after the end of the Route North Extension is located in the mostly farmland area, where the widening would be relatively easy.

3) Route South 1

This route starts from the Rioni I.C. and goes to the south to minimize housing relocations as much as possible. The total length of the new road section will be longer than the Route North and North Extension. The route passes through the edge of the populated areas, where the road will be constructed as an embankment to provide services for the residents to passes under the road. There will be a certain level of negative environmental impact to the residences.

4) Route South 2

This route is a variation of the Route South 1 in order to avoid passing through the edge of populated area. Thus, the total length will be longer than the Route South 1. Due to the further south connecting point to E-60, which is nearer to Samtredia, the widening section will be short.

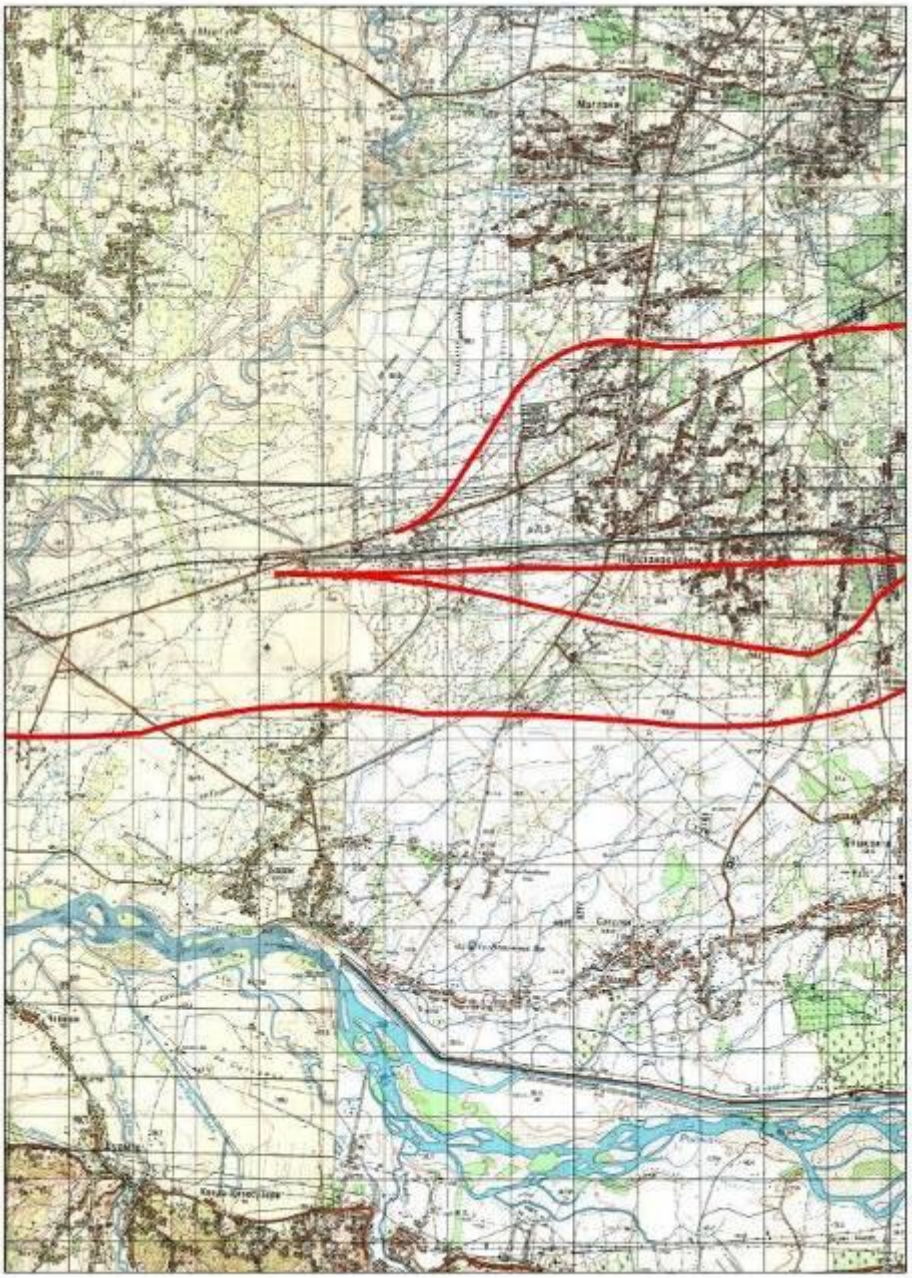
5) Route South 3

This route starts from the Rioni I.C. and almost reaches to the Zestafoni-Samtredia motorway location. There will not be adverse impacts to the nearby residences because most of the land devoted to the roadway will be farmland or abandoned land. This route is the longest new construction to Samtredia, which will be most costly solution. At the end of the route near Samtredia city there will be problems of erosion from the Rioni River. The protection structures to the erosion will further increase the construction costs.

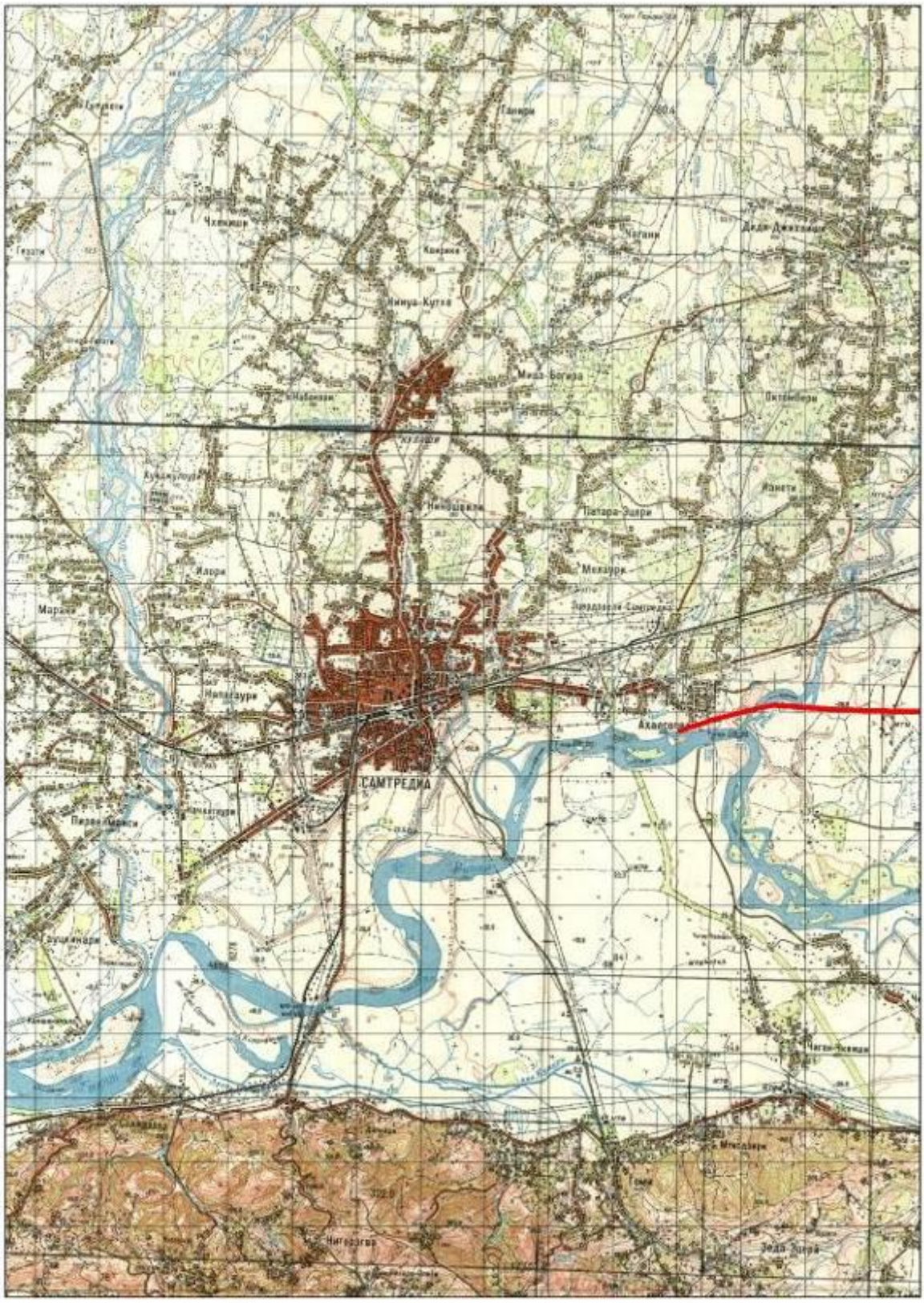
Staring Point – (X); **End Point** – 267 + 700
Length of the road section (existing road) – 34,440 km
Length of the road section (Designed section) – 32,010 km
Maximum allowed speed at the section - 120 km/hour
Minimum speed at the section – 25 km/hour
Forecasted traffic capacity:
2007 year - 6262 vehicle/per day
2030 year - 22866 vehicle/per day

Year	Passenger cars	Minibus	Light Truck	Large Bus	Medium Truck	Heavy Truck	Articulated Truck	Other	Total
2007	**3318.86**	**1264.924**	**344.41**	**231.694**	**156.55**	**281.79**	**626.2**	**12.524**	**6262**
2030	**12118.98**	**4618.932**	**1257.63**	**846.042**	**571.65**	**1028.97**	**2286.6**	**45.732**	**22866**
	53%	**20,2%**	**5,5%**	**3,7%**	**2,5%**	**4,5%**	**10%**	**0,2%**	

Design Capacity – 44000 vehicle/per day
Max. Capacity - 77000 vehicle/per day
Amount of lanes - 4
Width of lane - 3,75m
Width of sholder - 3,5m



Kutaisi West – Samtredia Section (1 Northern and 3 Southern Options)



Kutaisi West – Samtredia Section - South 3 Option End Point

3.5. CONSTRUCTION ACTIVITIES

The quantities of earthworks are basically estimated by examining the profiles of each route to drive the volume in cubic meter. Through the field survey and map analysis, JBIC Study Team confirmed that some sections (Zestafoni Bypass, Nakhshirghele - Kutaisi Improvement, and Kutaisi Bypass East) need much earthwork. For those sections, quantities of earthworks are estimated based on the profiles.

Earthworks are divided into two groups, "cut to fill" and "fill from borrow". "Cut to fill" is applied to sections where current ground level is higher than planned level, and "fill from borrow" is applied to sections where current ground level is lower than planned level. Based on the difference between the two levels, cross-sectional area, which is a trapezoidal form, can be estimated. By multiplying the distance of each section, the quantities of earthworks are estimated.

In the other sections, JBIC Study Team assumed that only 0.5m thickness embankment for road will be constructed because the topography of these sections is flat. Even in the improvement sections, as new pavement will be constructed, 0.5m thickness embankment will be constructed. The estimated quantities of earthworks are summarized in table below.

The quantities of bridges are e divided into three categories by the height of bridge. The categories are "up to 10m", "from 10 to 20m" and "more than 20m". The foundations of the bridge are piles foundation. The width of bridge is 24.5m for newly constructed bridges and 12.25m for expansion of existing bridges. If some existing bridges needs reconstruction, their width is set 24.5m. The quantities of bridges are shown in table below.

The quantities of the other work items are estimated in the following methods. The items mentioned in the following are chosen by referring the TRACECA Pre-Feasibility Study.

- Based on the result of field survey and the aerial photo, JBIC Study Team estimates the quantities of several work items. The items are "pipe culverts", "protection of slopes", "construction of roads for local traffic" and "anti noise devices".
- By examining the profiles of each route, JBIC Study Team estimates the quantities of "retaining walls".
- The quantities of "removal of buildings and structures" and "cost of occupied lands" are estimated by utilizing cadastral maps in 2002 and results of field survey. The range of this estimation is 20m from the center line of the route to both sides, and is arranged with certain widening in the areas of embankments and deep cuts.
- The quantities of some work items are set in proportion to the length of each section, as the TRACECA Pre-Feasibility Study showed. The items are "fixing of route and preparatory works", "road marking and traffic signing", "emergency network call", and "traffic control and general monitoring".
- The quantities of "water clearing structures", "steel wire fences", and "barriers" are also set in proportion to the length of each section. However, these quantities do not include the length of bridges and tunnels, because water clearing structures, steel wire fences, and barriers are not necessary in the section of bridges and tunnels.

• JBIC Study Team allocates one site as "archaeological sites" to each newly constructed route, based on the archaeological review, which is mentioned in annex 3. The allocated sections are Zestafoni Bypass and Kutaisi Bypass West.

Table: Quantities of major work items for Zestafoni – Kutaisi sections

No.	Route		Zestafoni Bypass		Zestafoni-Kutaisi Improvement		Kutaisi Bypass	Kutaisi Bypass	
	Section				Zestafoni – Nakhshireghele	Nakhshireghele - Kutaisi	East	West	
	Option		A Tunnel	B No Tunnel				North	North Extended
	Length of Section	km	9.1	9.0	17.0	5.2	7.2	8.5	13.9
1	Fixing of route and preparatory works in:								
	- Rolling terrain	km	5.1	5.0	0.0	0.0	7.2	0.0	0.0
	- Flat terrain	km	4.0	4.0	17.0	5.2	0.0	8.5	13.9
2	Removal of buildings and structures:								
	- Houses and farms	unit	27.0	27.0	13.0	1.0	0.0	3.0	6.0
3	Cost of Occupied lands:								
	- Useful for agriculture	ha	12.1	12.2	11.2	2.3	0.0	18.3	26.1
4	Archeological sites	unit	1.0	1.0	0.0	0.0	0.0	1.0	1.0
5	Cut to fill in:								
	- Rolling terrain	1000m3	698.9	1,009.2	0.0	0.0	277.1	0.0	0.0
	- Flat terrain	1000m3	0.0	0.0	0.0	325.5	0.0	0.0	0.0
6	Fill from borrow	1000m3	705.5	1,388.8	230.0	511.8	968.1	820.0	1,100.0
7	Road pavement considering the lay-bys:								
	a) New structure, type I								
	- In soft soils	1000m2	199.5	196.9	374.9	115.1	158.2	185.9	305.8
8	1.5 m diameter pipe culverts	m	105.0	189.6	237.0	50.0	105.0	245.0	350.0
9	Box-culverts, opening:								
	- 2.5x2.5 m	m	0.0	0.0	133.0	40.0	0.0	0.0	43.0
	- 4.0x2.5 m	m	43.0	142.0	198.0	30.0	43.0	86.0	129.0
	- 6.0x4.5 m	m	35.0	35.0	0.0	101.0	35.0	35.0	35.0
10	Bridges height:								
	a) Up to 10 m:								
	- Piles foundation	m2	0.0	0.0	3,087.0	0.0	1,890.2	735.0	1,715.0
	b) From 10 to 20 m								
	- Piles foundation	m2	0.0	0.0	0.0	6,474.1	0.0	0.0	0.0
	c) More than 20 m								
	- Piles foundation	m2	25,135.8	24,916.5	0.0	0.0	22,457.7	0.0	0.0
11	Overbridge								
	- 1 lane	unit	0.0	0.0	0.0	0.0	0.0	3.0	4.0
	- 2 lane	unit	3.0	3.0	1.0	0.0	0.0	1.0	2.0
12	Double-lane tunnels for one direction with length:								
	- More than 500 m	m	1,427.0	0.0	0.0	0.0	0.0	0.0	0.0
13	Retaining walls:								
	- Upper	m3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	- Down	m3	0.0	0.0	0.0	0.0	3,600.0	0.0	0.0
14	Protection of slopes from washing out with big size stonework	m3	0.0	0.0	0.0	0.0	36,000.0	0.0	0.0
15	Interchanges with:								
	a) International and state roads								
	- Type I	unit	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	- Type II	unit	0.0	0.0	0.0	0.0	1.0	0.0	0.0
	b) Local roads								
	- Type III	unit	2.0	1.0	0.0	0.0	1.0	1.0	1.0
16	Junctions with:								
	a) International and state roads								
	- Type IV	unit	0.0	1.0	0.0	1.0	1.0	0.0	0.0
	b) Local roads								
	- Type V	unit	0.0	0.0	1.0	0.0	0.0	0.0	0.0
17	Construction of roads for local traffic:								
	- Inhabited areas	km	0.5	0.5	0.0	0.0	0.0	0.0	0.0
	- Uninhabited areas	km	0.0	0.0	0.0	0.0	0.5	0.0	0.0
18	Anti noise devices	m	1,300.0	1,600.0	0.0	0.0	0.0	0.0	1,000.0
19	Water clearing structures	km	7.3	7.9	16.9	5.0	6.2	8.4	13.8
20	Earthworks for the preparation of construction sites:								
	- Maintenance centre and police stations	1000m2	0.0	0.0	30.0	0.0	0.0	0.0	0.0
	- Service areas	1000m2	0.0	0.0	45.0	0.0	0.0	0.0	0.0
21	Steel wire fences along the road	km	15.4	15.9	33.7	9.9	12.4	16.8	27.7
22	Barriers	km	15.4	15.9	33.7	9.9	12.4	16.8	27.7
23	Road marking and traffic signing	km	9.1	9.0	17.0	5.2	7.2	8.5	13.9
24	Emergency network call, variable messages system, light signals	km	9.1	9.0	17.0	5.2	7.2	8.5	13.9
25	Traffic control and general monitoring of traffic data	km	9.1	9.0	17.0	5.2	7.2	8.5	13.9

No.	Route		Kutaisi Bypass			Kutaisi Bypass (2lane)	
	Section		West			East	West
	Option		South 1	South 2	South 3		North
	Length of Section	km	17.9	19.5	32.0	2.4	8.5
1	Fixing of route and preparatory works in:						
	- Rolling terrain	km	0.0	0.0	0.0	2.4	0.0
	- Flat terrain	km	17.9	19.5	32.0	0.0	8.5
2	Removal of buildings and structures:						
	- Houses and farms	unit	10.0	3.0	4.0	0.0	3.0
3	Cost of Occupied lands:						
	- Useful for agriculture	ha	19.3	15.3	17.5	0.0	18.3
4	Archeological sites	unit	1.0	1.0	1.0	0.0	1.0
5	Cut to fill in:						
	- Rolling terrain	1000m3	0.0	0.0	0.0	58.2	0.0
	- Flat terrain	1000m3	0.0	0.0	0.0	0.0	0.0
6	Fill from borrow	1000m3	1,000.0	640.0	560.0	203.3	574.0
7	Road pavement considering the lay-bys:						
	a) New structure, type I						
	- In soft soils	1000m2	394.0	428.8	704.2	26.6	93.0
8	1.5 m diameter pipe culverts	m	770.0	910.0	805.0	64.5	150.5
9	Box-culverts, opening:						
	- 2.5x2.5 m	m	0.0	0.0	0.0	0.0	0.0
	- 4.0x2.5 m	m	301.0	129.0	0.0	0.0	52.8
	- 6.0x4.5 m	m	35.0	0.0	0.0	0.0	21.5
10	Bridges height:						
	a) Up to 10 m:						
	- Piles foundation	m2	490.0	490.0	8,085.0	516.3	367.5
	b) From 10 to 20 m						
	- Piles foundation	m2	0.0	0.0	0.0	0.0	0.0
	c) More than 20 m					0.0	0.0
	- Piles foundation	m2	0.0	0.0	0.0	6,447.1	0.0
11	Overbridge						
	- 1 lane	unit	4.0	7.0	6.0	0.0	3.0
	- 2 lane	unit	2.0	1.0	2.0	0.0	1.0
12	Double-lane tunnels for one direction with length:						
	- More than 500 m	m	0.0	0.0	0.0	0.0	0.0
13	Retaining walls:						
	- Upper	m3	0.0	0.0	0.0	0.0	0.0
	- Down	m3	0.0	0.0	0.0	0.0	0.0
14	Protection of slopes from washing out with big size stonework	m3	0.0	0.0	0.0	36,000.0	0.0
15	Interchanges with:						
	a) International and state roads						
	- Type I	unit	0.0	0.0	0.0	0.0	0.0
	- Type II	unit	0.0	0.0	0.0	1.0	0.0
	b) Local roads					0.0	0.0
	- Type III	unit	0.0	0.0	0.0	0.0	1.0
16	Junctions with:						
	a) International and state roads						
	- Type IV	unit	0.0	0.0	0.0	0.0	0.0
	b) Local roads					0.0	0.0
	- Type V	unit	1.0	1.0	1.0	0.0	0.0
17	Construction of roads for local traffic:						
	- Inhabited areas	km	0.0	0.0	0.0	0.0	0.0
	- Uninhabited areas	km	0.0	0.0	0.0	0.0	0.0
18	Anti noise devices	m	500.0	0.0	0.0	0.0	0.0
19	Water clearing structures	km	17.9	19.5	31.7	1.9	8.4
20	Earthworks for the preparation of construction sites:						
	- Maintenance centre and police stations	1000m2	0.0	0.0	0.0	0.0	0.0
	- Service areas	1000m2	0.0	0.0	0.0	0.0	0.0
21	Steel wire fences along the road	km	35.8	38.9	63.4	3.7	16.8
22	Barriers	km	35.8	38.9	63.4	3.7	16.8
23	Road marking and traffic signing	km	17.9	19.5	32.0	2.4	8.5
24	Emergency network call, variable messages system, light signals	km	17.9	19.5	32.0	2.4	8.5
25	Traffic control and general monitoring of traffic data	km	17.9	19.5	32.0	2.4	8.5

• As for “earthworks for the preparation of construction sites”, JBIC Study Team allocates one maintenance center and police station and one service area to Zestafoni-Kutaisi Improvement section. All quantities set by JBIC Study Team for Zestafoni Bypass, Zestafoni-Kutaisi Improvement, Kutaisi Bypass are shown in the following table. Furthermore, quantities of Kutaisi Bypass for 2-lane are also estimated by referring the quantities of Kutaisi Bypass for 4-lane.2 All the quantities are also summarized in the following table.

3.6. SUPPORT FACILITIES AND SERVICES

Bridge Plan

Planned motorway routes are running along major rivers: the Kvirila River in Zestafoni town and the Rioni River in Kutaisi town. There are several rivers and streams flow from north hill side into these major rivers. Naturally many bridges and culverts are required along the highway. Among these bridges two major bridges are located in the Zestafoni Bypass section and the Kutaisi Bypass East section. Other bridges are located mainly in the Zestafoni Bypass section where the route goes across hills and valleys. A bridge length depends on the local conditions of the site; some are long bridge with a long span due to foundation conditions and some are a long bridge with relatively short span. Most of the bridges of the Zestafoni Bypass will be designed as a steel truss bridge because of a long span length.

According to geomorphologic zoning of Georgia, the study area is included in the zone of intermountain depression of Georgia and includes the eastern part of Kolkheti alluvial lowland. The surface of the area is eroded by the river Kvirila and Dzirila and their tributaries. The foundation conditions of the planned road sections are, as can be seen from the 5.2.2 Geology, composed of mostly low-mountainous terrace relief consisting of strata of limestone, sandy rocks, and volcanic deposits (Zestafoni area). In this area, the bridge substructure will need pile foundations of different kinds and length depending on the geological conditions at site.

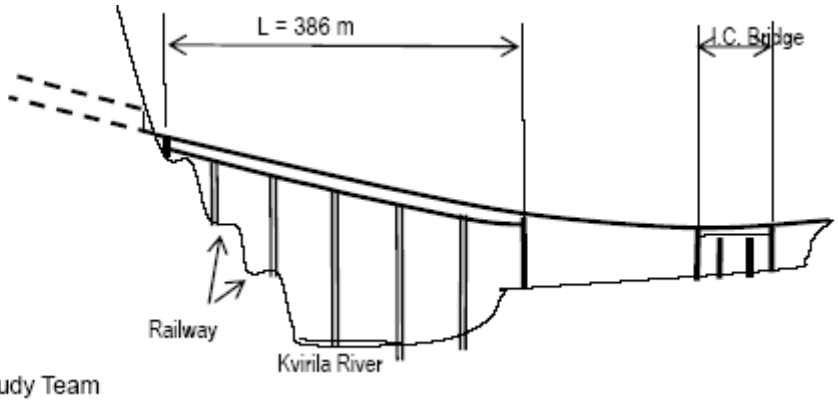
The widening section will utilize the deposit of flood plain terraces on the right bank of the river Kvirila with the mixture of boulders, sands, and loams. The existing bridges of E-60 are constructed on the pile foundations. The geological conditions of the Nakhshireghele district where alignment improvement is required, is expressed by the alternating layers, inter-layers, and streaks of limestone, argillaceous limestone and marls. The bridge will also need pile foundations of different kinds and length.

The eastern part of the Kutaisi Bypass will go along the ground of alternating layers of the limestone and marls and inter-layer of sandstones and breccias conglomerates as well as glauconite sandstones and marl base conglomerates. The bridge crossing the river Tskaltsitela will need fairly deep pile foundations due to the soft ground.

The bridges of the Kutaisi Bypass East section are the bridges crossing the river Rioni.

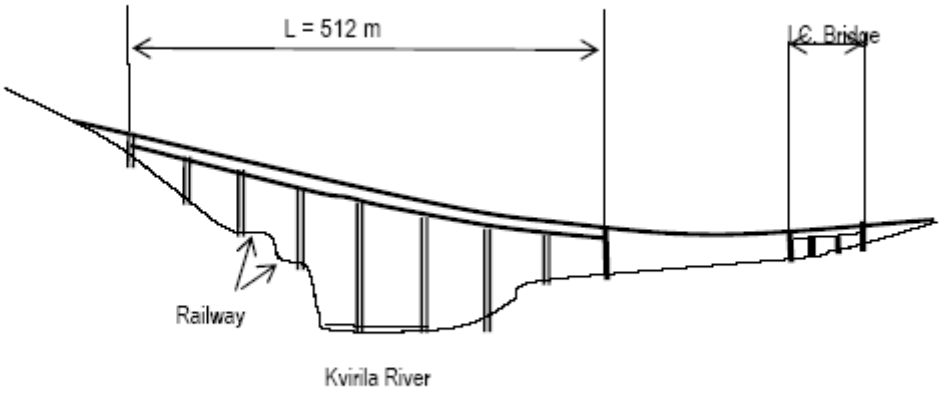
The foundation conditions are presented as eluvial-deluvial argillaceous and argillaceous-detritus formations, with their bed thickness changing from 1 m to 10 m

and strong alluvial deposits (alluvion) with their bed thickness reaching several tens of meters and mainly presented as boulders, shingle, gravel, sands and sandy-loams, with argillaceous ground inter-layers and streaks at some places. The bridge will need pile foundations of a kind which considers the existence of such difficult soils of boulders and gravel. The figure below shows the schematic drawing of the Kvirila River Bridge of the route with a tunnel.



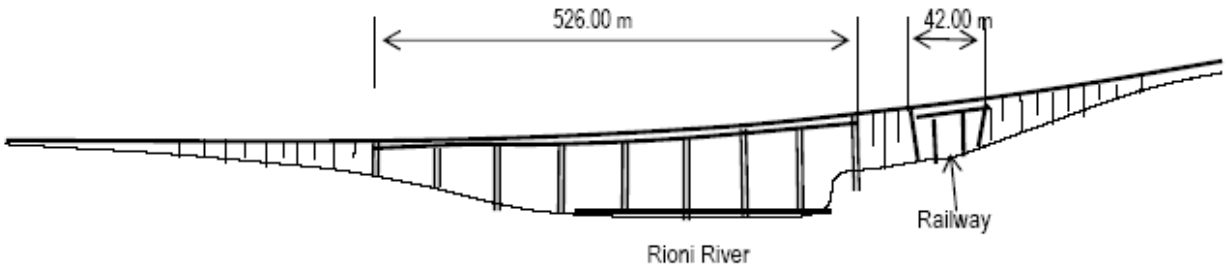
Source: JBIC Study Team

Fig. Bridge over the Kvirila River with Tunnel



Source: JBIC Study Team

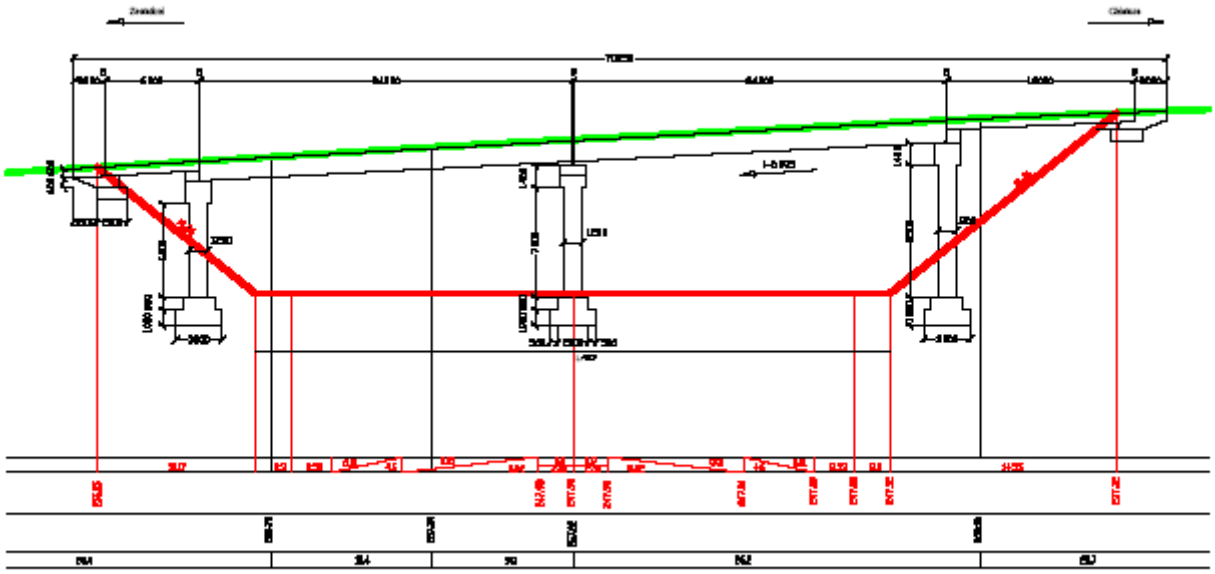
Fig. Bridge over the Kvirila River without Tunnel



Source: JBIC Study Team

Fig. Bridge over the Rioni River

The shape of over-passing structures will be determined by the height of cut, which also determines the bridge length. The figure below shows one of the over-passing bridges in the Zestafoni Bypass section.



Source: JBIC Study Team

Fig. Chiatura-Zestafoni Overpass

The other supporting facilities, like retaining walls and slope protection installations, culvert boxes, drainage pipes etc. are given in p.3.5.

3.7. CONSTRUCTION RELATED WASTES

Spoil

The earthwork balance provided in p. 3.5 (see table, points No 5 and 6) demonstrates that the generation of spoil ("cut to fill in": 1611000 m^3) is overbalanced by the requirement for filling inert materials ("fill from borrow": 3900000 - 4200000 m^3). Therefore, most part of spoil generated during construction will be utilized as filling material. Only that part of spoil, which could not be used for filling embankments is subject for disposal off-site.

3.8. EQUIPMENT TO BE USED DURING CONSTRUCTION

The list of equipment to be used during construction will be specified in detailed design. Here below we provide indicative list based on the data taken from the design documents for 12km length Agaiani-Igoeti section of the E-60 Highway.

No.	Minimum Equipment Type and Characteristics	Minimum Number required
1	**Bull Dozer with Ripper**	**4**
2	**Front loader**	**3**
3	**Tipper-Dumper**	**6**
4	**Motor Grader**	**2**
5	**Truck Excavator**	**1**
6	**Back Hoe**	**2**
7	**Vibratory Roller**	**2**
8	**Pneumatic Roller**	**1**
9	**Tandem Roller**	**3**
10	**Vibratory Screen**	**1**
11	**Crusher**	**1**
12	**Fully Automatic Batching Plant**	**1**
13	**Fully Automatic Hot-Mix Plant**	**1**
14	**Paver Finisher with Electronic Sensor**	**1**
15	**Bitumen Tank with kettle and Spray Bar**	**2**
16	**Bituminous Storage**	**1**
17	**Compressor**	**2**
18	**Mobile Generator**	**2**
19	**Water Tank with sprinkler**	**2**
20	**Crane**	**1**
21	**Concrete Paver With Electronic Sensor**	**1**

3.9. LIFESPAN OF THE PROJECT

It assumed that it will take a year for loan preparation and four to five years for implementation including procurement, construction. Construction period are anticipated to be around two and half or three years depending sections. One of the critical factors of the construction period will be Rioni River Bridge construction, which requires substantial work for construction.

4. ENVIRONMENTAL RECEPTORS IN THE AREA OF CONCERN

4.1. INTRODUCTION

The detailed information regarding environmental baseline conditions for the area of concern (including all alternative routes) is provided in the annex 3 of the present EIA. The baseline contamination data is reflected in the annex 4. Here below we provide brief description of the environmental sensitivities in a form of concise summary convenient for further analysis of potential impacts.

The main outcome of the assessment of environmental settings is that there are no showstoppers – areas prone to severe geological hazards or restriction zones (e.g. protected areas or extremely sensitive environmental receptors) – that may prohibit project implementation. The only strictly restricted zone in the region is Ajameti Nature Reserve. The selected sections for the Study are away from Ajameti Nature Reserve. However, in the case of Zestafoni – Samtredia Motorway, the route passes near this reserve, thereby special attention should be taken for bypassing the territories attributed to the reserve.

The most sensitive area is the site near v. Akhalsopeli, were the r. Rioni is intensively meandering and washing the right bank. The narrow strip of land (80 -100m width) between the bank and closest residential houses is partly occupied by the gas pipeline RoW. Thus the space for the highway construction is limited and certain river-bank protection installations are required to prevent further lateral erosion. This is necessary not only for protecting the infrastructure but also for minimizing resettlement needs. The scale of resettlement required for construction of the highway will dramatically increase if the narrow corridor will be further reduced.

The other sensitivities worthy to be mentioned are the Sagoria and Chognari forests. Sagoria forest (Kutaisi bypass) is natural forest of high conservative and recreational value and (although it is not protected area) the local environmental authorities strongly recommended to avoid crossing this sensitive receptor. Chognari forest (Zestafoni-Kutaisi section) is artificial mainly and is of less conservative value. Widening of the road will affect this forest. Land clearance and tree felling in this zone is not prohibited, however, proper offset measures should be planned and appropriate permit should be obtained from the forestry department of MoE.

Different water-bearing complexes may be identified within the study area, comprising deep circulation and shallow groundwaters. However no valuable groundwater resources and no aquifers sensitive to the highway project impacts are presented in the area. Relatively sensitive is the water-bearing complex of alluvial-deluvial deposits of the Quaternary period, which cover the gorges of the rivers Kvirila, Cholaburi, Dzusa, Chkhara, Tskaltsitela and Rioni and adjacent slopes. The depth of groundwater in these aquifers is relatively low and reaches in some floodplains 1 – 2m. The waters of the alluvial-deluvial complex have good drinking qualities, but following their limited expansion, are of the local designation only. The risk of contamination of these aquifers during construction activities is low.

The surface water resources in the area of concern are represented by some major and smaller rivers, streams and channels. Detailed description is given in annex 3. Data on water quality is provided in annex 4. Content of some heavy metals (having certain concern with the highway related contamination) and total petroleum hydrocarbons (TPH) have been analyzed. According to this data contamination by the heavy metals is not so significant, while contamination by the oil products was significant for the most part of the analyzed rivers (5 from 6). This demonstrates vulnerability of surface water resources and all the surface water receptors should be considered as sensitive.

All the sites should be considered sensitive in terms of archaeological resources. Some of archaeological sites are known but the precaution measures should be applied also for other sites, so far as the archaeological survey was not conducted systematically but mainly in places of previous major constructions. Some archaeological artifacts have been damaged during these works. The lesson should be carried out from this and preliminary clearance by the CAS of the Ministry of Culture is important before the start up of construction activities. This is of particular importance for the sites of new construction, but also should not be disregarded at the sites of widening the road.

4.2. SUMMARY LIST AND BRIEF DESCRIPTION OF ENVIRONMENTAL SENSITIVITIES

Zestafoni Bypass section

- rivers Kvirila and Cholaburi (surface water and aquatic ecosystems)
- patch of forest near the Zestafoni hospital (ownership of the Forestry Fund)
- hills North to Zestafoni – shallow landslides and potential of erosion risks

Known archeological monuments:

Shorapani – A stronghold of the antique and early medieval ages situated at the mouth of the rivers Kvirila and Dzirula

Village Kvemo Sazani – A hill of ancient settlement, Late Bronze Age, Early Iron Age

Village Argveta – A necropolis of the V-IV cc B.C.

Village Odilauri - A necropolis (pitchy tombs) of the VI-IV cc B.C.

Village Bezhatubani – Treasure consisting of bronze items, XII-VIII cc B.C.

Village Kvemo Sakara - Treasure consisting of bronze items, XII-VIII cc B.C.

The south Imereti foothills join with the northern slopes of the Achara-Imereti ridge, and the Guria and Imereti hills. Humidity is lower and the seasonal distribution of precipitation is more mediterranean. The highway passes through the Kolkheti lowland and Rioni basin. In general Landscapes are represented in the hill-mound zone (from Shorapani to v. Argveta) by Landscape 6 - plain-hill-mound erosive-accumulative landscape, with oak, zelcova carpinifolia (Lat.), beech-chestnut and polydominant Kolkheti type forests, evergreen undershrub. The landscape in the project area is strongly transformed due to dense population and agricultural activities. Small patches of forest owned by the forest department are remaining near the old Zestafoni hospital building and should be considered during precise routing on the detailed engineering stage.

Fig. Small patches of forest near the old Zestafoni hospital

Section from Zestafoni Bypass to Kutaisi Bypass

- river Kvirila and its tributaries: Chkhara, Dzevrula, Nakhshirgele, Chishura, Tskaltsitela and several smaller watercourses (water and aquatic ecosystems)
- hill near the village Nakshirgele, which should be cutted off to provide standard alignment features.
- Chognari forest near Kutaisi (artificial). The 2km length section of the existing road crosses Chognari forest. Upgrading of the road will require clearance of about 4 ha of the forest. The forest is not of high conservative value, however appropriate offset measures will be required.

Archeological monuments:

Village Kvemo Simoneti - Treasure consisting of bronze items, XII-VIII cc B.C.
Village Godogani – Treasure of bronze Kolkhi axes, XII-VIII cc B.C.
Village Godogani – A monument 'Jason Cave' of the Stone Age on the right bank of the river Tskaltsiteli, left of Zestaphoni-Kutaisi motorway, at the bridge of Godogani
Village Chognari – 'Nasajvarebi Bortsvi', cultural layers of the VIII-III cc B.C.

All other sections of the Highway section from v.Argveta till v. Partskhanakanevi and v.Akhalsopeli are located within the Landscape 2 - plain-lowlands accumulative landscape, with Imereti oak forests, at some places with evergreen undershrub. Along the highway route natural vegetation is mostly degraded due to densely populated areas and development of agriculture.

Fig. Chognari forest near Kutaisi (artificial)

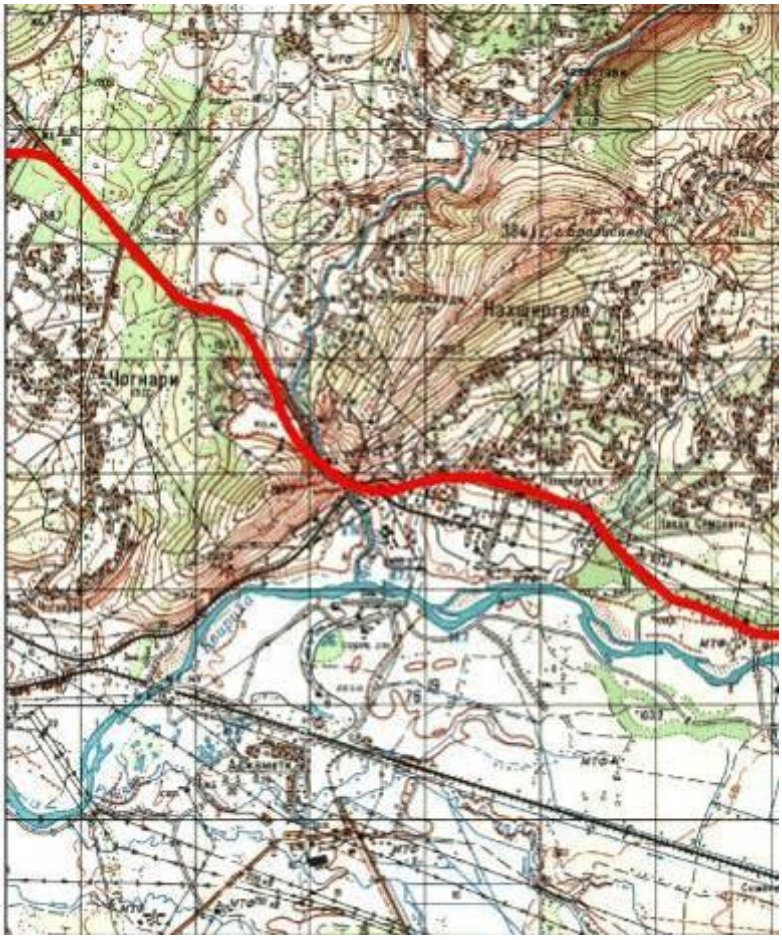


Fig. 2km length section of Chognari forest near Kutaisi

Kutaisi Bypass

- river Rioni (surface water and aquatic ecosystems)
- Saghoria forest (red list oak tree forest)

Archeological monuments:

Village Kvemo Meskheti – A necropolis (pitchy tombs) of the IV-II cc B.C.
Village Kvemo Meskheti – Treasure of coins (Kolkhi Tetri), the VI-IV cc B.C.
Village Partskhanakanebi – A hill of ancient settlements of the VIII-VII cc B.C.
Village Partskhanakanebi – A necropolis (pitchy tombs) of the IV-II cc B.C.
Village Maghlaki - A necropolis (pitchy tombs) of the IV-II cc B.C.
Village Maghlaki – A hill of ancient settlements of the VIII-VII cc B.C.
Village Kvitiri – A necropolis (pitchy tombs) of the IV-II cc B.C. of the Hellenistic Age
Village Kvitiri – A hill of ancient settlements of the VIII-VII cc B.C.

The Sagoria forest near the r.Rioni crossing in Kutaisi. The forest is the important recreation zone for Kutaisi and besides it is mainly structured by the Imeretian Oak *(Quercus Imeretina)*, which is included in the red book of Georgia. The forest is weakened due to the excess of water, resulting from the "Rionhesi" regulating channel. This makes the forest extremely vulnerable. Cutting of the RoW through the forest and its fragmentation will cause loss of the trees not only within the RoW, but far beyond.

Fig, Saghoria forest

Section from Kutaisi Bypass to Samtredia

- rivers Rioni, Gubistskali, channels (surface water and aquatic ecosystems)
- river Rioni - lateral erosion near v.Akhalsopeli

Archeological monuments:

Village Tkachiri - A hill of ancient settlements of the VIII-VII cc B.C.
Village Banoja - A necropolis (pitchy tombs) of the IV-III cc B.C.
Village Banoja – Cultural layers of the VIII-IV cc B.C.
Village Jikaishi - A hill of ancient settlements of the VIII-VII cc B.C.

Fig. Typical landscape at the Kutaisi – Samtredia section

Fig. river Rioni - lateral erosion near v.Akhalsopeli

The only problematic area for the Southern 3 route is the site near v. Akhalsopeli, were the r. Rioni is intensively meandering and washing the right bank. The narrow strip of land (80 -100m width) between the bank and closest residential houses is partly occupied by the gas pipeline RoW. The gas pipeline has been partly washed out and exposed in 2008 (see fig. above). Currently the mentioned section of the gas pipeline has been plugged and gas is supplied using other pipeline. The river bank

protection measures are taken at present. However, it should be taken into account that the space for the highway construction is limited and maybe more expended river-bank protection installations are required to protect the proposed highway RoW against further lateral erosion. This is necessary not only for protecting the existing infrastructure but also for minimizing resettlement needs. The scale of resettlement required for construction of the highway will dramatically increase if the narrow corridor will be further reduced. The problem is manageable but needs due consideration.

4.3. SUMMARY OF BASELINE CONTAMINATION DATA (Soil and Water Pollution; Noise; Radiation)

The objective of the assessment of baseline contamination was rough evaluation of existing situation that may be used for project impact analysis, prognosis of traffic related contamination values for future and for monitoring purposes.

The sampling/analysis methodology, location of sampling points and the results of the measurements are provided in the annex 4. Here below we provide just brief summary of conclusions.

Background radiation level has been measured along the whole proposed alignment for the preferable route. The measurements have been carried out on 9th, 10th and 11th of March of 2009 using the standard certified Russian device – "СРП 6801". The measurement was conducted continuously while driving the car along the proposed alignment and in 102 stopover sites out of car. The radiation backround level varied from 5 to 13 micro-roentgen/hours for different sites; For 98% of sites the radiation backround level was between 8 – 10 micro-roentgen/hours.

The surface water samples have been taken from 6 rivers to be crossed by the proposed highway alignment: the river Kvirila; the river Cholaburi/Dzevri; the river Tchishura; the river Rioni near Kutaisi; the river Tskaltsitela and the river Gubistskali. The samples were taken near the crossing sites. The integral pollution parameters reflecting traffic related contamination have been analyzed: (total petroleum hydrocarbons (TPH), Lead (Pb total); Zinc (Zn2+); Chrome (Cr6+) and Cadmium (Cd, total). The results demonstrate that the concentration of heavy metals, including lead, is within the frames of maximum admissible concentrations (MAC) established for the surface water standards. At the same time petroleum related contamination of the rivers is significantly exceeding MAC for 5 rivers (3-6 MAC) and is close to 1 MAC for the r.Rioni. The source of contamination mainly is related to traffic, car washing practices, absence of water treatment facilities at different workshops and small size enterprises.

The soil samples have been taken in 6 points from the sites adjacent to the existing highway and at the proposed alignments where no road exists at the moment. The integral pollution parameters reflecting traffic related contamination have been analysed: (total petroleum hydrocarbons (TPH), Lead (Pb total); Zinc (Zn2+); Chrome (Cr6+) and Cadmium (Cd, total). The results demonstrate that the concentration of petroleum hydrocarbons and heavy metals, including lead, is within the frames of maximum admissible concentrations (MAC) established for the surface water standards. However, it should be noted that the concentrations of Lead and Zinc

are quite high – varying from 0,3 to 0,5 MAC for Zinc and from 0,5 to 0,9 MAC for Lead. This data should be interpreted as existence of the background contamination, presumably related to traffic emissions and use of noncompliant (lead containing) fuel during years.

Ambient air sampling and noise measurements have been conducted at 4 sites in the vicinity of settlements crossed by the highway. Besides, traffic related emission modeling has been conducted using licensed Russian software "Ecolog Magistral-City". The analysis of samples and emission characteristics calculated for the current traffic capacity demonstrated that the traffic related contamination is not high in the vicinity of the settlements and the concentrations of harmful substances are significantly less than MAC within the 25 and 50 m from both sides of the existing road. More detailed information regarding emission characteristics and analysis of emission related impacts is provided in p. 5.2.

Background noise level have been measured in the same stop-over sites, where the air samples have been taken. The measurements have been carried out 3 times per day (morning, noon and evening) during 0,5 hour. The average of 30 measurements (1 per minute) has been taken as measured average value. Besides the noise level has been measured in many other stop-over sites along the highway route. These were 10 minute measurements once per day and this data was used to get general idea and comprise more sites. The measurements have been carried out from March 7 to March 12 of 2009 using the standard certified Russian device - "Шум 1М30".The background average noise level at a distance of 5 m from the road varied from 60 dBA to 80 dBA. That means that traffic related noise at a distance of 150-200 m from the road is within the admissible limits defined by standards. More detailed information regarding background noise and analysis of noise related impacts is provided in p. 5.3.

5. ENVIRONMENTAL IMPACTS

Paragraph 5.1 provides brief description of anticipated site-specific impacts related to the design, construction and operation phases of the E-60 Highway Upgrading and Reconstruction (Zestafoni - Samtredia section) Project. In paragraphs 5.2 and 5.3 (as well as in annexes 5 and 6) we will address emission and noise related impacts, which are most typical for the highway construction and rehabilitation, as well as at the operation stage. The paragraph 5.4 gives more expended description of impacts anticipated for the construction phase and related to different working sites: RoW, borrow pits and camp disposal site.

5.1 SUMMARY OF ACTIVITIES AND ANTICIPATED IMPACTS

5.1.1 Environmental Impacts – Design and Pre-construction Phase

№	I. Design Related Impacts	Yes/No	Comments
1	Alignment alternatives and potential impacts: • geohazards prone sites; • sensitive ecosystems • archaeology • landuse	No	The preferred routes are selected based on analysis of alternatives (see p.7 of EIA). No alternative alignments considered for the Zestafoni – Samtredia section are related to any landsliding, land subsidence or other geohazard risks. Environmental sensitivities to be considered: • Adjameti reserve (for Zestafoni – Samtredia Motorway) • Saghoria forest (Kutaisi bypass) • R.Rioni – lateral erosion of the right bank near v. Akhalsopeli • Landuse and resettlement issues are most important for optimal planning of route
2	Siting alternatives for borrow pits, waste disposal sites, asphalt mixing sites, workers camps, fueling and storage places and equipment yards	Yes	Dust/air Pollution, water pollution, landscape degradation impacts will depend on proper siting at the detailed engineering stage
3	Soil Erosion – Design of temporary and permanent drainage systems, retaining walls, berms and embankments, design of anti-erosion engineering measures and reinstatement plan	Yes	Proper design is important for minimizing erosion and secondary impacts: landscape degradation and increased sedimentation of watercourses, slow destruction of the highway pavement
4	Planning and design of interchanges and interception sites	Yes	Interference on local transportation and access; Safety of traffic;
5	Compliance with international design standards	Yes	Safety; efficiency of operations and maintenance
6	Noise and traffic emission nuisance	Yes	Noise and emissions related to traffic are tangible only in densely populated areas where the residential houses are located close to the road. Planning of bypasses around Kutaisi and Zestafoni is basic design solution. Bypassing Samtredia seems to be more problematic issue.
7	Bridges, viaducts, interchanges and flood protection installations	Yes	Proper design defines level of safety and risks of road destruction during flooding, earthquakes etc. No natural hazard impacts are expected for the Zestafoni - Samtredia section but design of the drainage systems and interchanges is important from safety and maintenance standpoint

8	Damage of infrastructure elements.	Yes	The highway is crossing several important infrastructure systems: 1. Railways and Roads Potential Impacts: Damage of railways Safety of motor road traffic and railway transportation 2. Power transmission lines, gas pipelines (particularly, near v. Akhalsopeli) Potential Impacts: Damage of other infrastructure systems 3. Irrigation channels Potential Impacts: • damage during construction of the road • contamination by traffic dust and emissions during exploitation

5.1.2. Environmental Impacts - Construction Phase

№	II. Construction Phase. Potential Impacts During Rehabilitation Works	Yes/No Severity	Sites
1	Destruction of natural landscape (relief, soil cover, vegetation, eco-systems, habitats and wildlife) in the right-of-way occupied by the highway.	Yes Minor	Whole alignment
2	Destruction of natural landscape (relief, soil cover, vegetation, eco-systems, habitats and wildlife) on the access roads, in the borrow pit sites, waste dumps, construction camps and equipment yards.	Yes Medium	borrow pit sites, waste dumps, construction camps and equipment yards to be defined at detailed engineering stage
3	Landslides, slumps, slips and other mass movements in road cuts triggered by the construction activities.	No	No
4	Erosion stimulated from fresh road cuts and fills and temporary sedimentation of natural drainage ways. Erosion of lands below the road bed receiving concentrated outflow from covered or open drains.	Yes Medium	Mainly - Zestafoni bypass section.
5	Increased suspended sediment in streams affected by erosion at construction sites and fresh road cuts, fills and waste dumps. Declined water quality and increased sedimentation	Yes Minor	Mainly - Zestafoni bypass section. r. Kvirila
6	Impact of construction activities on aquatic ecosystems of the rivers and streams crossed by the highway	No	About 45 river and channel crossings; 2 major and several smaller rivers (see annex 3 p. 3.3
7	Soil and water contamination during construction by oil, grease, fuel and paint in the RoW, access roads, construction camps and equipment yards and asphalt mixing sites.	Yes Minor	To be determined at Detailed design stage
8	Poor sanitation and solid waste disposal in construction camps and work sites (sewerage, sanitation, waste management)	Yes Medium	To be determined at Detailed design stage
9	Construction wastes alongside the RoW and roadside litter.	Yes Medium	Whole alignment
10	Air pollution from vehicle operations during construction in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas. Local dust.	Yes minor/ Medium	Crossed settlements
11	Air pollution from asphalt plants.	Yes Medium	Supplier site
12	Noise pollution from vehicle operation during construction in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas. Local noise.	Yes minor	Crossed settlements

13	Poaching by construction workers	No or very minor	r.Rioni
14	Creation of temporary breeding habitats for mosquito vectors of disease e.g. sunny, stagnant pools of water. Creation of stagnant water bodies in borrow pits, quarries, etc. suited to mosquito breeding and other disease vectors. Recontamination by infectious biological materials (e.g. Anthrax) during earth works near the pest holes (i.e. not registered Anthrax sites)	Yes Minor	Whole alignment
15	Health hazards by noise, air emissions and dust raised and blown by vehicles during construction activities.	Yes Medium minor	Crossed settlements
16	Impacts on Archaeological Sites	Yes	Whole alignment; High probability near known sites listed in annex 3
17	Hazardous driving conditions where construction interferes with pre-existing roads.	Yes Minor	Whole alignment; Crossed settlements
18	Impact on existing infrastructure The highway is crossing or bypassing in close vicinity to several important infrastructure systems: 1. Railways Potential Impacts: Damage of railways; Safety of motor road traffic and railway transportation 2. Power transmission lines; 3. gas pipelines (particularly,) 4. Oil pipeline Potential Impacts: Damage of other infrastructure systems 5. Irrigation channels Potential Impacts: • damage during construction of the road contamination by traffic dust and emissions during exploitation	medium or high	 v.Shorapani City of Kutaisi near v. Akhalsopeli 21 channels including Channel of Rioni hydropower station
19	Accident risks associated with vehicular traffic and transport, that may result in spills of toxic materials, detonation of explosive load, injuries or loss of life	Yes Minor	Whole alignment; sensitive sites: crossed settlements

Character of Main of the Anticipated Impacts - Construction Stage

Activity	Impact	Character of impact							
		Direct	Indirect	Positive	Negative	Reversible	Irreversible	Temporary	Residual
Land clearance and grading in the RoW	Destruction of natural landscape, habitats, erosion	+			+		+		+
	Emissions	+			+	+		+	
	Noise, vibration	+			+	+		+	
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	
Construction of the new carriageway; pavement	Destruction of natural landscape, habitats, erosion								
	Emissions	+			+	+		+	
	Noise, vibration	+			+	+		+	
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	
Exploration of borrow pits	Destruction of natural landscape, habitats, erosion	+			+		+		+
	Emissions	+			+	+		+	
	Noise, vibration	+			+	+		+	
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution	+			+	+		+	
Transportation of sand, gravel, stones from borrow pits. Material supply.	Destruction of natural landscape, habitats, erosion								
	Emissions	+			+	+		+	
	Noise, vibration	+			+	+		+	
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	

Demolition of part of existing pavement during rehabilitation of the existing carriageway	Destruction of natural landscape, habitats, erosion								
	Emissions	+			+	+		+	
	Noise, vibration	+			+	+		+	
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	
Disposal of spoil and wastes	Destruction of natural landscape, habitats, erosion	+			+	+		+	
	Emissions	+			+	+		+	
	Noise, vibration	+			+	+		+	
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	

5.1.3 Environmental Impacts - Operation Phase

№	**III. Operations Phase** **Potential Long-term impacts of Highway Rehabilitation Project (Impact of Physical Installations; Traffic and Emergencies)**	**Yes/No** **Severity**	**Sites**
20	Long-term degradation of natural landscape (relief, soil cover, vegetation, habitats) in the certain part of the right-of-way (land strips adjacent to the highway – affected by construction activities).	Yes Minor	Whole alignment
21	Long-term degradation of natural landscape (relief, soil cover, vegetation, habitats and wildlife) on the access roads, in the borrow pit sites, waste dumps, construction camps and equipment yards.	Yes Minor	To be determined at design stage
22	Landslides, slumps, slips and other mass movements in road cuts and adjacent territories stimulated or triggered by the project (woodcutting and clearance of slope vegetation, change of drainage patterns, change of relief and soil compactness etc.).	No	No
23	Erosion from road cuts and fills and temporary sedimentation of natural drainage ways. Erosion of lands below the road bed receiving concentrated outflow from covered or open drains.	Yes Medium	Mainly Zestafoni bypass section
24	Landscape disfiguration by embankments and deep cuts, fills and quarries. Marred landscape (scars from rod cuts, induced landslides and slumps etc.).	Yes Medium	RoW whole alignment; Quarry sites
25	Changes of hydrological patterns of the rivers and streams crossed by the highways induced by installation of bridges, revetments, river-bank protection installations and other hydro technical installations and related impacts on infrastructure, arable lands and ecosystems located on adjacent territories	No	No
26	Alteration of overland drainage and subsoil drainage patterns (where road cuts water tables, springs, etc.)	No	No

27	Increased suspended sediment in streams affected by erosion at construction sites and fresh road cuts, fills and waste dumps. declined water quality and increased sedimentation	Yes Minor	Zestafoni bypass section r.Kvirila
28	Soil and water contamination by oil, grease, fuel and paint alongside the highway	Yes Minor	Whole alignment
29	Contamination of ground and surface waters by herbicides for vegetation control or chemicals (e.g. calcium chloride) for dust control	No	No
30	Air pollution from asphalt plants during maintenance works.	Yes Minor	Whole alignment
31	Air pollution from vehicle operation, in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas. Local dust.	Yes Minor	Crossed settlements
32	Noise pollution from vehicle operation, in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas.	Yes Minor	Crossed settlements
33	Roadside litter.	Yes Medium	Whole alignment
34	Creation of a new pathway for disease vectors affecting humans and animals.	Yes Medium	Whole alignment
35	Creation of a transmission corridor for diseases, pests, weeds and other undesirable organisms	Yes Medium	Whole alignment
36	Health hazards by dust raised and blown by vehicles.	Yes Minor	Crossed settlements
37	• Dislocation and compulsory resettlement of people living on the right of way • Near cities and in rich farming regions, many people can be affected	See in p. 6.2	Crossed settlements; Particular importance near v. Akhalsopeli; See in p. 6.2
38	Obstruction of routes from homes to farms, etc, increasing travel time.	Yes Minor	Crossed settlements See in 6.3
39	Impairment of non-motored transportation in the highway corridor due to reduced or impeded rights-of-way.	No	No
40	Induced development: roadside commercial, industrial, residential, and “urban sprawl”.	Yes Minor	Yes Minor See in p.6.3
41	Planned development and illegal invasion of homelands of indigenous peoples by squatters and poachers causing serious social and economic disruption	No	No
№	**Potential Operation Phase Emergency Related Impacts**	**Yes/No** **Severity**	
42	Accident risks associated with vehicular traffic and transport, that may result in spills of toxic materials injuries or loss of life(see 'Hazardous Materials Management' section), injuries or loss of life (see 'Public Health and Safety section)	Yes Medium	Crossed settlements Whole RoW

Character of Main of the Anticipated Impacts - Operation Stage

Activity/Factor	Impact	Character of impact							
		Direct	Indirect	Positive	Negative	Reversible	Irreversible	Temporary	Residual or long-term
Physical existence of linear installation	Destruction of natural landscape, habitats, erosion	+					+		+
	Emissions								
	Noise, vibration								
	Ground pollution and/or waste generation								
	Ground and surface water pollution								
Traffic	Destruction of natural landscape, habitats, erosion								
	Emissions	+			+				+
	Noise, vibration	+			+				+
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	
Maintenance works	Destruction of natural landscape, habitats, erosion	+		+					
	Emissions	+			+				+
	Noise, vibration	+			+				+
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	
Accidents	Destruction of natural landscape, habitats, erosion		+		+	+		+	
	Emissions		+		+	+		+	
	Noise, vibration								
	Ground pollution and/or waste generation		+		+	+		+	
	Ground and surface water pollution		+		+	+		+	

5.2. IMPACTS RELATED TO AIR EMISSIONS

Air emission related impacts and mitigations are usually considered as most typical and significant issues for the road rehabilitation projects. This issue is in more details discussed in annex 5. Here we provide brief summary of the analysis of traffic emissions related to current and forecasted traffic volumes.

Operation Phase

Emission impacts related to current conditions of traffic.

Based on the provided information about the current traffic intensity, calculation of traffic related emissions have been conducted for each section of the highway (1. Zestafoni bypass; 2. Zestafoni – Kutaisi section; 3. Kutaisi bypass; 4. Kutaisi – Samtredia), using licensed Russian software "Ecolog Magistral – City".

For each section calculations have been carried out for 500m long section (traffic intensity is almost the same for different subsections of the same length) and the data sheets are provided in annex 5.

Using the proposed method the air quality modeling for unfavorable meteorological conditions has been performed considering the area of rectangle (700m x 100m) with centerline coinciding with the highway centerline. Spacing was taken as 50m. In addition, maximal concentrations of harmful substances have been calculated in two points: at a distance of 25 m (point 1) and 50m (point 2) athwart to the centerline.

Graphical diagrams reflecting the modeling details are presented in annex 5. According to the modeling data maximum concentrations of harmful substances in check points 1 and point 2 for different sections is, as demonstrated in the table below:

Harmfu Substance	Highway Section							
	I		II		III		IV	
№ of check point	1	2	1	2	1	2	1	2
NO_2	0,23	0,14	0,33	0,21	0,24	0,15	0,29	0,18
NO	0,0077	0,0048	0,01	0,007	0,0081	0,0051	0,0098	0,0062
Soot (PM)	0,0016	0,001	0,0024	0,0015	0,0018	0,0011	0,002	0,0013
SO_2	0,0027	0,0017	0,0037	0,0024	0,0031	0,0019	0,0034	0,0021
CO	0,04	0,02	0,05	0,03	0,04	0,02	0,05	0,03
Benz(a)pyrene	0,0017	0,0011	0,0034	0,0021	0,0017	0,0011	0,0017	0,0011
Formaldehyde	0,0039	0,0024	0,0063	0,0040	0,0049	0,0031	0,0053	0,0034
Fractions of benzine	0,0042	0,0026	0,0056	0,0035	0,0042	0,0026	0,005	0,0031
Fractions of kerosene	0,002	0,0012	0,0034	0,0021	0,0027	0,0017	0,0027	0,0017
Impact summation groups (NO_2 and SO_2)	0,23	0,14	0,33	0,21	0,25	0,16	0,29	0,18

As it is demonstrated by calculations, maximum concentrations of harmful substances for current trafic conditions, do not exceed Maximum Admissible Concentrations (MAC) and traffic related contamination at the territories adjacent to the highway is not expected to be significant in nearest future.

The ambient air quality for the traffic volumes forecasted for year 2030 could be estimated via linear extrapollation of the current parameters applying conseravtive (worst case scenario) approach. This conservative estimation is based on the assumption that the emission indices will not change for 2030. Based on the mentioned approach and forecasted traffic data following conversion factors could be applied for the linear extrapollation for each subsection of the highway:

1. Zaetafoni Bypass
Forecasted traffic
Year 2007 - 5026 vehicles/per day
Year 2030 - 19568 vehicles/per day
conversion factor - 3,89

2. Zaetafoni – Kutaisi Section
Forecasted traffic
Year 2007 - 7039 vehicles/per day
Year 2030 - 27406 vehicles/per day
conversion factor - 3,89

3. Kutaisi Bypass
Forecasted traffic
Year 2007 - 5067 vehicles/per day
Year 2030 - 18505 vehicles/per day
conversion factor - 3,65

4. Kutaisi – Samtredia Section
Forecasted traffic
Year 2007 - 6262 vehicles/per day
Year 2030 - 22866 vehicles/per day
conversion factor - 3,65

According to the proposed conversion factors the maximum concentrations of harmful substances in check points 1 and point 2 for different sections is calculated, as demonstrated in the table below:

Harmfu Substance	Highway Section							
	I		II		III		IV	
№ of check point	1	2	1	2	1	2	1	2
NO_2	0,89	0,54	1,28	0,81	0,87	0,54	1,05	0,65
NO	0,03	0,02	0,04	0,03	0,029	0,018	0,035	0,022
Soot (PM)	0,006	0,004	0,009	0,005	0,006	0,004	0,0073	0,0047
SO_2	0,01	0,006	0,014	0,009	0,017	0,007	0,012	0,008
CO	0,155	0,077	0,19	0,11	0,146	0,073	0,18	0,11
Benz(a)pyrene	0,0066	0,004	0,013	0,008	0,006	0,004	0,006	0,004
Formaldehyde	0,015	0,009	0,024	0,015	0,017	0,011	0,019	0,012
Fractions of benzine	0,016	0,010	0,021	0,013	0,015	0,009	0,018	0,011
Fractions of kerosene	0,007	0,004	0,013	0,008	0,009	0,006	0,009	0,006
Impact summation groups (NO_2 and SO_2)	0,89	0,54	1,28	0,81	0,91	0,58	1,05	0,65

Analysis of the data provided in the above table demonstrates that the maximum exceeding of MAC is not higher than 28%. However, it should be taken into account that for the year 2030 the current emission indices will be significantly reduced and besides, the MAC standard used in Georgia at present ($0,085mg/m^3$) will be changed during coming 1-2 years to bring them in compliance with the EU standards ($0,2mg/m^3$). The decision to bring the national emission and ambient air quality standards in compliance with the EU standards and requirements of the EC Directive No 96/62/ of 27.09.1996 is already fixed in the law of Georgia on "Protection of the Ambient Air".

According to the mentioned circumstances, the ambient air quality at the territories adjacent to the reconstructed highway is considered to be within the frames of admissible norms for the situation of 2030.

Mitigation of the impacts related to the increased traffic emissions during following years could be subdivided on local /project-specific measures and general regulatory/policy measures .

Local measures: proper planning of greenery planting to screen emission impacts on the settlements.

General measures: state control over the fuel quality and engine maintenance and technical compliance.

Construction Phase

Impacts of construction related emissions and dust and relevant mitigation measures are discussed in p. 5.4.

5.3. IMPACTS RELATED TO NOISE

Noise is usually considered as most typical and significant impact characteristic for the road rehabilitation projects. This issue is in more details discussed in annex 6. Here we provide brief summary of the analysis.

Construction Phase

As a result of rough estimation of construction related noise, we can assume that the noise impact will not exceed radius of 320m. This means that the rural settlements will not be affected. Neither ecologically sensitive areas will be disturbed by the noise nuisance. Temporary and slight increase of the noise level near the construction ground within the 300m radius is acceptable impact. However, mitigation of this impact is possible by engine maintenance practice and avoidance of engine work in non-operational mode. The only limitation that could be recommended is to minimize the night-time works at the section near the City Kutaisi and other settlements. The night-works at other sites that are located far from settlements could be carried out without limitation.

Operation Phase

Traffic related noise will not affect area out of 160m from the highway. The impact is not expected to be high even in 2030, when the traffic intensity is expected to increase significantly as compared with the current situation. Actually, the implementation of the project will lead to decrease of the noise related impact on the settlements, so far as the most densely populated areas, like Zestafoni and Kutaisi cities will be bypassed.

The only two sections, where the noise impact may need to be mitigated by special means are: a) the Zestafoni bypass (700m lenth subsection adjacent to the densely populated area of the North-East part of Zestafoni city and 300m length section in the village Kvemo Sakara) and b) the end point fo the studied route near the village Akhalsopeli (two 400m length subsections)

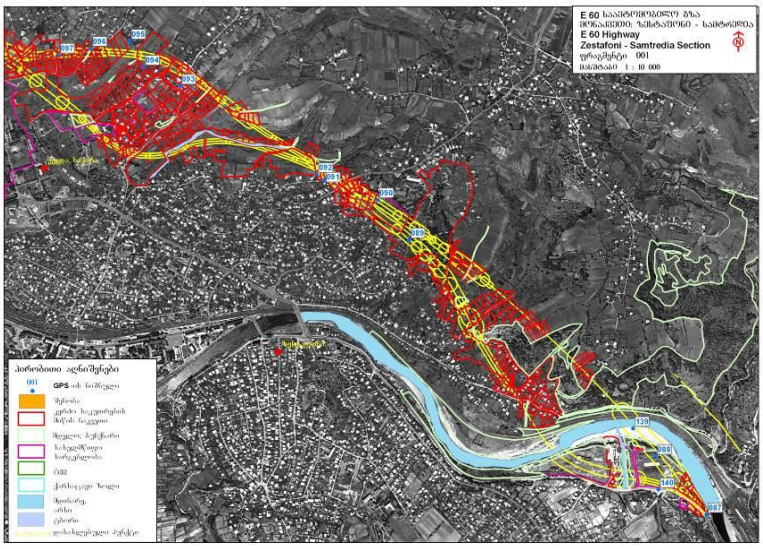


Fig. Densely populated area North-Est to Zestafoni city

The impact of the increased traffic will be to certain extent compensated by improvement of road characteristics (geometrical and pavement) and better driving conditions. The additional mitigation measure should be: a) limitation of traffic velocity; b) implementation of engine maintenance control mechanisms;

5.4. OTHER TYPES OF CONSTRUCTION RELATED IMPACTS

5.4.1. Construction Related Impacts Within the RoW

Pollution and Waste

Improper handling, storage, use and disposal of construction materials and wastes could pose a risk of water/ soil contamination at the construction site and storage site. Improper maintenance and fuelling of equipment could also lead to the potential contamination of soil/ water.

Soil Pollution

Potential pollutants from a project of this nature include the following (this list is not exhaustive):
• Diesel fuel, lubrication oils and hydraulic fluids, antifreeze, etc. from construction vehicles
and machinery
• Miscellaneous pollutants (e.g. asphalt, cement and concrete)
• Construction wastes (packaging, stones and gravel, cement and concrete residue, wood, etc.)
• Extremely small amount of hazardous wastes (e.g. waste oils, oily rags, spent filters, contaminated soil, etc) constituting about 0.1% of total amount of the wastes.

Water Pollution

Water pollution may result from a variety of sources, including the following:

- Spillages of fuel, oil or other hazardous substance, especially during refueling
- Silt suspended in runoff waters (“construction water”)
- Washing of vehicles or equipment or disturbance of watercourse banks and bed during watercourse crossings by heavy machinery
- Exposure of contaminated land and groundwater

Spillages etc may travel quickly downhill to a watercourse or water body. Once in a watercourse, it can be difficult to contain the pollution which can then impact over a wide area downstream. It is therefore vital that prompt action is taken in the event of any potential water pollution incident.

Once the working width has been stripped of topsoil, the subsoil becomes exposed. During earthworks in a wet weather this may result in uncontrolled release of suspended solids from the work area.

Construction Related Wastes:

Inert Construction Wastes
The following types of inert waste are anticipated to be produced from these activities:

- According to the earth-work calculations almost all the generated spoil will be used as filling material for embankments etc. However, certain amount of materials not applicable as filling material could be produced.
- Contaminated soil; (low probability and amounts)

Non Hazardous Construction Wastes
In summary the main non-hazardous construction wastes will include the following:

- Timber (small amount of removed trees and bushes).
- Metals (including scrap metal and wire) – negligible amount of metal waste is expected.

Hazardous Construction Wastes
Small quantities of the hazardous wastes will arise mainly from the vehicle maintenance activities. A number of hazardous wastes, which could be generated, include:

- liquid fuels;
- lubricants, hydraulic oils;
- chemicals, such as anti-freeze;
- contaminated soil;
- spillage control materials used to absorb oil and chemical spillages;
- machine/engine filter cartridges;
- oily rags, spent filters, contaminated soil, etc)

The hazardous waste is expected to constitute in average about 0.1% of total amount of the wastes. According to local legislation (Order #36/N of the Minister of Labour, Health and Social Protection of 24.02.2003) small amounts of certain types of hazardous wastes could be disposed on municipal landfills. Disposal of the most part of hazardous wastes should be agreed with the MoE and local authorities.

Recontamination by infectious biological materials (e.g. Anthrax) is a potential threat during earth works near the pest holes (i.e. not registered Anthrax sites). The risks are related to the fact that a large amount of the spontaneous burial sites is not registered by the relevant authorities.

Topsoil losses due to topsoil stripping

- Topsoil washout due to improper storage and reinstatement
- Silt runoff to watercourses and water bodies
- Exposure of contaminated land

Flora. Potential impact is minimal, although the project design envisages land clearance activities. The most sensitive ecological receptors (Adjameti reserve; Saghoria forest;) have been avoided during route selection process. The landscape at the preferable route is mostly strongly transformed and has no ecological value.

However construction of the Zestafoni bypass may have impact on small patch of forest near the old hospital building. This area should be avoided or the impact should be minimized through thorough routing process at the detailed design stage. Widening of the road at the Zestafoni – Kutaisi section will result in inevitable cutting of a narrow strip of Chognari forest bordering the existing road. Upgrading of the road will require clearance of about 4 ha of the forest. The forest is not of high conservative value, however appropriate offset measures will be required.

Fauna. Potential impact on ichtyofauna is related to the possible pollution of the rivers by increased sediment runoff during earthworks and contamination due to improper fuel and waste management. First of all rivers Kvirila and Rioni should be considered. Construction related noise and emissions are not too much disturbing for waterfowls. Poaching practiced by the workers could be a minor (unlikely) issue for the waterfowls. The mentioned impacts are of low probability, temporary, insignificant and manageable. With regard to the biological environment it is important to note, that the upgrading of the existing road (zestafoni-Kutaisi section) , as it is designed, will not cause the loss of valuable habitat or ecosystems, or new fragmentation of currently undisturbed natural habitats. Construction of new bypasses also will not have any tangible impact, so far as the alignment crosses strongly transformed rural and urban landscapes.

Landscape. The project design does not envisage any substantial changes of valuable landscape. The only irreversible impact is limited to additional land clearance needed for additional lane of the highway at the Chognari forest section and near the small forest located in the vicinity of old Zestafoni Hospital.

Water use. Water will be required for maintenance works and for dust protection measures (water bowsers). The amount of required water is not high and the sources exist in the vicinity of the project sites (rivers). However, the water intake and discharge limits should be calculated and relevant regulations should be met.

Impacts on Archaeological Sites. Land clearance works, grading and excavations are associated with the risks of damaging underground archaeological remnants. Most expected archaeological sites are listed in the annex 3. However, not listed sites could be as sensitive as already known archaeological sites, so far as according to historical overview provided in the annex 3 (p. 3.7) the whole area of project development is of historical and archaeological interest. The known sites have been identified just during major construction works, particularly during construction of the existing highway. The other sites have not been studied systematically. During construction of the highway in Soviet times some archaeological artifacts have been destroyed. Therefore, special care should be taken not only at the new construction sites, but also at the sites where the existing 2-lane motor road will be upgraded to 4 lane highway.

Transport related impacts

Roughly about 250000 runs of heavy trucks are required to deliver required amount of inert materials to the needed sites within the construction corridor. Different types of impacts are anticipated in that regard:

- Noise & Vibration Impacts
- Traffic congestion (nuisance)
- Air pollution (dust; emissions)

- Mud on roads
- Refueling, maintenance and vehicle cleaning and related risks of soil and water contamination

Traffic Disruption. Roughly about 250000 runs of heavy trucks are required to deliver required amount of inert materials amount of materials to the needed sites within the construction corridor. The construction sites impose certain safety risks for the population and, therefore, compliance with safety rules is important. Local traffic can be impacted by transport activities related to the project. The mentioned impact is temporary, insignificant and manageable. Long-term impact on local traffic should be beneficial.

Infrastructure. The main identified infrastructure elements that could be affected during construction activities are listed below:

Railways
Railway (one difficult crossing of railway is located at the starting point, immediately after crossing the r. Kvirila near the v. Shorapani

Fig. Railway crossing – proposed bridge on the r. Kvirila near the v. Shorapani

The second complex crossing of railway is located at the site of the r. Rioni crossing (railway follows left bank of r. Rioni) in Kutaisi (Kutaisi bypass section).

The third complex railway crossing is located after the crossing r.Rioni at the Kutaisi West – Samtredia section of the proposed highway. Exact site for crossing as well as engineering details will be provided at the detailed design stage.

Channels

The highway crosses in total about 21 irrigation channels. Despite the fact that the most part of channels is concrete paved and no pollution of water is possible due to run off or infiltration from the contaminated soil, some undesirable contamination of water by traffic dust and emissions precipitates is expected. This is not major issue but should be considered while planning mitigation measures.

Fig. Channel on the Southern 3 subsection of the highway

Pipelines.

Gas pipeline RoW is in the close vicinity of the highway route endpoint near the village Akhalsopeli. The pipeline could be damaged during earth-works

Fig. Pipeline near village Akhalsopeli

Safety and Access.
There will be reduced access to areas adjacent to construction and potential hazards to vehicles and pedestrians during construction downtime.

5.4.2 Construction Related Impacts at the Quarrying Sites

The borrow pits location will be proposed by the engineering team at the detailed design stage The exploration of the borrow pits should be conducted by the licensed companies or the Constructing Contractor has to obtain its own license. However, potential impact of the increased quarrying activities on river bed and floodplain landscape, ichthyofauna and groundwater should be considered.

4200.000 m^3 of the inert material is required for the project needs. About 1600000 m^3 could be covered by cut in materials. The rest 2600000 m^3 of the inert material should be delivered from quarries.

Roughly about 250000 runs of heavy trucks are required to deliver this amount of materials to the needed sites within the construction corridor. The dust and emission impacts should be considered during planning mitigation measures, as well as potential river contamination due to improper fueling and vehicle operations (see 5.3.1) These additional potential impacts should be subject for the management plan.

5.4.3 Construction Related Impacts at the Camp Site

Site for the construction camp will be identified at the detailed design stage. The potential impacts related to the construction and operation of the camp could be summarized as follows:

- Potential damage of topsoil
- Contamination related to fuel storage and fuelling operations
- Sewerage related contamination
- Waste management

5.4.4 Construction Related Impacts at the Asphalt Plant Sites

The asphalt will be provided to constructing contractor by the suppliers and, therefore, the asphalt plant related impacts are not direct impact of the project. However, the impacts of the asphalt plants (particularly emissions, waste disposal and pollution) should be considered as indirect impact of the project due to the increased production of asphalt by the existing plants.

Direct impacts of the asphalt plants (landscape degradation; emissions and dust; noise etc.) should be considered in case if the constructing company will decide to use its own mobile asphalt plants. In that case relevant EIA should be prepared and environmental Impact Permit should be obtained for installation and operation of the plant.

6. ASSESSMENT OF SOCIAL IMPACT

6.1. ISSUES RELATED TO LAND PURCHASE AND RESETTLEMENT

The potential land acquisition impact and scale and costs of resettlement activities have been estimated roughly, based on alternative alignments provided by the technical team, cadastral maps of 2002 and site visits. The resettlement screening conclusion is that implementation of the project will require acquisition of more than 600 private land plots, involve physical relocation and, therefore, development of the Resettlement Action Plan is necessary. No construction activities should be commenced at the site until full compensation is provide to the affected persons to their satisfaction and in accordance with the Georgian legislation and IFI's regulations.

The buffer (corridor) of impact as provided by engineering team is 40m width construction corridor (20m from each side of the centerline) with certain widening in the areas of embankments and deep cuts.

In the list below, we provide data for different proposed alternatives. The rough estimation of the resettlement compensation costs is based on assumption, that most part of the crossed private land in rural zones is agricultural.

Indicative market prices, provided in Kutaisi and Zestafoni municipalities, could be applied for the rough estimations of land acquisition costs and compensation for the demolished buildings:

Villages Partskhanakanevi and Kvitiri
Cost of private lands near the highway (alongside) - 5 - 7USD/sq.m
In the depth of the village - 1 -1,5 Gel/sq.m
Cost of 2 floor houses - 15000 - 17000USD

Villages Zemo and Kvemo Meskheti -
Cost of private land - 1 Gel/sq.m
2 floor houses 20000 USD

Village Nakhshirgele
Cost of private land - 055 - 0,66 Gel/sq.m
2 floor houses - 12000 - 15000 USD

Assumptions for rough estimation: cost of private land - 1 USD /sq.m

Cost of private house – 20000 USD

Buildings owned by state will not require compensation.

		Location (km Post)		Length (meters)		Amount Affected private land plots	Total Area m^2 Affected private land plots	Area cutted by Buffer m^2 Affected private land plots	Amount of Buildings on Affected private land plots	Cost of Land cutted by Buffer Affected private land plots USD	Cost of Buildings USD	Total Resettlm. Costs USD
		Start	End	New Alignment	Existing Road							
Zestafoni Bypass Option	Tunnel Route	190+600	200+100	9,070	9,500	165	411 304	120 936	27	120 936	540000	660936
	No Tunnel Route	190+770	200+100	8,940	9,330	91	499 992	121 678	27	121 678	540000	661678
Zestafoni – Kutaisi Section	Zestafoni - Nakhshireghele	200+100	217+100	17,040	17,040	227	708 957	111 527	13	111 527	260000	371527
	Nakhshireghele - Kutaisi	217+100	222+500	5,230	5,400	12	56 469	22 667	1	22 667	20000	42667
Kutaisi Bypass East Option	2 Lane North	227+400	N.L.	2,420	2,430*							
	4 Lane North	222+500	N.L.	7,190	7,320*	0	0	0	0	0	0	0
	4 Lane South	222+500	N.L.	7,280	7,320*	0	0	0	0	0	0	0
Kutaisi West to Samtredia Rd	North Original	N.L.	244+00	8,450	10,640†	144	692 738	183 289	3	183 289	60000	243289
	North Extension	244+00	248+900	5,450	4,940	71	286 720	77 331	3	77 331	60000	137331
	South 1	N.L.	253+400	17,910	20,740†	109	1 141 052	192 505	10	192 505	200000	392505
	South 2	N.L.	253+400	19,490	20,740†	111	2 057 777	153 102	3	153 102	60000	213102
	South 3	N.L.	268+00	32,010	35,340†	189	2 267 332	174 505	4	174 505	80000	254505

6.2. SOCIO-ECONOMIC EFFECTS OF THE PROJECT

The baseline social conditions are described in the annex 7. The health and safety issues are covered in the environmental part of the impact analysis (p. 5.1 and 8.1.2).

At the Feasibility Study stage the social impacts other than resettlement have been estimated according to the following 3 elements.

i. Breakage of Community: new alignment may split some parts of community and inconvenience the residents not resettled for current free communication and movements within the community.
ii. Hindrance to local traffic: dedicated highway may hinder local traffics from crossing the new alignment.
iii. Gain and Loss to Local Economies: new alignment may induce more visitors or deter visitors to localities affected by the project, thereby increasing or reducing economic opportunities to local economies.
Below we provide our estimation using the same parameters.

No	Section	Breakage of Community (degree 0 – 3)	Hindrance to local Traffic (degree 0 – 3)	Gain and loss to Local Economies (degree -1 - +1)
1	Zestafoni Bypass	1	0	0
2	Zestafoni-Kutaisi	0	0	1
3	Kutaisi Bypass	1	0	1
4	Kutaisi- Samtredia Norhern Kutaisi - Samtredia Sothern 1 and 2	1 2	1	1
5	Kutaisi- Samtredia Southern 3	0	0	1
6	Zestafoni- Samtredia	0	0	-1

Breakage of community and hindrance of local traffic, as well as resettlement, could be a issue in case of realization of the Kutaisi-Samtredia Nothern route (v. Kvemo and Zemo Meskheti) or Southern 1 and 2 options (v. Partskhanakanevi). Kutaisi- Samtredia Southern 3 is not associated with the community breakage or traffic hindrance risks.

Zestafoni-Samtredia option may have some negative impact on the local economies. Mainly this could be associated with the losses of the business opportunities by the local owners of the commercial roadside businesses. The macro-scale impact on Kutaisi economics due to shifting the main transportation current for about 10km from the city is not considered as significant, so far as the connecting road infrastructure is quite developed and could be easily upgraded, so that Kutaisi will still remain well integrated with the main motor transportation network.

On the other hand implementation of the Kutaisi-Samtredia Northern and Southern 1 and 2 could result in limitations of urban planning and hindering further development of the Kutaisi city to the Southern direction (from the Nikea street to South). To certain extent this impact is relevant to the Kutaisi – Samtredia Southern 3 option, as well. Zestafoni-Samtredia option would not have this kind negative impact. Summarizing, we can conclude that the Southern 3 and Zestafoni-Samtredia options are more or less comparable in terms of social impacts. However, the Zestafoni-Samtredia option is associated with higher environmental risks, so far as it crosses very close to the Adjameti protected area.

In general, upgrading of the E-60 highway definitely will have beneficial impact on national and local economies:

- improved road infrastructure will support incomes related transit flows
- improved road infrastructure will facilitate tourism development in the region
- Access to the markets for local producers (agriculture etc.) will be easier and more reliable

7. ANALYSIS OF ALTERNATIVES

7.1. "NO PROJECT" ALTERNATIVE

Socio-economical benefits of the project have been identified during the Feasibility Studies performed by Louis Berger and Transprojekt Roads Survey and Design Institute in the years 2003-2004 and by Atkins Consultants Ltd in the year 2005. The abovementioned studies have confirmed that - "In general, the social-economic effect resulting from the proposed road modernization project can provide for overall increase in wealth and access to livelihoods for the national population. The main national benefit is: increased quality of the major transport artery which contributes in national economy, better infrastructure, increased government revenues from transit taxes which could contribute to improved social services. The use of local labor will provide inflow of cash into the local economies along the motorway route".

As we have mentioned earlier, according to preliminary environmental assessment performed by Consultant's environmental team, it is likely that the anticipated impacts even in the relatively sensitive zones could be managed by application of conventional slope stabilization technologies, TEM design and construction standards and good environmental practices. Therefore, no extraordinary costs are imposed by the necessity of mitigation measures.

Final conclusion is that the "No Project" alternative should be rejected and only alignment alternatives are subject for further analysis.

7.2. ALTERNATIVE ALIGNMENTS

Introduction

The alternative alignments for consideration have been proposed for following segments of the Zestafoni – Samtredia section of the highway:

		Location (km Post)		New Alignment		
		Start	End			
Zestafoni Bypass Option	Tunnel Route	190+600	200+100	9,070		
	No Tunnel Route	190+770	200+100	8,940		
Zestafoni – Kutaisi Section	Zestafoni - Nakhshireghele	200+100	217+100	17,040		
	Nakhshireghele - Kutaisi	217+100	222+500	5,230		
Kutaisi Bypass East Option	2 Lane North	227+400	X	2,420		
	4 Lane North	222+500	X	7,190		
	4 Lane South	222+500	X	7,280		
Kutaisi West to Samtredia Rd	North Original	X	244+00	8,450		
	North Extension	244+00	248+900	5,450		
	South 1	X	253+400	17,910		
	South 2	X	253+400	19,490		
	South 3	X	268+00	32,010		

The alternatives will be compared on a ground of qualitative multi-criteria analysis taking into account conclusion of the Feasibility Study and general technical requirements set forth in relevant international standards and requested by the Government of Georgia.

Criteria for comparing different alignments.

- The objectives of the project should be met
- Compliance with the TEM technical standards and Georgian and JBIC environmental guidelines is mandatory
- The environmental and social impacts should be mitigated and compensated to the acceptable level
- Very rough consideration of additional costs (in terms of – acceptable/unacceptable) imposed by necessity of mitigation

Notes on methodological approach:

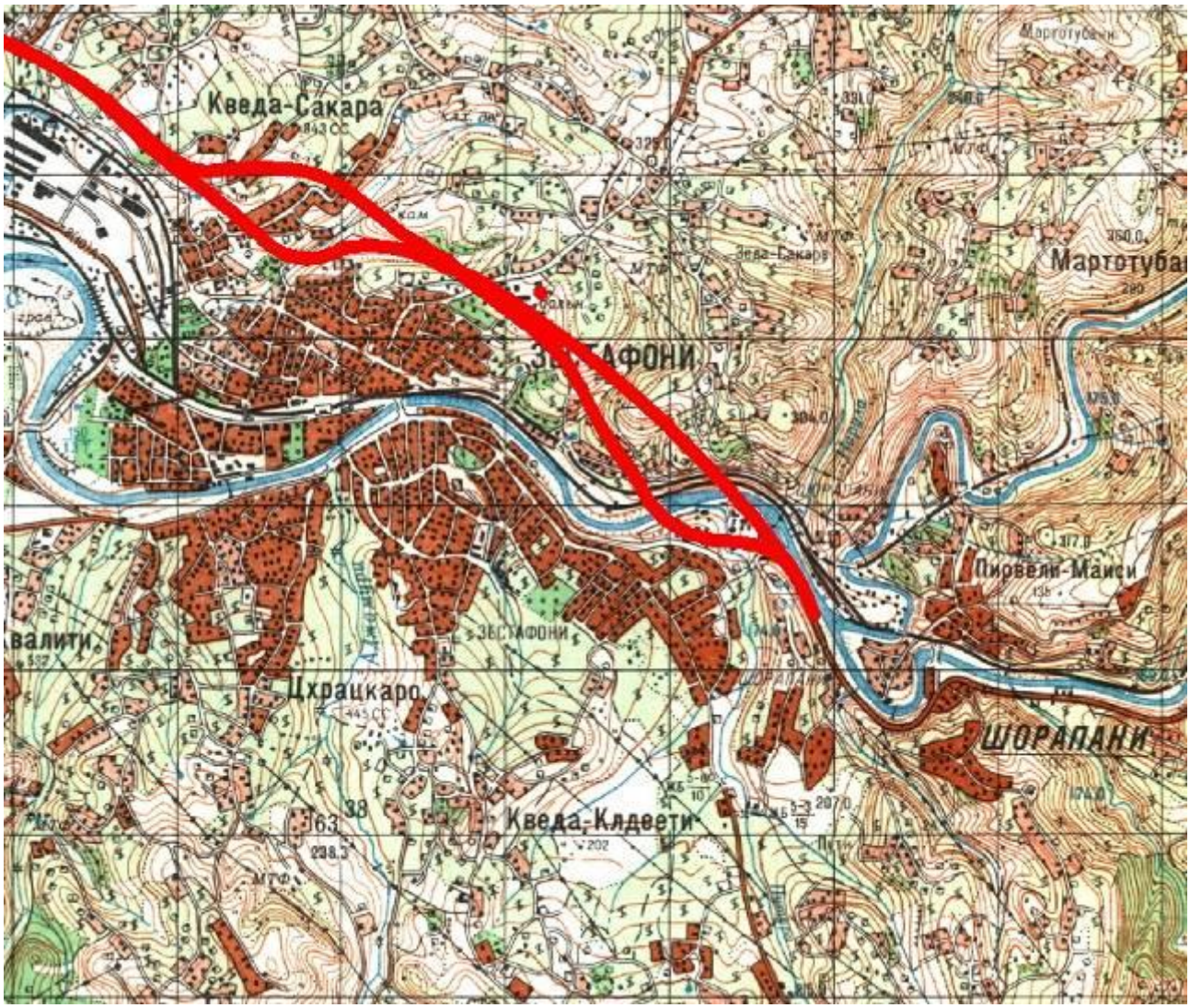
The aim of Consultant at current stage of evaluation is to conduct a rapid analysis of the alternatives that are currently envisaged by RDMED regarding the upgrade of this road to a 4-lane highway... The Consultant will gather existing information at RDMED and will check that the alternatives that are proposed are feasible. The Consultants will make sure that the alternatives are compatible with the Bank requirements regarding environmental assessment and resettlement. As a result the Consultants should be able to confirm or to comment the alternatives envisaged by the Government. At this stage the Consultants are not expected to carry out large multi-criteria analysis to investigate on potential benefits and impacts of the investment on economy, social pattern, urban, environment and so on but rather to comment on the alternatives that were selected in consultations with the Government.

In accordance with this approach, we propose qualitative multi-criteria analysis, which, to our opinion, provides sufficient ground for decision-making. Very rough consideration of additional costs (in terms of – acceptable/unacceptable) imposed by necessity of mitigation and compensation seems to us feasible and sufficient to meet requirements. Quantitative cost-benefit analysis would be excessive exercise not being necessary for decision making and not required by the ToR.

Technical requirements

Technical requirements and standards to be respected during all stages of project development and useful for comparing alternatives, as well, are described in the chapter 3 paragraph 3.3 of present report.

Zestafoni Bypass Option



Brief technical description of options:
Tunnel route - the Northern option (option 1) after crossing the r.Kvirila by bridge enters the tunnel of 2 km length.

	Start Point	End Point	Length
Tunnel Route (Northern)	190+600	200+100	9,070
No Tunnel Route (Southern)	190+770	200+100	8,940

Factors	Option 1 (Northern) Tunnel Option	Option 2 (Southern) No Tunnel Option
Technical Constraints		
Constraints to meet Project objective (2x2lane Highway)	No constraints	No constraints
Specific Design Measures enabling to meet Project objective	Tunnel 2 km length Acceptable Costs	Standard design Acceptable Costs
Constraints to comply with TEM standards	Standard alignment characteristics; Acceptable Costs	Standard alignment characteristics; Acceptable Costs
Specific Design Changes enabling to comply with TEM standards	Standard design Acceptable Costs	Standard design Acceptable Costs
Terrain Constraints		
Terrain limitations for const-ruction (2x2lane Highway)	Rocky hills on the bank of r.Kvirila;	No constraints
Specific Design Changes required to overcome terrain limitations	Need of tunnel 2km length	No constraints
River and gully crossings	r. Kvirila	r. Kvirila
Technical solutions	Bridge	Bridge
Geohazards	No	No
Geohazard mitigation	Not required	Not required
Erosion	Low	Low
Erosion Mitigation	No (mainly slopes are passed by tunnel)	Common anti-erosion measures during construction
Environmental Constraints		
Triggering erosion	Not severe	Not severe
Mitigation of erosion	Conventional erosion protection measures during construction;	Conventional erosion protection measures during construction;
Triggering landslides and rock falls	No	No
Mitigation of landslides	Not required	Not required
Impacts on terrestrial ecosystems and habitats	Small patch of forest near Zestafoni Hospital;	Small patch of forest near Zestafoni Hospital;
Mitigation Measures	Precise routing and avoiding; Replanting;	Precise routing and avoiding; Replanting;
Impacts on aquatic habitats	Impact on r.Kvirila During construction; Not severe; temporary; reversible;	Impact on r.Kvirila During construction; Not severe; temporary; reversible;
Mitigation Measures	Seasonal planning of works; Construction best practices and standards;	Seasonal planning of works; Construction best practices and standards;
Impacts on water resources	Impact on r.Kvirila During construction; Not severe; temporary; reversible;	Impact on r.Kvirila During construction; Not severe; temporary; reversible;
Mitigation	Pollution prevention and waste management plans;	Pollution prevention and waste management plans;
Social Constraints		
Resettlement impact	amount of affected land plots 165, area - 120 936 m^2, buildings 27	amount of affected land plots 1, area - 121 678 m^2, buildings 27

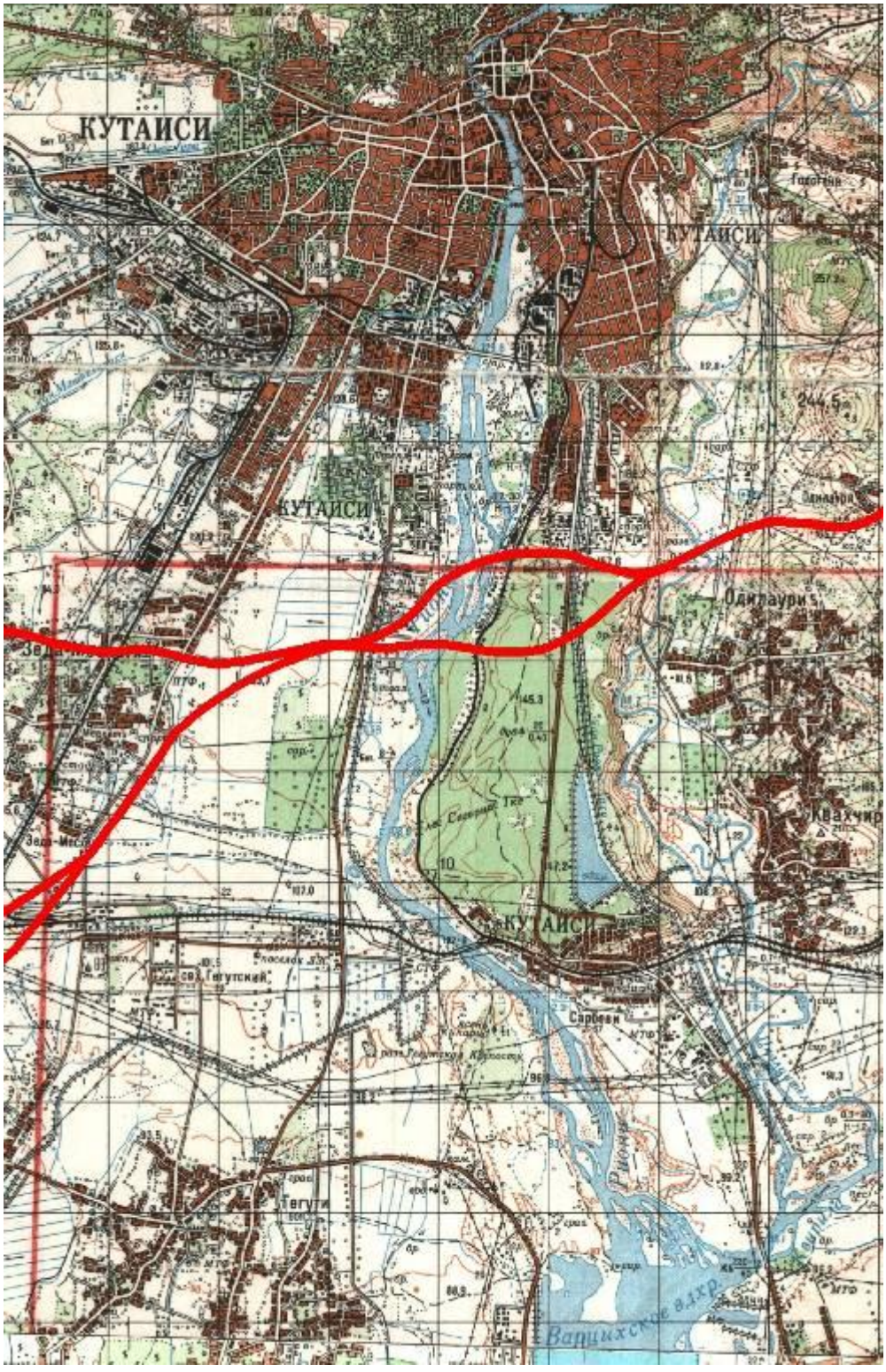
Cost of compensation	660936 USD	661678 USD
Impact on Cultural Heritage	Low Risks	Low Risks
Mitigation of impacts on cultural heritage	Supervision during construction. Conservation of findings. Minimal efforts and resources	Supervision during construction. Conservation of findings. Minimal efforts and resources
Residual Impact of Traffic Noise on the Population in case of implementing possible mitigation measures	From low to medium Acceptable but requires further assessment and control	From low to medium Acceptable but requires further assessment and control
Mitigation of Noise	Regulatory requirements on vehicle good repair and traffic speed limitations; Noise barriers;	Regulatory requirements on vehicle good repair and traffic speed limitations; Noise barriers;
Residual Impact of Traffic Emissions on the Population in case of implementing possible mitigation measures	From low to medium Acceptable but requires further assessment and control	From low to medium Acceptable but requires further assessment and control
Mitigation	Regulatory requirements on vehicle good repair and fuel quality	Regulatory requirements on vehicle good repair and fuel quality
Safety of Traffic	Incompliance with TEM standards. Closeness to the village. One level interchange. **Medium level risks.**	Incompliance with TEM standards. Closeness to the village. One level interchange. **Medium level risks.**
Mitigation of Traffic Risks		
Impact on infrastructure	Potential impact on railway and rural road; Potential impact on channels	Potential impact on railway and rural road; Potential impact on channels
Mitigation	Compliance with design and construction standards;	Compliance with design and construction standards;
Conclusion	**comparable**	**comparable**

Comparison of Alternatives

The resettlement issues, are the most important for the whole route. In case of the Zestafoni bypass option there is not significant difference of resettlement impacts for "Tunnel" and "No Tunnel" options. The amount of affected land plots is higher for the "Tunnel" option, but the amount of buildings and land plot area to be compensated is comparable (almost equal).

The only environmental sensitivities presented within the area of concern is the r.Kvirila and the small patch of forest near the Zestafoni hospital. Both options of the road have the same scale impact on the mentioned receptors. In terms of archaeological sites the estimated impact is similar to both options. The terrain constraints require different technical solutions (e.g. tunneling for the Northern option), and this affects construction costs. Erosion and shallow landslides do not pose a significant problem strongly affecting the costs of options.

Kutaisi Bypass East Option



Brief technical description of options:

	Start Point	End Point	Length
2 Lane North	227+400	N.L.	2,420
4 Lane North	222+500	N.L.	7,190
4 Lane South	222+500	N.L.	7,280

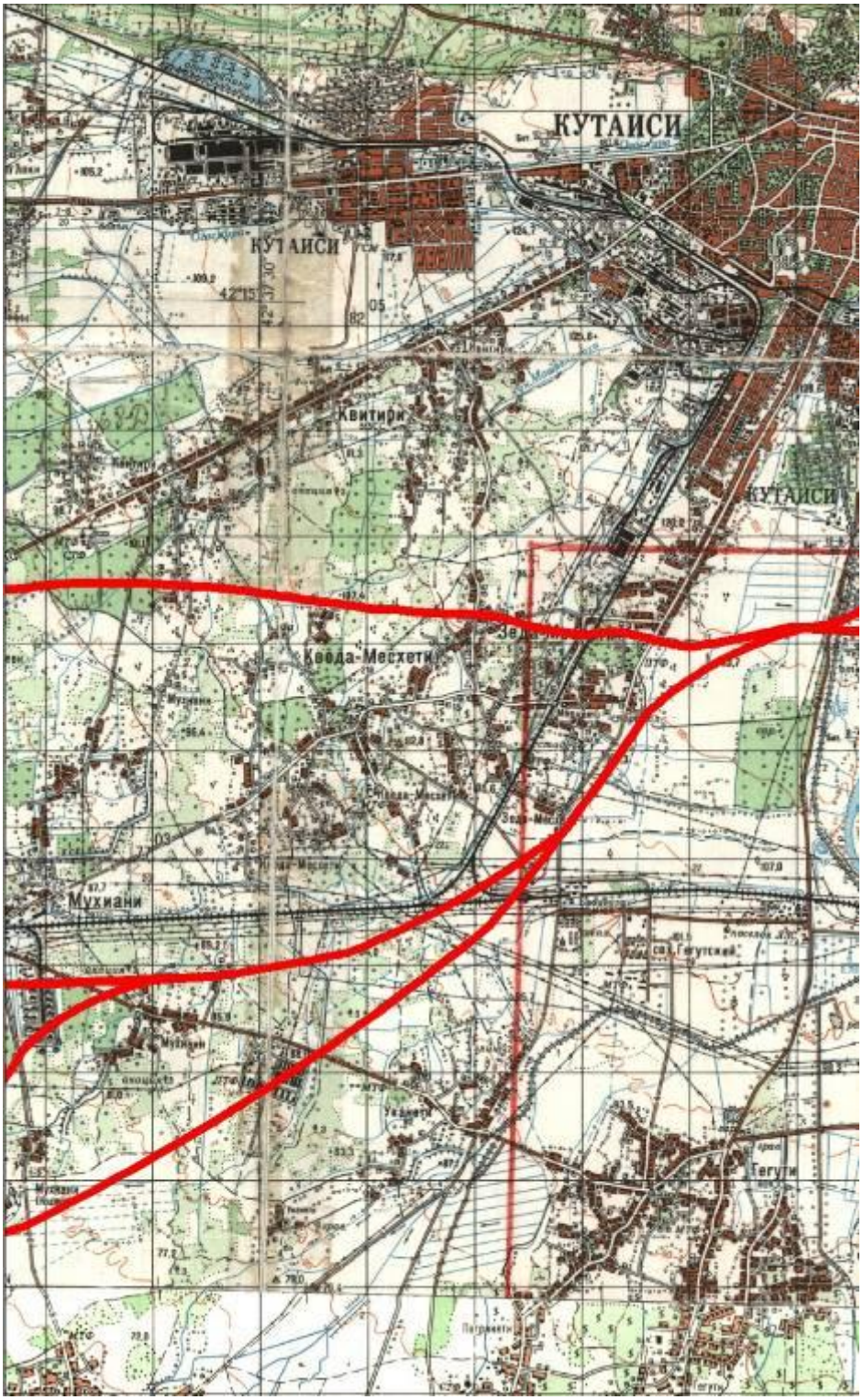
Factors	Option 1 and 2 Northern	Option 3 Southern
Technical Constraints		
Constraints to meet Project objective (2x2lane Highway)	No constraints	No constraints
Specific Design Measures enabling to meet Project objective	Standard design; Bridge Acceptable Costs	Standard design; Bridge Acceptable Costs
Constraints to comply with TEM standards	Standard alignment characteristics; Acceptable Costs	Standard alignment characteristics; Acceptable Costs
Specific Design Changes enabling to comply with TEM standards	Standard design Acceptable Costs	Standard design Acceptable Costs
Terrain Constraints		
Terrain limitations for construction (2x2lane Highway)	River crossing	River crossing
Specific Design Changes required to overcome terrain limitations	Bridge	Bridge
River and gully crossings	r. Rioni	r. Rioni
Technical solutions	Bridge	Bridge
Geohazards	No	No
Geohazard mitigation	No	No
Erosion	Lateral erosion of river bank	Lateral erosion of river bank
Erosion Mitigation	protection engineering measures	protection engineering measures
Environmental Constraints		
Triggering erosion	No	No
Mitigation of erosion	Conventional erosion protection measures during construction;	Conventional erosion protection measures during construction;
Triggering landslides and rock falls	No	No
Mitigation of landslides	Not required	Not required
Impacts on terrestrial ecosystems and habitats	Avoids Saghoria forest. No impacts.	Saghoria Forest. Red list oak trees. Showstopper. Rejected as option.
Mitigation Measures	Precise routing and avoiding; Replanting;	No efficient mitigation in case of crossing
Impacts on aquatic habitats	Impact on r.Rioni during construction; Not severe; temporary; reversible;	Impact on r.Rioni During construction; Not severe; temporary; reversible;
Mitigation Measures	Seasonal planning of works; Construction best practices and standards;	Seasonal planning of works; Construction best practices and standards;
Impacts on water resources	Impact on r.Kvirila During construction; Not severe; temporary; reversible;	Impact on r.Kvirila During construction; Not severe; temporary; reversible;
Mitigation	Pollution prevention and waste management plans;	Pollution prevention and waste management plans;

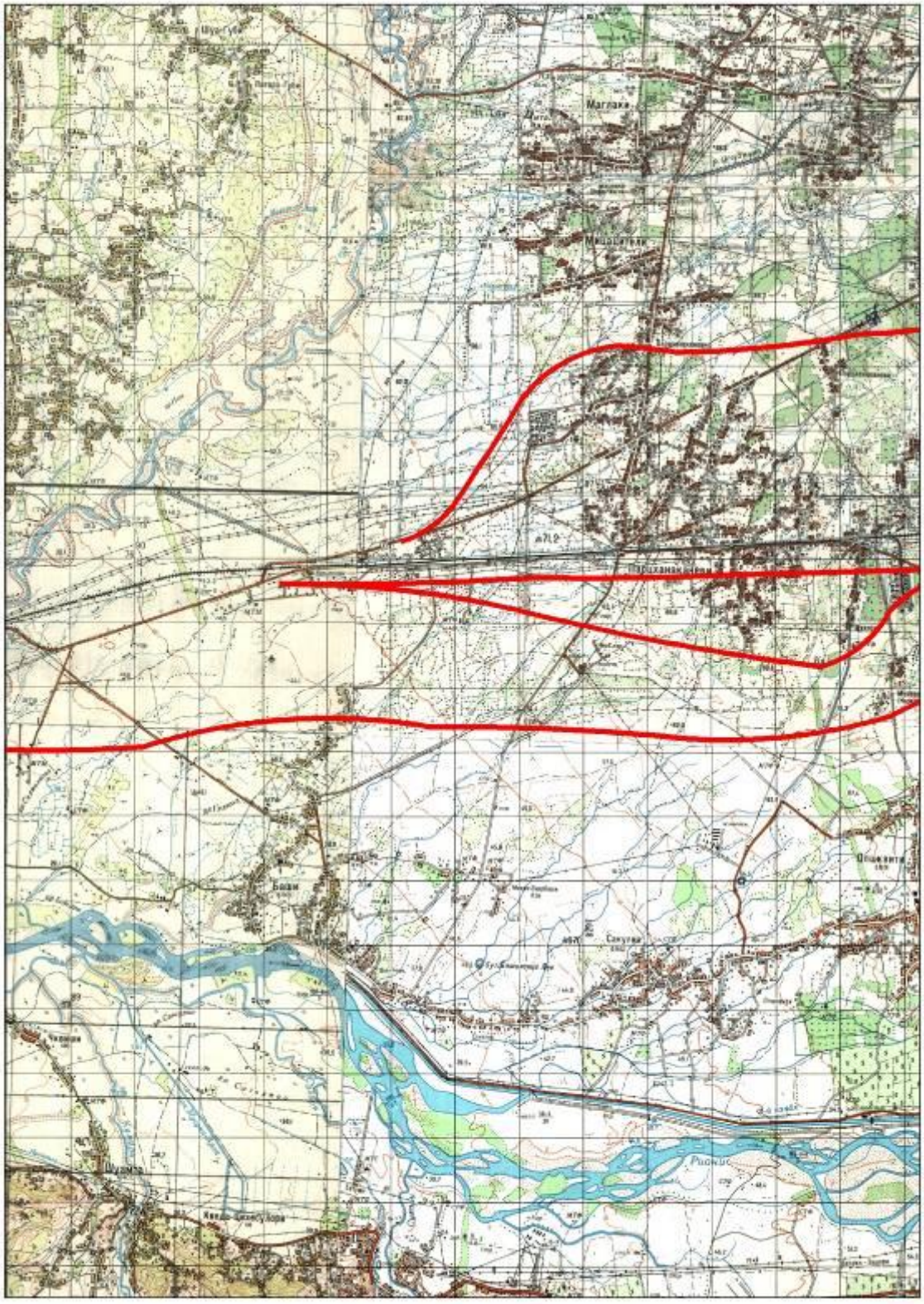
Social Constraints		
Resettlement impact	No	No
Cost of compensation	No	No
Impact on Cultural Heritage	Low Risks	Low Risks
Mitigation of impacts on cultural heritage	Supervision during construction. Conservation of findings. Minimal efforts and resources	Supervision during construction. Conservation of findings. Minimal efforts and resources
Residual Impact of Traffic Noise on the Population in case of implementing possible mitigation measures	From low to medium Acceptable but requires further assessment and control	From low to medium Acceptable but requires further assessment and control
Mitigation of Noise	Regulatory requirements on vehicle good repair and traffic speed limitations; Noise barriers;	Regulatory requirements on vehicle good repair and traffic speed limitations; Noise barriers;
Residual Impact of Traffic Emissions on the Population in case of implementing possible mitigation measures	From low to medium Acceptable but requires further assessment and control	From low to medium Acceptable but requires further assessment and control
Mitigation	Regulatory requirements on vehicle good repair and fuel quality	Regulatory requirements on vehicle good repair and fuel quality
Safety of Traffic	Incompliance with TEM standards. Closeness to the village. One level interchange. **Medium level risks.**	Incompliance with TEM standards. Closeness to the village. One level interchange. **Medium level risks.**
Mitigation of Traffic Risks		
Impact on infrastructure	Potential impact on railway and rural road; Potential impact on channels	Potential impact on railway and rural road; Potential impact on channels
Mitigation	Compliance with design and construction standards;	Compliance with design and construction standards;
Conclusion	**Preferable**	**Discounted**

Comparison of Alternatives

The Southern route has been rejected, so far as it crossed the Saghoria forest, which is red list oak tree forest and represents popular recreational area for the Kutaisi residents. Besides the route crosses special school for the orphan children constructed under the international support, school for the deaf and dumb children and training base of popular football club – Torpedo Kutaisi. The Northern route avoids these sensitivities and crosses old abandoned tractor factory sites.

Kutaisi West to Samtredia Rd





Brief technical description of options:

	Start Point	End Point	Length
North Original	N.L.	244+00	8,450
North Extension	244+00	248+900	5,450
South 1	N.L.	253+400	17,910
South 2	N.L.	253+400	19,490
South 3	N.L.	268+00	32,010

Matrix of Alternatives

Factors	North original + Extension	South 1	Option South 2	Option South 3
Technical Constraints				
Constraints to meet Project objective (2x2lane Highway)	No constraints	No constraints	No constraints	No constraints
Specific Design Measures enabling to meet Project objective	Standard design	Standard design	Standard design	Standard design
Constraints to comply with TEM standards	Standard alignment characteristics;	Standard alignment characteristics;	Standard alignment characteristics;	Standard alignment characteristics;
Specific Design Changes enabling to comply with TEM standards	Standard design	Standard design	Standard design	Standard design
Terrain Constraints				
Terrain limitations for construction (2x2lane Highway)	No constraints	No constraints	No constraints	No constraints
Specific Design Changes required to overcome terrain limitations	Standard design	Standard design	Standard design	Standard design
River and gully crossings	only small irrigation channels	only small irrigation channels	only small irrigation channels	only small irrigation channels
Technical solutions	Standard design	Standard design	Standard design	Standard design
Geohazards	No	No	No	No
Geohazard mitigation	Not required	Not required	Not required	Not required
Erosion	Low	Low	Low	Low
Erosion Mitigation	Common anti-erosion measures during construction	Common anti-erosion measures during construction	Common anti-erosion measures during construction	Common anti-erosion measures during construction
Environmental Constraints				
Triggering erosion	Not severe	Not severe	Not severe	Not severe
Mitigation of erosion	Conventional erosion protection measures during construction;	Conventional erosion protection measures during construction;	Conventional erosion protection measures during construction;	Conventional erosion protection measures during construction;

Triggering landslides and rock falls	No	No	No	No
Mitigation of landslides	Not required	Not required	Not required	Not required
Impacts on terrestrial ecosystems and habitats	No	No	No	No
Mitigation Measures	limited	limited	limited	limited
Impacts on aquatic habitats	No	No	No	No
Mitigation Measures	No	No	No	No
Impacts on water resources	Channels	Channels	Channels	Channels
Mitigation	Pollution prevention and waste management plans;	Pollution prevention and waste management plans;	Pollution prevention and waste management plans;	Pollution prevention and waste management plans;
Social Constraints				
Resettlement impact	amount of affected land plots 215, area - 260620 m2, buildings - 6	amount of affected land plots 109; area - 192 505m2, buildings - 10	amount of affected land plots 111; area - 153 102m2, buildings - 3	amount of affected land plots 189; area - 174 505m2, buildings - 4
Cost of compensation	380620 USD	392505 USD	213102 USD	254505 USD
Impact on Cultural Heritage	Low Risks	Low Risks	Low Risks	Low Risks
Mitigation of impacts on cultural heritage	Supervision during construction. Conservation of findings. Minimal efforts and resources	Supervision during construction. Conservation of findings. Minimal efforts and resources	Supervision during construction. Conservation of findings. Minimal efforts and resources	Supervision during construction. Conservation of findings. Minimal efforts and resources
Residual Impact of Traffic Noise on the Population in case of implementing possible mitigation measures	From low to medium Acceptable but requires further assessment and control	From low to medium Acceptable but requires further assessment and control	From low to medium Acceptable but requires further assessment and control	From low to medium Acceptable but requires further assessment and control
Mitigation of Noise	Regulatory requirements on vehicle good repair and traffic speed limitations; Noise barriers;	Regulatory requirements on vehicle good repair and traffic speed limitations; Noise barriers;	Regulatory requirements on vehicle good repair and traffic speed limitations; Noise barriers;	Regulatory requirements on vehicle good repair and traffic speed limitations; Noise barriers;
Residual Impact of Traffic Emissions on the Population in case of implementing possible mitigation measures	From low to medium Acceptable but requires further assessment and control	From low to medium Acceptable but requires further assessment and control	From low to medium Acceptable but requires further assessment and control	From low to medium Acceptable but requires further assessment and control

Mitigation	Regulatory requirements on vehicle good repair and fuel quality	Regulatory requirements on vehicle good repair and fuel quality	Regulatory requirements on vehicle good repair and fuel quality	Regulatory requirements on vehicle good repair and fuel quality
Safety of Traffic	Incompliance with TEM standards. Closeness to the village. One level interchange. **Medium level risks.**	Incompliance with TEM standards. Closeness to the village. One level interchange. **Medium level risks.**	Incompliance with TEM standards. Closeness to the village. One level interchange. **Medium level risks.**	Incompliance with TEM standards. Closeness to the village. One level interchange. **Medium level risks.**
Mitigation of Traffic Risks				
Impact on infrastructure	Potential impact on railway and rural road; Potential impact on channels	Potential impact on railway and rural road; Potential impact on channels	Potential impact on railway and rural road; Potential impact on channels	Potential impact on railway and rural road; Potential impact on channels
Mitigation	Compliance with design and construction standards;	Compliance with design and construction standards;	Compliance with design and construction standards;	Compliance with design and construction standards;
Conclusion	**comparable**	**comparable**	**comparable**	**comparable**

Comparison of Alternatives

The technical and environmental constraints are not so important for selecting best option. The main sensitive issue is resettlement.

8. MITIGATION MEASURES AND ENVIRONMENTAL MANAGEMENT PLAN

8.1. MITIGATION MEASURES

8.1.1 Mitigation of Construction Related Impacts

Pollution Prevention Measures:

Water/ Soil Pollution. Specific mitigation measures should be implemented at the construction site for prevention of water and soil pollution:

Prevent operation of vehicles in the river and if there is no alternative, inspection of vehicles will be required to ensure that there is no leakage of fuel and lubricating materials.

Contractors will ensure the proper handling of lubricants, fuel and solvents. Fuel and lubricant storage tanks will not be located within 50m of any watercourse, well or dry gorges. All tanks will be placed in a bund of at least 110% of the tank's maximum capacity. If more than one tank is stored within the bund, the system must be capable of storing 110% of the biggest container's capacity or 25% of their total capacity, whichever is greater. The bund will be impermeable (e.g. concrete-lined), without drainage points or other breaches. Accumulated rainwater in bunds will be pumped out of the bund to either drains or the ground if uncontaminated. In case of fuel spillage the spilled fuel should be recollected and contaminated bund treated by the absorbents: sawdust, sand or straw.

All fuel / hydrocarbon dispensing nozzles are to be of a drip control design and securely locked when not in use.

No fuel storage or refueling of vehicles or equipment will be allowed within 50m of any watercourse, water body, well, dry gorge or within any designated wetland area or aquifer. Vehicles will not be left without supervision during refueling process. All refueling operations on the working sites will use absorbent pads and/or straw to minimize spills, which will be put in place prior to the commencement of refueling operations. Ground water and surface water pollution risk will be reduced or eliminated in case of immediate removal of polluted ground. Soiled ground and absorbents will be removed, stored and treated as hazardous waste. In case of significant spill authorized and responsible person will be informed, works will be stopped till the elimination of pollution risk Refueling will always be carried out with the correct equipment (i.e. nozzles of the appropriate size), and only by suitably trained and experienced Refueling Operators. Fuel supply equipments will be regularly revised to prevent leakage due to inappropriate condition of refueling equipments. Equipment and storages will be isolated and guarded to prevent pollution due to cases of stealing or vandalism. All mobile plant, including but not limited to cranes, compressors, generators, bulldozers, excavators etc. and storage tanks will be maintained and operated such that all leaks and spills of materials will be minimized. Daily plant checks (Vehicle Maintenance Procedure) will be undertaken to ensure no leaks or other problems are apparent. Vehicle maintenance, cleaning, degreasing etc will be undertaken in designated areas of hard-standing, not over made unstable ground (embankments etc.). Water Tanks with sprinklers are envisaged for watering roads and machinery maintenance. Maintenance points will not be located within 50m of any watercourse, well or dry gorge. The storage of potentially polluting materials, refueling and maintenance of mobile plant within 50m of all watercourses/water bodies, dry riverbeds and within designated wetlands and aquifers will be prohibited.

Erosion control measures will be applied during construction activities to prevent increased runoff into the watercourses.

Contractor will plan all excavations, topsoil and subsoil storage so as to reduce to a minimum any runoff. Contractors will be required to organize and cover material storage areas and to isolate wash down areas from watercourses by selecting areas that are not free draining into any watercourse.

Where any area of the spread is at risk from silt pollution washing off into a watercourse of water body, effective measures will be put in place to ensure that such pollution does not occur. Such measures may include:
• Use of silt fences
• Use of straw bales to deflect and filter water
• Use of a system of bunds and grips to prevent water from entering watercourses, etc.
• Use of holding/settling lagoons to store water running off the spread. It is intended to use natural settling rather than flocculants to facilitate sedimentation following which clean water can be disposed.

Asphalt or wet cement and/or concrete will not be allowed to enter any watercourse, pond or ditch.

No impacts are envisaged on groundwater (depth is more than 5m), However, where there could be risk that the aquifer is directly affected by the works (i.e. the excavation will be through permeable / water-bearing strata), the methodology employed will ensure that no contamination can enter the aquifer. This may involve the use of impermeable layers being placed in the trench and/or the use of clay layer along the trench.

The disposal of excess soil and rock

• The earthwork balance provided in p. 3.5 (see table, points No 5 and 6) demonstrates that the generation of spoil ("cut to fill in": 1611000 m^3) is overbalanced by the requirement for filling inert materials ("fill from borrow": 3900000 - 4200000 m^3). Therefore, most part of spoil generated during construction will be utilized as filling material. However, certain amount of materials not applicable as filling material could be produced.
• Allow local communities to utilize any excess rock, which may be left following reuse. Suitable access to the materials will be agreed with the local authorities in consultation with the community.
• Transport any further material to the nearest spoil disposal sites agreed in consultations with the environmental services of the local authority, as well as Regional services of the MoE. The main purpose is not to damage valuable landscapes or soil deposits and other ecological sensitivities. For the rock disposal (if required) licensed borrow pits could be used. Rock disposal pits used for final disposal must meet the MoE requirements for Inert Landfills or Technogenic Rock Deposits and should be agreed with the MoE. For the disposal of spoil eroded and ragged (ravained) sites could be selected and agreed with MoE and spoil material could be used for improving relief and reinstatement of the eroded sites. The costs for disposal of the rocks within the private borrow pits should be agreed with the concrete owners. The spoil disposal in eroded sited will cost only the price of work related to transportation of spoil and reinstatement of eroded sites.

Constructing Contractor is obliged:

- to agree with the Regional Services of MoE about sites for spoil and rock disposal

- If required, to elaborate plan of spoil and rock disposal in accordance with the requirements provided by Regional Services of MoE (disposal plan; reinstatement plan etc. as requested by MoE)
- Costs of the spoil and rock disposal should be included into cost break-down provided by constructing contractor within bidding proposal and should be reflected in the contract.

Waste Handling

All waste from the construction site will be disposed of in accordance with national environmental regulations and at sites approved by the environmental authority.
The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in:
• Waste handling
• Waste treatment; and
• Waste storage.
Burning of waste on any construction site is forbidden with the exception of stub and small branches from felled trees and bushes, which is better to be burned in order to avoid pest dissemination.

Hazardous Construction Wastes
Small quantities of the hazardous wastes will arise mainly from the vehicle maintenance activities (liquid fuels; lubricants, hydraulic oils; chemicals, such as anti-freeze; contaminated soil; spillage control materials used to absorb oil and chemical spillages; machine/engine filter cartridges; oily rags, spent filters, contaminated soil, etc). Taking into account absence of specific hazardous waste treatment facilities in Georgia, the common construction practice accepted by the authorities is to dispose the mentioned types of wastes at the municipal landfills.

Noise, dust and emissions

The settlements are not affected significantly by the construction related emissions, so far as the new alignments of the highway mainly bypass the densely populated areas. However, emissions of heavy machinery involved in the construction should be managed by proper engine maintenance practice and usage of good quality fuel. The work of engines in a no-operation mode should be excluded.

Relatively high impact is connected with the dust emissions, which hardly can be quantified. However, it is obvious that the earth works and transportation of gravel and other inert materials from borrow-pits will impose nuisance related with dust. This is temporary impact, and should be mitigated by periodical watering of the work sites.

According to noise modeling results (annex 6), the settlements or ecologically sensitive areas will not be disturbed by the noise nuisance. Temporary and slight increase of the noise level near the construction ground within the 300m radius is acceptable impact. However, mitigation of this impact is possible by engine maintenance practice and avoidance of engine work in non-operational mode. The only limitation that could be recommended is to minimize the night-time works at the Kutaisi bypass East and in the vicinity of villages, i.e. village Akhalsopeli. The night-works at other sites could be carried out without limitation.

All vehicles shall be maintained so that their noise and emissions do not cause nuisance to workers or local people. Near the settlements, the rehabilitation activities will be limited to daylight working hours to reduce impacts. All vehicles will be checked and repaired in case of need to eliminate increased level of noise due to damaged parts.

Regular maintenance of diesel engines will be undertaken to ensure that emissions are minimized, for example by cleaning fuel injectors. Routine maintenance will be to a high standard to ensure that vehicles are safe and that emissions and noise are minimized. All plant used on site will be regularly maintained so as to be in good working order at all times to minimize potentially polluting exhaust emissions.

Vehicle refueling will be undertaken so as to avoid fugitive emissions of volatile organic compounds through the use of fuel nozzles and pumps and enclosed tanks (no open containers will be used to stored fuel).

If deemed necessary in dry conditions or where significant quantities of dust are being or are likely to be produced mitigation measures will be arranged with the Construction Manager. Mitigation measures will include:

- Damping down using water bowsers with spray bars or other technical means;;
- Sheeting of construction materials and storage piles; and
- Use of defined haulage routes and reductions in vehicle speed where required. Materials will be transported to site in off peak hours.
- Materials transported to site will be covered/ wetted down to reduce dust. The construction site will be watered as appropriate. Protective equipment will be provided to workers as necessary. All vehicles will be checked and repaired in case of need to eliminate increased emission due to damaged parts

Such measures will be used, where human or animal receptors lie within 300 m of the ROW

Protection of Quarrying Sites

The exploration of the borrow pits should be conducted by the licensed companies. In case if the constructing company intend to perform quarrying activities, the company has to obtain related license. Potential impact of the increased quarrying activities on ichthyofauna, groundwater and landscape should be considered anyway. Validity of licenses for the abovementioned companies is a main mechanism to guarantee that most of impacts related to quarrying will be mitigated. License is provided by the MoE only on a basis of preliminary assessment (including limits and conditions for reinstatement). The Regional Services of the MoE and Environmental Inspectorate are in charge to control compliance of the quarrying company's performance. The role of the Road Department within this plan should be to ensure timely and permanent involvement of the MoE regional services in construction supervision.

The measures aimed on mitigation of the dust and emission impacts, as well as potential river contamination due to improper fueling and vehicle operations, should be the same as above described pollution prevention measures, but control on this sensitive site should be more strict. Road Department and Constructing Contractor's environmental personnel should pay more attention to this site during monitoring.

Protection of irrigation channels

Permanent monitoring during construction. Full reinstatement in case of damage. Avoid dust and fuel contamination by reducing construction related traffic in the vicinity of the channel.

Topsoil Protection

The topsoil will not be handled by Contractor when the following conditions are observed:
• The topsoil is frozen;

• The site is experiencing persistent rainfall;
• The topsoil is saturated; or
• Handling will damage the structure of the topsoil.

Topsoil Storage The storage of topsoil in stockpiles, no more than 2m high with side slopes at a maximum angle of 45^0, will take into consideration the following:
• Dedicated storage locations that prevent the stockpiles being compacted by vehicle movements or contaminated by other materials;
• Segregation from subsoil stockpiles;
• No storage where there is a potential for flooding;
• No storage at less than 25m from river/streams, subject to site specific topography.
In the event that the topsoil stockpiles experience significant erosion Contractor will implement corrective action such as installing erosion matting over the stockpiles if further surface compaction and/or seeding fails. Contractor will protect the stockpiles from flooding and run-off by placing berms or equivalent around the outside where necessary.
Topsoil stockpiles will be monitored and should any adverse conditions be identified corrective actions will include:
• Anaerobic conditions - turning the stockpile or creating ventilation holes
through the stockpile;
• Erosion - temporary protective silt fencing will be erected;

Subsoil Storage The storage of subsoil in stockpiles, no more than 3m high with side slopes at a maximum angle of 600, will take into consideration the following:
• Dedicated storage locations where the stockpiles will not be compacted by vehicle movements or contaminated by other materials; and
• Segregation from topsoil stockpiles.

In the event that the subsoil stockpiles experience significant erosion Contractor will institute corrective action such as installing erosion matting over the stockpiles.

Reinstatement of Topsoil. Topsoil removed from the highway itinerary will be used for reinstatement of the topsoil in the adjacent Construction Corridor affected by the project activities. Topsoil from the sites, which will not be reinstated to the initial conditions will be distributed carefully on the surrounding area. Topsoil will be reinstated separately from subsoil, with care taken to avoid mixing of the materials. The topsoil reinstatement will be sufficient to restore the fertile depth to the initial conditions as judged by the topsoil strip during visual observation and comparison of the reinstated site and adjacent land. When replacing the topsoil Contractor will program the works such that the areas furthest away from the stockpiles are reinstated first with reinstatement getting progressively closer to the stockpiles, thus reducing the number of vehicle movements over the reinstated topsoil. The reinstated topsoil will then be harrowed, where practical, to protect the stability and promote vegetative growth.

Temporary Erosion Control Measures
The measures, by which Contractor will address the protection of "slopes" adjacent to the highway against erosion before permanent reinstatement, are outlined in this section. Temporary erosion control measures will be introduced as necessary, paying special attention to:
• Construction activities that increase the potential for erosion from the slope sides and/or sediment mobilization in watercourses;
• Straw bale barriers in locations requiring small volumes of sediment interception;
Temporary erosion control measures will be left in place until the slopes are stabilized to the approval of Road Department. The purpose of temporary erosion control measures is to:
• Interrupt surface water run-off;

• Slow the velocity of water runoff to the extent practical;
• Divert water off exposed check dam areas;
• Prevent and minimize sediment transportation off the construction sites; and

Final Reinstatement and Long-term Anti-erosion Measures

All the work sites (except permanently occupied by the road and supporting facilities) should be reinstated to its initial conditions (relief, topsoil, vegetation cover). So far as very limited woodcutting and bush clearance is required for the highway upgrading, preservation of top-soil is sufficient for reinstating the natural grass vegetation cover as well. Replanting of bushes and trees is considered below in a section "Landscaping and planting of greenery".

Landscaping and eco-compensation

The 2km length section of the existing road crosses Chognari forest. Upgrading of the road will require clearance of about 4 ha of the forest. The forest is not of high conservative value, however appropriate offset measures will be required. According to the Georgian regulations (Decree of the Government of Georgia #132 of 11.08.2005) before starting land clearance in the forested area it is required to conduct precise demarcation of the corridor, to ensure detailed cadastral description of the trees within the corridor, to mark all the trees subject for felling. All these operations should be conducted by the constructing contractor in consultation with MoE and with participation of the regional representatives of the forestry department of MoE. The tree felling is allowed only after issuance of appropriate consent by MoE, which is based on the results of cadastral studies within the demarked corridor and is associated with request for compensation measures..

Protection of the cultural heritage

Despite the fact that the construction sites are not located near any known subterranean monuments or areas of an archeological interest, destruction of archeological layers during the construction process is possible. To avoid this risk, preliminary preventive studies and archeological supervision during the earth-works is necessary. Supervisory procedures and all other necessary measures should be agreed with the Ministry of Culture when obtaining the construction permit, in accordance with the rules of the permit issuance. According to the article 14 of the Law on Cultural Heritage, Permit on conducting quarrying activities in Georgia, as well as construction of an object of a special importance as it may be defined under the legislation of Georgia, is issued by a competent authority based on the positive decision of the Ministry of Culture, Monument Protection and Sport of Georgia. The basis for the conclusion is the archeological research of the proper territory to be carried out by the entity wishing to accomplish the ground works. The entity wishing to do the earth-works is obliged to submit the Ministry the documentation about the archeological research of the territory in question. The preliminary research should include field-research and laboratory works. In case of identifying an archeological object on the territory to study, the conclusion of the archeological research should contain the following information: (a) a thorough field study of the archeological layers and objects identified on the study territory by using modern methodologies, (b) recommendations about the problem of conservation of the identified objects and planning of the building activity on the design territory, on the basis of the archeological research. According to the established practice, the archaeological studies are conducted under the detailed design contract at the stage of obtaining the Construction Permit.

At the construction stage archaeological monitoring should be ensured by the constructing contractor under the supervision of the Ministry of Culture, Monument Protection and Sport of

Georgia. The budget necessary for the archeological supervision and other agreed works should be fixed under the construction works appraisal.

Only legally registered suppliers having all required permits and licenses will be used. This is relevant to the borrow pit operators, as well as to the asphalt suppliers. Checking of compliance with the permit and license requirements is the only way that the project may have influence and mitigate impacts related to the suppliers' operations. In case if the constructing company decides to explore borrow pits, appropriate licenses should be obtained from the MoE. The constructing contractor may take decision to install asphalt mixing plants to produce asphalt for their operations. In that case special EIA and obtaining of the Environmental Impact Permit is required.

Safety and Access. Alternate access will be provided for vehicles and pedestrians. Appropriate lighting and signs will be employed.

Resume to 8. 1.1

Commitment of Constructing Contractor to adhere the environmental management requirements described in the present EMP (Contractor Control Plan) should be incorporated into the contract (e.g. the present EMP could be attached as annex and essential part of the contract).

Based on the present EMP (Contractor Control Plan) the Constructing Contractor is obliged to produce its own EMP (Contractor's Implementation Plan) with further description of details (schedule, involved personnel, required resources etc.).

The Spoil and Rock Disposal Plan (or project) and Eco-compensation project (if requested by MoE) should be elaborated by constructing contractor and relevant costs should be reflected in the overall construction budget. Final version of spoil and rock disposal plan and disposal sites should be agreed with the MoE. The Spoil and Rock Disposal Plan, as well as Eco-compensation Plan should be included in the final EMP (Contractor's Implementation Plan). The final version of the plan should be agreed with the Road Department.

8.1.2 Mitigation of Long-term and Operation Related Impacts

Certain measures aimed on mitigation of operation related impacts should be implemented at the design/construction stage. In our case, this is relevant to the noise abatement measures.

Noise abatement

Traffic related noise will not affect area out of 40-50m from the highway. The impact is not expected to be high even in 2030, when the traffic intensity is expected to increase significantly as compared with the current situation. The abatement measures (installation of noise barriers and speed restriction) applied for the specific sections of the highway, enable to reduce the noise level up to 12dBA. The only two sections, where the noise impact may need to be mitigated by special means are: a) the Zestafoni bypass (700m length subsection adjacent to the densely populated area of the North-East part of Zestafoni city and 300m length section in the village Kvemo Sakara) and b) the end point fo the studied route near the village Akhalsopeli (two 400m length subsections)

The residential houses could be located at a distance of 10-20m form the highway. In case of installing the noise barriers, the average noise level could be reduced from predicted 68-65 dBA

to acceptable 55 dBA. The precise locations for the noise barriers, as well as design, should be determined at the detailed design stage.

The impact of the increased traffic will be to certain extent compensated by improvement of road characteristics (geometrical and pavement) and better driving conditions. The additional mitigation measure should be: a) limitation of traffic velocity; b) implementation of engine maintenance control mechanisms;

Below we would mention the mitigation measures to be implemented at operational stage. Most of these measures (predominantly maintenance works) should be implemented by Road Department utilizing funds from the state budget, lawns, grants and other financial sources.

Erosion and land stability control and landscaping. Road Department should ensure permanent erosion and land stability control and monitoring of landscape restoration after completion of construction works, as well as timely implementation of corrective actions. Corrective actions include, but are not limited to maintenance of drainage systems and implementation of anti-erosion measures (berms, vegetation cover etc.) whenever required.

Roadside litter and fuel pollution. RDMED should coordinate with the local Governmental institutions and private companies and facilitate arrangement and proper functionality of supporting facilities and services (fueling stations, waste management services)

Air emissions, noise and pollution during the maintenance works. RDMED should ensure incorporation of environmental considerations in the maintenance contracts and monitor implementation.

Landscaping and planting of greenery. In a long-term perspective and in relation with the entire length of highway RDMED should plan development of the roadside zone applying proper landscaping and greenery planting strategies. Visual and aesthetic, as well as emission screening aspects should be taken into consideration.

Prevention and mitigation of accident risks associated with vehicular traffic and transport, that may result in spills of toxic materials injuries or loss of life Emergency preparedness. RDMED in conjunction with the Ministry of Interior (Department for Managing Emergency Situations) should facilitate development of legislation and emergency response plans regulating transportation of hazardous materials. The system of measures may include but not limited to:

- Design and implement safety measures and an emergency plan to contain damages from accidental spills.
- Designate special routes for hazardous materials transport.
- Regulation of transport of toxic materials to minimize danger.
- Prohibition of toxic waste transport through ecologically sensitive areas.

The abovementioned measures and plans should be elaborated in accordance with the Law of Georgia on Hazardous Substances and Regulations of the MoE on "Norms of Usage of Chemicals in the Environment and Rules of Transportation, Storage and Usage of Chemicals". Regulations of other countries (e.g. Order of the Minister of Transport of Russia # 73 issued 08.08.1995 as amended in 1999) could be used as supporting materials.

Prevention of Proliferation of Human, Animal and Plant Diseases.

The Customs Services, the National Center for the Disease Control and Medical Statistics (NCDC) and the "National Service for the Foodstuffs Safety, Veterinary and Plant Protection" of the Ministry of the Agriculture are responsible entities to prevent proliferation of human, animal and plant diseases due to transportation of people and goods.

8.2. MONITORING

The monitoring plan for the project is summarized **in Appendix 2.** Monitoring measures include site supervision, verification of permits, monitoring of compliance of the contractor performance and environmental impacts like: noise, dust, soil and water pollution and air emissions etc.

The capacity of the Road Department to monitor environmental compliance is assessed as adequate for overall management of the projects. For environmental monitoring of concrete projects, including rehabilitation of the Zestafoni-Samtredia section of the highway, supervision services will be procured by the Road Department.

8.3. IMPLEMENTATION ARRANGEMENTS

Overall responsibility for the coordination and implementation of the EMP will be with the Road Department. As such they will be responsible for liaising with local environmental authorities, municipalities, all the responsible institutions listed in the section B of the present document, the local community and the contractors engaged for construction on environmental issues associated with the implementation of this EMP and the Environmental Guidelines for Contractors.

The Road Department will be responsible for ensuring that: (i) Georgian environmental regulation and WB guidelines are met; (ii) All required environmental permits and licenses (e.g. permit on water use or discharge or license on borrow pit exploration) are obtained by the constructing contractor and material suppliers; (iii) Waste is disposed in accordance with the national regulations and at the disposal sites designated by the Regional Services of the MoE. (iv) any other requirements identified by the Ministry of Environment and agreed with the Road Department; and (v) the Environmental Management and Monitoring Plans are implemented.

8.4. COSTS OF IMPLEMENTATION

The costs of environmental activities associated with the construction will be included in the contract for construction.

Costs of spoil and rock disposal is variable and could not be precisely defined before elaboration of the concrete plan. The costs for disposal of the rocks within the private borrow pits should be agreed with the concrete owners. The spoil disposal at eroded sited will cost only the price of work related to transportation of spoil and reinstatement of eroded sites.

Some not significant expenses are foreseen with respect to the following public consultation on the EIA and EMP and will be borne by the Road Department.

Appendix 1. Environmental Management Matrix

Construction Phase

Impacts Related to Construction Activities					
Impacts	**Sites**	**Mitigation Measures**	**Costs**	**Responsibility for Implementation**	**Responsibility for Monitoring**
Destruction of natural landscape (relief, soil cover, vegetation, eco-systems, habitats and wildlife) in the right-of-way occupied by the highway. **Character of impact**: immediate drastic changes of landscape in the construction corridor.	Whole alignment	**Mitigation strategy** - prevalence of preventive measures: Optimal alignment option (no valuable landscapes, ecosystems,. Pre-entry survey) pre-entry survey and prevention of damage to fauna (if required; not expected) Top-soil storage and use for reinstatement and landscaping **long-term (remediation)**: – see mitigation strategy for operation phase	Pre-entry survey 3 experts	Constructing Contractor	RDMED Constructing Contractor Regional services of MoE
Destruction of natural landscape (relief, soil cover, vegetation, eco-systems, habitats and wildlife) on the access roads, in the borrow pit sites, waste dumps, construction camps and equipment yards. 140 cubic. meters of the inert materials should be explo-red and delivered to the working site **Character of impact**: immediate drastic changes of landscape in the construction corridor.	Camp site and Quarries to be determined	**Mitigation strategy**: prevalence of preventive measures: • Optimal siting • Pre-entry survey, replanting of rare species (if required), prevention of damage to fauna, • top-soil storage **long-term (remediation)**: – see mitigation strategy for operation phase	Included in the costs provided above No extra costs	Designing Contractor Constructing Contractor	RDMED Constructing Contractor Regional services of MoE
Erosion stimulated from fresh road cuts and fills and temporary sedimentation of natural drainage ways. **Character of impact: immediate**; Fresh road cuts may immediately trigger intensive erosion during construction and drastic increase of sedimentation	Mainly Zestafoni bypass	**mitigation strategy**: prevention through implementing temporary anti-erosion measures – temporary drainage, biomatting or geo - textile cover, berms etc. • Limitation of earth moving to dry periods. • Protection of most susceptible soil surfaces with mulch. • Protection of drainage channels with berms, straw or fabric barriers. • Installation of sedimentation basins	insignificant	Constructing Contractor	RDMED Constructing Contractor Regional services of MoE
Erosion of lands below the road bed	Mainly	• Increase number of drain outlets.	insignificant	Constructing	RDMED

receiving concentrated outflow from covered or open drains.	Zestafoni bypass	• Place drain outlets so as to avoid cascade effect. • Line receiving surface with stones, concrete.		Contractor	Constructing Contractor
Topsoil losses due to improper storage and handling	RoW whole alignment Camp	**Topsoil Protection** The topsoil will not be handled by Contractor when the following conditions are observed: • The topsoil is frozen; • The site is experiencing persistent rainfall; • The topsoil is saturated; or • Handling will damage the structure of the topsoil. **Topsoil Storage** The storage of topsoil in stockpiles, no more than 2m high with side slopes at a maximum angle of 450, will take into consideration the following: • Dedicated storage locations that prevent the stockpiles being compacted by vehicle movements or contaminated by other materials; • Segregation from subsoil stockpiles; • No storage where there is a potential for flooding; • No storage at less than 25m from river/streams, subject to site specific topography. In the event that the topsoil stockpiles experience significant erosion Contractor will implement corrective action such as installing erosion matting over the stockpiles if further surface compaction and/or seeding fails. Contractor will protect the stockpiles from flooding and run-off by placing berms or equivalent around the outside where necessary. **Reinstatement of Topsoil** Topsoil removed from the highway itinerary will be used for reinstatement of the topsoil in the adjacent Construction Corridor affected by the project activities. Topsoil from the sites, which will not be reinstated to the initial conditions will be distributed carefully on the surrounding area. Topsoil will be reinstated separately from subsoil, with care taken to avoid mixing of the materials.	insignificant	Constructing Contractor	RDMED Constructing Contractor Regional services of MoE
Increased suspended sediment in	RoW KP	**Mitigation strategy**: prevention through implementing temporary	insignificant	Constructing	RDMED

streams affected by erosion at construction sites and fresh road cuts, fills and waste dumps. Declined water quality and increased sedimentation **Character of impact**: immediate; Fresh road cuts may immediately **trigger** intensive erosion during construction and drastic increase of sedimentation	near rivers.	anti-erosion measures – temporary drainage, temporary sediment catchments etc. • Protect susceptible surfaces with r fabric, • Establishment of retention ponds to reduce sediment loads before water enters streams		Contractor	Constructing Contractor Regional services of MoE
Soil and water contamination during construction by oil, grease, fuel and paint in the RoW, equipment yards and asphalt plants.	RoW whole alignment	• Collect and recycle lubricants. – • Avoid accidental spills through good practice. • Avoid refueling near watercourses; Ensure proper maintenance of equipment and fueling of the vehicles and machinery. • Check vehicles (leaking of fuel etc.) • Organize and cover material storage areas; • Isolate concrete, earthwork and other works from water courses by using sealed formwork; • Isolate wash down areas of cement and gravel trucks and other equipment from water courses by selecting areas for washing that are not free draining directly or indirectly into water courses; All refueling operations on the working sites will use absorbent pads and/or straw to minimize spills, which will be put in place prior to the commencement of refueling operations. Ground water and surface water pollution risk will be reduced or eliminated in case of immediate removal of polluted ground. Soiled ground and absorbents will be removed, stored and treated as hazardous waste. In case of significant spill authorized and responsible person will be informed, works will be stopped till the elimination of pollution risk Refueling will always be carried out with the correct equipment (i.e. nozzles of the appropriate size), and only by suitably trained and experienced Refueling Operators. Fuel supply equipments will be regularly revised to prevent leakage due to inappropriate condition of refueling equipments. Equipment and storages will be isolated and guarded to prevent pollution due to cases of stealing or vandalism. All mobile plant, including but not limited to cranes, compressors, generators, bulldozers, excavators etc. and storage tanks will be maintained and operated such that all leaks and spills of materials	insignificant	Constructing Contractor	RDMED Constructing Contractor Regional services of MoE

		will be minimized. Daily plant checks (Vehicle Maintenance Procedure) will be undertaken to ensure no leaks or other problems are apparent. Vehicle maintenance, cleaning, degreasing etc will be undertaken in designated areas of hard-standing, not over made ground. Maintenance points will not be located within 50m of any watercourse, well or dry gorge. The storage of potentially polluting materials, refueling and maintenance of mobile plant within 50m of all watercourses/water bodies, dry riverbeds and within designated wetlands and aquifers will be prohibited. The personnel involved in the handling of fuel, hazardous and non-hazardous waste will undergo specific training in: • fuel and lubricant handling procedures			
Poor sanitation and solid waste disposal in construction camps and work sites (sewerage, sanitation, waste management)	RoW whole alignment Camp KP	Provide adequately located and maintained latrines and waste disposal facilities Allow local communities to utilize any excess rock, which may be left following reuse. Transport any further material to the nearest licensed spoil disposal pit. Spoil disposal pits used for final disposal must meet the requirements for Inert Landfills by the MoE. All waste from the construction site will be disposed of in accordance with local environmental regulations and at sites approved by the environmental authority. The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in: • Waste handling • Waste treatment; and • Waste storage. Burning of waste on any construction site is forbidden with the exception of stub and small branches from felled trees and bushes, which is better to be burned in order to avoid pest dissemination.	insignificant	Constructing Contractor	RDMED Constructing Contractor Regional services of MoE
Construction wastes alongside the RoW and roadside litter. Disposal of excess soil and rock. About 140 000 cubic meters of cut material (soil and rocks) should be disposed	Whole alignment	Provide for disposal facilities agreed with Regional Services of MoE Allow local communities to utilize any excess rock, which may be left following reuse. Transport any further material to the nearest spoil disposal sites agreed with the MoE. The main purpose is not to damage valuable landscapes or soil deposits and other ecological sensitivities. For the rock disposal licensed borrow pits could be used. Rock disposal pits used for final disposal must meet the MoE requirements for Inert Landfills or Technogenic Rock Deposits and should be agreed with	insignificant	Constructing Contractor	RDMED Constructing Contractor Regional services of MoE

		the MoE. All waste from the construction site will be disposed of in accordance with local environmental regulations and at sites approved by the environmental authority. The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in: • Waste handling • Waste treatment; and • Waste storage. Burning of waste on any construction site is forbidden with the exception of stub and small branches from felled trees and bushes, which is better to be burned in order to avoid pest dissemination.			
Air pollution from vehicle operations during construction in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas. Local dust.	Near the settlements	• Require adherence to engine maintenance schedules and standards (or use alternative fuels) to reduce air pollution. • Periodically water down or lightly oil temporary roads. • Enhance public transportation and traffic management capability. Cover trucks carrying cement and/or gravel; Wet or cover trucks carrying stone/ sand/ gravel; Haul materials in off peak traffic hours. The construction site will be watered as appropriate. Protective equipment will be provided to workers as necessary. All vehicles will be checked and repaired in case of need to eliminate increased emission due to damaged parts. All vehicles shall be maintained so that their noise and emissions do not cause nuisance to workers or local people. Regular maintenance of diesel engines will be undertaken to ensure that emissions are minimized, for example by cleaning fuel injectors. Routine maintenance will be to a high standard to ensure that vehicles are safe and that emissions and noise are minimized. All plant used on site will be regularly maintained so as to be in good working order at all times to minimize potentially polluting exhaust emissions. Vehicle refueling will be undertaken so as to avoid fugitive emissions of volatile organic compounds through the use of fuel nozzles and pumps and enclosed tanks (no open containers will be used to stored fuel). If deemed necessary in dry conditions or where significant quantities of dust are being or are likely to be produced mitigation measures will be arranged with the Construction Manager. Mitigation measures	insignificant	Constructing Contractor	RDMED Constructing Contractor

		will include: • Damping down using water bowsers with spray bars or other technical means;; • Sheeting of construction materials and storage piles; and • Use of defined haulage routes and reductions in vehicle speed where required. Materials will be transported to site in off peak hours. • Materials transported to site will be covered/ wetted down to reduce dust. The construction site will be watered as appropriate. Protective equipment will be provided to workers as necessary. All vehicles will be checked and repaired in case of need to eliminate increased emission due to damaged parts Such measures will be used, in particular, where human or animal receptors lie within 300m of the ROW (settlements near the road)			
Air pollution from asphalt plants.	Supplier site	Contract only licensed supplier having all required environmental permits.	insignificant	Constructing Contractor	RDMED Constructing Contractor
Noise pollution from vehicle operation during construction in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas. Local noise.	Near the settlements	Install and maintain mufflers on equipment. Routine maintenance will be to a high standard to ensure that vehicles are safe and that emissions and noise are minimized. All plant used on site will be regularly maintained so as to be in good working order at all times to minimize noise.	insignificant	Constructing Contractor	RDMED Constructing Contractor
Infrastructure. The main infrastructure element that could be affected is the nearest network of the irrigation channels. Damage caused by construction activities could be a issue.	21 channels	**Protection of irrigation channels including Tezi-Okami irrigation channel from construction related damage and contamination.** Permanent monitoring during construction. Full reinstatement in case of damage. Avoid dust and fuel contamination by reducing construction related traffic in the vicinity of the channel. Construction Camp will be situated near the channel and, therefore, additional care should be taken to avoid fuel contamination. Fueling operations should be conducted at a distance from the channel (30m)	insignificant	Constructing Contractor	RDMED Constructing Contractor Ministry of Agriculture
Quarrying Sites: potential impact of the increased quarrying activities on ichthyofauna, groundwater and landscape 140 cubic. meters of the inert materials should be explored and delivered to the working site	to be determined	Control of validity of licenses. (The license is given with description of exploration limits and reinstatement commitments). Control of vehicle operations. Avoid traverse of watercourse. Exclude leakage of oil or fuel. Check the condition of vehicles.	insignificant	Constructing Contractor	RDMED Constructing Contractor Regional services of MoE

Construction Camp Site The potential impacts related to the construction and operation of the camp could be summarized as follows: • Woodcutting during camp construction • Potential damage of topsoil • Contamination related to fuel storage and fuelling operations • Sewerage related contamination • Waste management	to be determined.	• Proper waste management. • Organize sewerage according standards. • Pollution prevention strategies: proper organization of fueling, waste management; • Proper storage of topsoil • Reinstatement of topsoil and vegetation cover; • Greenery planting project	insignificant	Constructing Contractor	RDMED Constructing Contractor Regional services of MoE
Creation of temporary breeding habitats for mosquito vectors of disease e.g. sunny, stagnant pools of water. Creation of stagnant water bodies in borrow pits, quarries, etc. suited to mosquito breeding and other disease vectors.	Whole alignment	Remove all created pools till spring-time. Reinstate relief and landscape.	insignificant	Constructing Contractor	RDMED
Health hazards by noise, air emissions and dust raised and blown by vehicles during construction activities.	Settlements	Dust control by application of water or chemicals. Noise control, installation of mufflers on equipment, daytime works; See points 11 - 13	insignificant	Constructing Contractor	RDMED Constructing Contractor
Impacts on archaeological sites and remnants	Whole alignment;	Permanent monitoring during land clearance and excavation activities. Stoppage and suspension of construction activities in case of archaeological findings. Completion of required archaeological works before restarting construction activities. Conservation of remnants.	insignificant Not determined	Archaeologist from CAS Constructing Contractor	RDMED Constructing Contractor Archaeologist from CAS
biological recontamination during earthworks near pest-holes of soil infections (e.g. anthrax);	Whole alignment	Permanent monitoring during land clearance and excavation activities. Stoppage and suspension of construction activities in case of burial site findings. Notification to the local division of Veterinary Department. Veterinary clearance before start up.	insignificant	Constructing Contractor	RDMED Constructing Contractor
Hazardous driving conditions where construction interferes with pre-existing roads.	Whole alignment	Provide in design for proper markers and safety signs on roads, including lights. Instruct the drivers	insignificant	Constructing Contractor	RDMED

Final Reinstatement and Long-term Anti-erosion Measures	Whole alignment All working sites.	All the work sites (except permanently occupied by the road and supporting facilities) should be reinstated to its initial conditions (relief, topsoil, vegetation cover). So far as very limited woodcutting and bush clearance is required for the highway upgrading, preservation of top-soil is sufficient for reinstating the natural grass vegetation cover as well	insignificant	Constructing Contractor	RDMED Constructing Contractor
Protection of existing greenery	Whole alignment	The felled trees should be registered and compensated in accordance with the relevant regulations (in particular – "The law Protection of the State Forest Deposits and Greenery Plantation in Tbilisi and its Surroundings"). Tree felling should be performed upon preliminary notification to the relevant authority (Regional Services of MoE or Municipal Services). Form of compensation is – planting of new greenery.	insignificant	Constructing Contractor	RDMED Constructing Contractor
Landscaping and planting of greenery	Whole alignment	For the start up of construction activities special Landscaping and Eco-compensation project should be elaborated to compensate the tree felling on Chognari forested section. The eco-compensation project should be agreed with the forestry department of MoE.	about 60000 GEL.	Constructing Contractor	RDMED Constructing Contractor
Accident risks associated with vehicular traffic and transport, that may result in spills of toxic materials, detonation of explosive load, injuries or loss of life(see WB Environmental Sourcebook: 'Hazardous Materials Management' section), injuries or loss of life (see 'Public Health and Safety section) Accidents due to construction related vehicles and heavy machinery or traffic interference with construction activities.	Whole alignment; sensitive sites: settlements	• Provide in design for proper markers and safety signs on roads, including lights. Instruct the drivers • Design and implement safety measures and an emergency plan to contain damages from accidental spills. • Designate special routes for hazardous materials transport. • Regulation of construction transport in terms of traffic interference. • Prohibition of toxic waste transport through ecologically sensitive areas and densely populated areas.	insignificant	Constructing Contractor	RDMED Constructing Contractor

Operation Phase

Long-term impacts of Project Implementation and Specific Impacts of Operation Phase

Impacts	Sites	Mitigation Measures	Costs	Responsibility for Implementation	Responsibility for Monitoring and Enforcement
Lon-term degradation of natural landscape at land strips and slopes adjacent to highway. Visual impacts. Change of drainage patterns, erosion, degradation of vegetation, fragmentation of habitats.	Whole alignment	**Mitigation strategy:** prevalence of long-term remediation and conservation measures. Restoration of the landscape to the natural shape (at the sites not occupied permanently by the carriageways and road facilities, and where reinstatement is possible). Reinstatement of landscape. Restore topsoil and vegetation cover, bio-restoration, landscaping, mitigation of visual impacts;	No extra costs	Constructing contractor RDMED in long-term perspective	RDMED Regional services of MoE
Lon-term degradation of natural landscape (relief, soil cover, vegetation, habitats and wildlife) on the access roads, in the borrow pit sites, waste dumps, construction camps and equipment yards.	territories adjacent to RoW (whole alignment) Camp Borrow pits sites	Restoration of the landscape to the natural shape (to the extent possible). Reinstatement of landscape and vegetation cover, bio-restoration, landscaping, mitigation of visual impacts, conservation of replanted rare species. Restoration of sites to original conditions to extent possible through reclamation measures	No extra costs	Constructing contractor RDMED in long-term perspective	RDMED Regional services of MoE
Erosion from road cuts and fills and sedimentation of natural drainage ways. Erosion of lands below the road bed receiving concentrated outflow from covered or open drains. **Character of impact**: long-term. Change of relief, drainage patterns, land clearance, may cause gradual but stabile intensification of erosion	Whole alignment	**Mitigation strategy:** long-term – remediation; reinstatement of relief and landscape; Installation of long-term drainage systems and anti-erosion structures. • reinstatement of relief, soil and vegetation cover • installation of long-term drainage system and permanent monitoring.; • Installation of sedimentation basins, seeding or planting of erodible surfaces as soon as possible • Increase number of drain outlets. • Place drain outlets so as to avoid cascade effect. • Line receiving surface with stones, concrete. • Long-term monitoring and maintenance	No extra costs	Constructing contractor RDMED in long-term perspective	RDMED Regional services of MoE
Landscape disfiguration by embankments and deep cuts, fills and quarries. Marred landscape (scars from rod cuts, induced landslides and slumps etc.).	RoW whole alignment; Sites:	• Maintenance and and/or restoration of roadside vegetation • Use an architectural design to 'blend with the landscape. • Replant disfigured surfaces.	insignificant	Constructing contractor RDMED in long-term perspective	RDMED Regional services of MoE
Increased suspended sediment in streams affected by erosion at	RoW KP	**Mitigation strategy:** long-term – remediation; Reinstatement of relief and landscape; Long-term monitoring;	Insignifi-cant	Constructing contractor	RDMED

construction sites and fresh road cuts, fills and waste dumps. declined water quality due to increased sedimentation. **Character of impact**: long-term. Change of relief, drainage patterns, land clearance, may cause gradual but stabile intensification of erosion	near rivers	Installation of long-term drainage systems and anti-erosion structures. Reinstatement of vegetation cover. • Protect susceptible surfaces with mulch or fabric, • Establishment of vegetative cover on erodible surfaces as soon as possible • Establishment of retention ponds to reduce sediment loads before water enters streams		RDMED in long-term perspective	Regional services of MoE
Soil and water contamination by oil, grease, fuel and paint alongside the highway	Whole alignment	Facilitate installation of standard refueling stations and repair shops along the highway	Insignifi-cant	RDMED in long-term perspective	RDMED
Air pollution from asphalt plants during maintenance works.	Settlements	Install and operate air pollution control equipment.	Insignifi-cant	RDMED supervising works and Maintenance Contractor	RDMED
Air pollution from vehicle operation, in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas. Local dust.	Settlements	• Monitoring of air quality and traffic related emissions (including inspection of vehicle emissions) • Development of policy and regulations limiting traffic related emissions (regulations on fuel quality etc.) • Require adherence to engine maintenance schedules and standards (or use alternative fuels) to reduce air pollution. • Plant trees along the roadside to screen and smoothen emission impacts on the close located villages	Insignifi-cant	MoE Constructing contractor RDMED in long-term perspective	RDMED
Noise pollution from vehicle operation, in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas.	Settlements	• Require adherence to engine maintenance schedules and standards • Plant trees along the roadside to screen and smoothen noise impacts on the close located villages • Enhance public transportation and traffic management capability.	Insignifi-cant	Maintenance contractor RDMED in long-term perspective	RDMED
Roadside litter.	Whole alignment	• Provide for disposal facilities. • Encourage anti-littering laws and regulations.	Insignifi-cant	Local Government authorities and RDMED provide facilities and Regional services of MoE tracks compliance with standards	RDMED Regional services of MoE
Infrastructure. The infrastructure	21 channel	**Monitoring during construction.**	Insignifi-	Constructing	RDMED

elements that could be affected is the nearest network of the irrigation channels.	crossings	**Reinstatement of accidentally damaged channels.**	cant	Contractor	Constructing Contractor
Creation of a new pathway for disease vectors affecting humans and animals. Creation of a transmission corridor for diseases, pests, weeds and other undesirable organisms	Whole alignment	Establishment of plant ad animal sanitation service and related to control the whole highway. Activity not specific for the current project.	Insignifi-cant	Customs Services, "Sanitary Supervision Inspection of the MLHSP", and the "National Service for the Foodstuffs Safety, Veterinary and Plant Protection" of the Ministry of the Agriculture	RDMED
Health hazards by dust raised and blown by vehicles.	Settlements	Impact is minimal on asphalt paved highway. Dust control by application of water.	Insignifi-cant	RDMED	RDMED
• Dislocation and compulsory resettlement of people living on the right of way • Near cites and in rich farming regions, many people can be affected	Settlements	Minimise resettlement by proper routing and design. Develop RAP ; provide meaningfull public consultations; implement RAP			
Obstruction of routes from homes to farms, etc, increasing travel time.		Design of interchanges (in average each 3 km) have mitigated this potential impact.	Included in construc-tion costs	Constructing Contractor	RDMED
Induced development: roadside commercial, industrial, residential, and "urban sprawl".		Facilitate roadside commercial activities. Assist to persons who had roadside commercial activity on the old alignment, avoided by new route.			
Planned development and illegal invasion of homelands of indigenous peoples by squatters and poachers causing serious social and economic disruption	Yes Minor	Minor issue.			

Landscaping and planting of greenery	**Whole length of the Highway**	Development of the roadside zone applying proper landscaping and greenery planting strategies. Visual and aesthetic, as well as emission screening aspects should be taken into consideration.	To be de-termined by RDMED	RDMED Contractor	RDMED
Accident risks associated with vehicular traffic and transport, that may result in spills of toxic materials injuries or loss of life(see WB Environmental Sourcebook: 'Hazardous Materials Management' section), injuries or loss of life (see 'Public Health and Safety section) Accidents due to increased traffic.		Facilitate development of legislation and enforcement system regulating transportation of hazardous materials. Facilitate emergency preparedness and development and implementation of the sectoral (RDMED) and National Emergency Response Plan related to Natural and Technogenic Hazards (developed by the ministry of Interior in 2006); • Design and implement safety measures and an emergency plan to contain damages from accidental spills. • Designate special routes for hazardous materials transport. • Regulation of transport of toxic materials to minimize danger. • Prohibition of toxic waste transport through ecologically sensitive areas.	Insignifi-cant	MoE MoI TRC RDMED	RDMED MoE MoI TRC

Appendix 2. Environmental Monitoring Plan

Construction Phase

Phase	**What?** (*parameter is to be monitored)*	**Where?** (is *the parameter to be monitored)*	**How?** (is the parameter to be monitored /type of monitoring equipment/?)	**When?** (*is the parameter to be monitored – frequency of measurement or continuously)*	**Why?** *(is the parameter to be monitored (reply is not obligatory))*	**Cost**	**Responsible Institution**
Material supply	Possession of official approval or valid operating license	Supplier of materials (asphalt, cement and gravel)	Inspection checking licences	Before an agreement for the supply of materials is formalized	Assure compliance with HSE requirements	N/a	Plant operator; Constructing Contractor RDMED
Material transport according to the schedule and routes defined for deliveries	Truck loads covered/ wetted Air pollution due to the dust and fumes related to the Material Transport	Construction site	Supervision dust dust abatement measures in EMP	Unannounced inspections during work hours	Assure compliance with HSE requirements. Ensure safety, and minimize traffic disruption.	Minimal Included in supervision contracts	Constructing Contractor; RDMED
Top-soil stripping stage. Final reinstatement.	Top-soil storage. Reinstatement. Erosion control. Landscape destruction; Visual impacts;	Construction site	Supervision Compliance with topsoil protection measures (EMP)	Periodic (Unannounced inspections during work hours); Following completion of the works.	Assure compliance with, construction standards, environmental norms and EMP provisions;	Minimal Included in supervision contracts	Constructing Contractor RDMED
Construction work hours	Noise levels; Equipment;	Construction site	Inspection; noise measuring device; Compliance with EMP	Periodic (average once per month); Following complaints	Assure compliance with HSE requirements.	Minimal Included in supervision contracts	Constructing Contractor RDMED
Construction work hours	Vibration	Construction site	Supervision Compliance with EMP	Unannounced inspections; following complaints	Assure compliance with HSE requirements.	Minimal Included in supervision contracts	Constructing Contractor RDMED
Construction work hours	Dust and Air pollution (solid particles, suspended solids, flying heavy metal particles)	At or near construction site	Visually dust dust abatement and vehicle maintenance measures in EMP	During material delivery and periodically in dry periods during construction	Assure compliance with HSE requirement, Assure compliance with, environmental norms and EMP provisions.	Minimal Included in supervision contracts	Constructing Contractor RDMED

Phase	**What?** (*parameter is to be monitored)*	**Where?** (is *the parameter to be monitored)*	**How?** (is the parameter to be monitored /type of monitoring equipment/?)	**When?** (*is the parameter to be monitored – frequency of measurement or continuously)*	**Why?** *(is the parameter to be monitored (reply is not obligatory))*	**Cost**	**Responsible Institution**
Whole construction period.	Traffic safety/ Vehicle/ pedestrian access Visibility/ appropriate signs	Construction site	Observation Compliance with EMP	Once per week in the evening	Assure compliance	Minimal Included in supervision contracts	Constructing Contractor; RDMED
Whole construction period.	Material and waste storage, handling, use Water and soil quality (suspended solids, oils, etc)	Material and waste storage sites; Run off from site; material storage areas; wash down areas	Observation Waste at working sites Soil and material storage practice Compliance with EMP	During material delivery and periodically during construction (average 1/week), especially during precipitation (rain/ snow/ etc).	Assure pollution abatement; Assure compliance with, construction standards, environmental norms and EMP provisions;	Minimal Included in supervision contracts	Constructing Contractor; RDMED
Whole construction period.	Waste Management	All construction sites; Camps;	Observation Waste at working sites Compliance with EMP	Once per week	Assure pollution abatement; Assure compliance with, construction standards, environmental norms and EMP provisions	Minimal Included in supervision contracts	Constructing Contractor; RDMED
Whole construction period.	Equipment maintenance and fuelling Water and soil quality (suspended solids, oils, fuel, etc)	Refueling and equipment maintenance facilities; Run off from site; material storage areas	Observation site contamination; Compliance with EMP	During material delivery and periodically during construction (average 1/week), especially during precipitation (rain/ snow/ etc).	Assure pollution abatement	Minimal Included in supervision contracts	Constructing Contractor; RDMED
Whole construction period.	Impacts on archaeological sites and remnants	All earthwork sites	Observation archaeological remnants in RoW Compliance with EMP	Permanent/daily	Assure cultural heritage protection	Minimal	CAS represent. Constructing Contractor; RDMED;

Phase	**What?** (*parameter is to be monitored)*	**Where?** (is *the parameter to be monitored)*	**How?** (is the parameter to be monitored /type of monitoring equipment/?)	**When?** (*is the parameter to be monitored – frequency of measurement or continuously)*	**Why?** *(is the parameter to be monitored (reply is not obligatory))*	**Cost**	**Responsible Institution**
Whole construction period.	biological recontamination during earthworks near pest-holes of soil infections (e.g. anthrax);	All earthwork sites	Observation carcasses of animals and burial sites at the earthwork sites; Compliance with EMP	Permanent/daily	Assure health protection	Minimal Included in supervision contracts	Construction Field officer; RDMED Veterinary Department of the NSFSVPP
Whole construction period.	Protection of infrastructure elements	Crossings of irrigation channels;	Observation; damage of channel; Compliance with EMP	During construction activities at the sites of concern	Assure infrastructure protection	Minimal Included in supervision contracts	Constructing Contractor ; RDMED
During and after completion of construction	Greenery Planting/ Eco-compensation	Chognari area	Observation compliance with the tree felling plan agreed with the MoE Compliance with the eco-compensation requirements set forth by MoE	During and after completion of construction	Assure additional protection of	Minimal Included in supervision contracts	Constructing Contractor; RDMED
Whole construction period.	Protective equipment. Organization of traffic by-pass; H&S requirements	Construction site	Inspection Compliance with the HSE plan prepared by the constructing contractor	Unannounced inspections during works	Assure compliance with HSE requirements	Minimal Included in supervision contracts	Constructing Contractor; RDMED

Operation Phase

Phase	**What?** (*parameter is to be monitored)*	**Where?** (is *the parameter to be monitored)*	**How?** (is the parameter to be monitored /type of monitoring equipment/?)	**When?** (*is the parameter to be monitored – frequency of measurement or continuously)*	**Why?** *(is the parameter to be monitored (reply is not obligatory))*	**Cost**	**Responsible Institution**
Whole operation period	**Lon-term degradation of natural landscape** at land strips and slopes adjacent to highway. Development of landslides, rockfalls and other natural hazardous processes. Visual impacts. Change of drainage patterns, erosion, degradation of vegetation	Whole alignment	Observation criteria: erosion, rockfall and landslide features; comparison of landscape with pre-project features;	Quarterly	Assure erosion protection, reinstatement and mitigation of visual impacts;	N/a	RDMED personal responsible for engineering and environmental monitoring ;
Whole operation period	Increased suspended sediment in streams affected by erosion	Near rivers;	Observation Erosion and runoff features;	Quarterly	Assure water protection;	Minimal	RDMED Field officer;
During maintenance works	Air pollution from asphalt plants during maintenance works.	Whole alignment	Observation; Checking technical compliance of plant;	Once during start up of maintenance works	Pollution abatement;	Minimal	
Whole operation period	Routine waste and pollution management; Roadside litter and minor fuel contaminations;	Whole alignment	Observation waste and fuel contamination signs on the road;	Monthly	Waste management and pollution abatement;	Minimal	RDMED Field officer;
Whole operation period	Air pollution from vehicle operation	Near settlements	Observation; Sampling/analysis	Quarterly/Annually	Pollution abatement;	Minimal	MoE
Whole operation period	Noise pollution from vehicle operation	Near settlements	**Noise measurement**	According to MoE plan; Upon grievances	Noise protection and compliance with HSE requirements;	Minimal	MoE
Whole operation period; Especial attention during epidemics and plant disease expansion;	Plant/veterinary sanitation measures	Special check-points	Checking cargo certificates; special procedures;		Prevention of disease spread;	Minimal	Plant Protection Inspection of the NSFSVPP
Whole operation period	Emergency preparedness	Emergency team offices; Simulation trainings;	Emergency team offices; Simulation trainings;	Annually Checking the Plan and training practices;	Emergency preparedness; Rescue and salvage operations; Pollution abatement;	Minimal	MoE; MoI

9. PUBLIC CONSULTATION AND DISCLOSURE

9.1 Requirements for Public Review

Legislation and regulations of Georgia

In April 2000 Georgia ratified Aarhus convention. This UNECE convention facilitates and regulates information availability, public society involvement in the decision making and law availability issues for the field of environmental protection. It implements the principle of the need of involvement of all interested parties in order to reach steady development. The convention provides the field of environmental protection to be turned within the area of governmental accountability, transparency and responsibility. Social involvement provides for the better projects creation, better development and co-governance.

The law of Georgia on Environmental Impact Permit (2008) gives the description of the procedure of social consulting in the process of EIA and defines timeline of EIA public review and consulting, namely:

1. The project executor will conduct public review on the impact on environment before submittal of the project to the governmental agency responsible for permission issuance (in case if activities to be performed require constructional permission, public review must be conducted before starting the second step of the permission obtaining procedures).
2. The project executor will publish the information on the planned activity after the conducting of public review. The information will be published by the administrative territorial office (if any) of the region, where the activity is planned.
3. The announcement must contain the following information:
   a) goal, title and place of the planned activity;
   b) location of the agency where the interested subjects will be able to familiarize themselves with the documents associated with the activity (including reports on environmental impact);
   c) the deadline for submittal of considerations;
   d) place and time for public review.
4. The executor will:
   a) provide EIA hard copy and electronic version to the administrative agency, that issues permission in a week after publication;
   b) accept and consider written notes and considerations provided by citizens in 45 days after the date of evaluation publication;
   c) conduct public review of the planned activity no later than in 60 days after the publication of the announcement;
   d) invite corresponding local self – administration and governmental agencies representatives; the Ministry of the Environmental Protection and the Ministry of Economical Development and other involved administrative agencies to the public review;
5. Reviews will be conducted in a public way and any citizen will be able to attend it.
6. Public review will be conducted at the region administrative center, where the activity is planned.

According to the article 7 of the law, during 5 days after conducting the public disclosure meeting, the minutes of the meeting should be prepared to reflect all the questions and comments raised and explanations, provided by the project proponents in response. Appropriate corrections should be incorporated into the main text of the EIA, if required. If the comments and proposals of stakeholders are not accepted the letter of explanation should be sent to the authors. The

minutes of the meeting, as well as response letters, explanations and corrections should be submitted to the MoE or the administrative body responsible for issuing the Permit as supplementary materials to the EIA. The mentioned documents should be considered as an essential part of the EIA.

JBIC requirements for Public Disclosure

Disclosure of Information Regarding Confirmation of Environmental and Social Considerations by JBIC

(1) Basic Principles

JBIC welcomes information provided by concerned organizations and stakeholders, so that it may consider a diverse range of opinions and information in its environmental reviews and supervision of projects. In order to encourage concerned organizations and stakeholders to provide information to JBIC at an early stage and to ensure its accountability and transparency in the environmental review process, JBIC makes available, important information on environmental reviews in ways appropriate to the nature of the project, while the environmental review is in progress. JBIC may also, when necessary, seek the opinions of concerned organizations and stakeholders.

In addition to the aforementioned principles, if requested by third parties, JBIC will provide them with information regarding environmental and social considerations within its capacity to do so. JBIC respects the confidentiality of the commercial and other matters of the borrowers and related parties, and observes concurrently the principles of information disclosure and such confidentiality.

(2) Timing of Disclosure and Content of Disclosed Information

Prior to making decisions on funding and depending on the nature of the project, JBIC discloses information in principle at the timing and with the contents listed below. JBIC endeavors to disclose information in a manner that allows enough time before decisions are made on funding:

• Upon completion of the screening of a project, JBIC discloses, as soon as possible, the project name, country, location, an outline and sector of the project, and its category classification, as well as the reasons for that classification; and
• For Category A and Category B projects, JBIC publishes the status of major documents on environmental and social considerations by the borrowers and related parties, such as EIA reports and environmental permit certificates, etc. issued by the host government on the JBIC website, and promptly makes available the EIA reports etc.

After executing a loan agreement, JBIC provides the results of its environmental reviews of projects in Categories A, B and FI for public perusal on the JBIC website.

JBIC pays due consideration to the confidentiality of the commercial and other matters of the borrowers and related parties, taking into account their competitive relationships, and encourages them to exclude such confidential information from any documents on environmental considerations submitted by them that may later be subject to public disclosure. Any information that is prohibited from public disclosure in the agreement between JBIC and the borrower may be disclosed only with either the agreement of the borrowers and related parties or in accordance with legal requirements.