Municipal Development Fund of Georgia

Initial Environmental Examination

Section-1: Tbilisi-Phonichala

Volume-1

Engineering, Procurement, Construction Management and Supervision of the Modernization of Tbilisi-Rustavi Section of the Tbilisi-Red Bridge (Azerbaijani Border) Road

Contract No: SUTIP/C/QCBS-3

Funded by
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Prepared by: WEG
Prepared for:
DOHWA Ltd / TRANSPROJECT Ltd
Ministry of Regional Development and Infrastructure

GEORGIA

2012

Korea **Georgia** **Georgia**

TABLE OF CONTENTS

VOLUME II. ANNEXES

Annex 1. Legal Framework and Administrative Structure in Georgia

Annex 2. Report of The Environmental Protection Agency on Measurements of Baseline Contamination Within The Project Area

Annex 3 Modeling of Traffic Related Emissions

Annex 4. Licensed Quarries in Project Area

Annex 5. Procedures for Extraction of Plant Species Included in Red List of Georgia from the Natural Environment and Change of Category of Forestry Fund Land

Annex 6. Waste Management Plan for Construction Camps and Equipment Yards

Annex 7. Protocols of Public Consultation Meetings

GLOSSARY
(piquets -kilometers).

ABBREVIATIONS

ADB	Asian Development Bank
EIA	Environmental Impact Assessment
EIP	Environmental Impact Permits
EMP	Environmental Management Plan
HWL	High Water Level
IFI	International Financial Institution
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
L/A	Loan Agreement
MAC	Maximum Admissible Concentration
MoE	Ministry of Environment Protection and Natural Resources
NSFSVPP	National Service for Food Safety, Veterinarian and Plant Protection
ODA	Official Development Assistance
PAP	Project Affected Persons
RAP	Resettlement Action Plan
RD	Roads Department
RDMRDI	Roads Department of Ministry of Regional Development & Infrastructure of Georgia
RoW	Right of Way
RPF	Resettlement Policy Framework
TEM	Trans-European Motorway
TOR	Terms Of Reference
USSR	Union of Soviet Socialist Republics
WB	World Bank

WEIGHTS AND MEASURES

°C	degree Celsius
ha	hectare
km	kilometre
km^2	square kilometres
litres/s	litres per second
m	metre
m^2	square metre
m^3/s	cubic metre per second
m^3	cubic metre
mm	milimetre
s	seconds

CURRENCY EQUIVALENTS

Currency Unit - Lari (GEL)
$1 = approx1.637 (March 2012)

NOTE

In this report, “$” refers to US Dollars.

Executive Summary

Background

The modernization of road section-1of 4 km from Tbilisi to Phonichala forms a part of Tbilisi-Rustavi Highway with a total length of 17.1 km is one of the components /sub-projects identified for reconstruction. The Municipal Development Fund of Georgia (MDF) is the project executing, implementing and disbursing agency. The MDF is the Employer and acts on behalf of the municipality and the Road Department of Georgia. The project will focus on the improvement of the existing transport services linking Tbilisi to Rustavi. The Project includes targeted measures and specific facilities such as provision of interchanges, road widening, bus stops, road marking, revetment, stabilization treatment of sanitary area, footbridge or underpass to ensure a quick, safe and reliable bus services and guarantee proper physical connection with metro network at the entrance of the city.
The national consulting firm WEG has been engaged by DOHWA Engineering Ltd/Transproject Ltd to prepare and deliver the IEE for Tbilisi-Phonichala Project to MDF.

Scope of Report

The IEE demonstrates and describes the need for this Project. The IEE details the Project concept design, proposed method of delivery and proposed location of the Project. This IEE considers the technical constraints of the Project and by doing so presents the potential positive and negative social and environmental impacts that may result from its implementation.

This IEE presents the following:

- Introduction and assessment methodology;
- Project Description
- Legal requirements;
- Description of existing environment:
- Socioeconomic condition
- Considered Project alternatives;
- An assessment of potential impacts as a result of the Project:
- Proposed mitigation and environmental management plan;
- Environmental Monitoring Program
- Public consultation;
- Grievance Redress Mechanism
- Conclusions and recommendations

Objectives

This Initial Environmental Examination (IEE) has been prepared as part of the ADB supports (ADB Loan 2655-GEO) in undertaking the feasibility/design of the Engineering, Procurement, Construction Management and Supervision of the Modernization of Tbilisi-Phonichala Section. Further, this existing road continues towards the Tbilisi-Red Bridge (Azerbaijani Border) Road up to 17.1 km as end of the Project.
The objective of the study is to help the Government prepare and implement an efficient, safe and sustainable transport network, in accordance with international environmental safeguards.

Project Description

This IEE Report is prepared for **Section 1: (Subproject-1,Tbilisi to Phonichala**, has 4.0km long length of road alignment on the Project. It will be considered upgrading the existing section of the road between Tbilisi (Gulia street square) and Phonichala Settlement (Kvemo Phonichala). The existing 2~6 lanes road will be upgraded to 6 lanes of which the width of each lane has 3.50m. The central barrier is of 6m width. Side walk for pedestrian will be installed on both sides – of 2.5~3.0m width. Pavement is of asphalt concrete. The new road infrastructure includes three bridges, one of which locates at interchange and the other two locate over the dry gorges descending from adjacent slopes to the existing road, and one interchange. Construction of the infrastructure will entail acquisition of additional private land and will affect private structures and businesses somewhat. Besides, construction of the road will require replacement of the existing utilities and communication infrastructures either.

In addition, the project's special focus will also be given to the improvement of the express bus services linking Tbilisi to Rustavi, with specific facilities such as bus stops, road marking, footbridge or underpass will be developed to ensure a quick, safe and reliable bus services and guarantee proper physical connection with metro network at the entrance of the city.

Government Policies and Legislation, ADB SPS

The Annex 1, presents detail description of the environmental legal framework and administrative structure in Georgia including environmental regulations, measures required and indicates the institutions at the local and national levels responsible for issuing permits, licenses, and enforcing compliance with environmental standards. ADB safeguard requirements; screening and categorization of projects. This Section also provides public consultation procedures; procedure for official submission of EIA/IEE, Rules for construction projects by Government Ministries etc. In addition, information on relevant agencies such as, Road Department, Ministry of Environmental protection, and Ministry of Economy and Sustainable Development are assembled as well.

Summary of Findings

This IEE study has identified that there is the potential for both positive and negative environmental and social impacts to occur as a result of the Project. The IEE has determined that comprehensive and effective management and mitigation measures are feasible to be implemented through all delivery phases of the Project. Such measures could feasibly mitigate

potentially negative impacts and enhance the identified potential positive benefits. Key potential negative impacts identified in this IEE if unmitigated include:

- Impacts to environments are possible from the accidental spillage, leakage or improper management of hazardous substances such as fuels or oils;
- Wastes generated by the accommodation of personnel living and working on site could pollute nearby environments if improperly managed;
- Noise from project construction activities may affect local people or nearby fauna

The identified potential negative impacts are likely to be able to be minimized and managed effectively with the implementation of the measures detailed in the Environmental Management Plan.

Potentially positive impacts that could result from the Project include, safe driving conditions for transit motor transport flows and local residents and higher carrying capacity of the road. The design road is also very much important for the socio-economic development of the population of Kvemo Kartli region, particularly for the population and industries in the city of Rustavi and Gardabani region. Many of 120,000 residents of Rustavi work or study in Tbilisi.

In addition, the modernization of Tbilisi-Red Bridge (Azerbaijani border) road will allow transporting the passengers and various goods to Baku, the capital of Azerbaijan through the improved and modern road. This road will also make Tbilisi and Georgian Black Sea resorts and ports more accessible to the population of Azerbaijan.

The community consultation field work resulted in engagement with a large number of stakeholders, across a broad range of socio-economic groups. The main results of this consultation showed that the community is supportive of the proposed Project and perceived benefits of the Project by increasing business and local employment opportunities.

The detailed Resettlement Action Plan is under preparation. At this stage, it is summarized, that this project will affect as minimum 26 households. Its impact is related to permanent take of 36 private commercial land plots with total area of 33,481sq.m. None of the affected land plots is agricultural. No crops are cultivated on the affected commercial land plots. Acquisition of only 4 land plots is associated with losses of nearly 1000 trees. The main impact is related to the loss of land, structures and businesses. In total 20 structures will be destroyed, including 8 operational and non-operational gas filling stations, 2 Car Maintenance Workshops, 1 shop, 1 non-operational café, 1 liquefied gas plant, and 4 complexes of ancillary buildings. 9 legal entities will suffer in terms of business impacts (either temporary interruption or mostly permanent loss of business facilities). According to the ADB SPS 2009 this sub-project is thus classified as of category A and needs the preparation of a Land Acquisition and Resettlement Plan (LARP).

Results of this IEE suggest that the proposed Project is likely to be able to proceed without resulting in any negative significant impacts to physical, biological, or socio-economic environments occurring, if appropriate management measures are implemented. As such, the Project will have overall beneficial impact as well as some minor negative impacts that will be carefully monitored and adequately mitigated. Therefore, the completion of this IEE fully meets the MoE and ADB requirements and submitted to MoE to obtain Environmental Impact Permit.

1. INTRODUCTION

1.1 Background

1. The Government of Georgia signed a loan agreement of USD 85 million with the Asian Development Bank (ADB) under a MFF to implement the Sustainable Urban Transport Investment Program-Project-1. The modernization of road section of 4 km from Tbilisi to Phonichala forms a part of Tbilisi-Rustavi Highway with a total length of 17.1 km is one of the components /sub-projects identified for reconstruction. The Municipal Development Fund of Georgia (MDFG) is the project executing, implementing and disbursing agency. The MDFG is the Employer and acts on behalf of the municipality and the Road Department of Georgia. The objective of the Project is to develop an efficient, affordable, and environmentally sustainable transportation system that forms a part of the south-east route of the country.

2. The project will focus on the improvement of the existing transport services linking Rustavi to Tbilisi. The Project targeted measures and specific facilities such as provision of interchanges, road widening, bus stops, road marking, footbridge or underpass included to ensure a quick, safe and reliable bus services and guarantee proper physical connection with metro network at the entrance of the city. The Program was developed as the Government's response to the transportation problems in urban areas, which include large traffic volumes between Tbilisi and Rustavi route causing increasing delays, as a result of previous under-investment in infrastructure maintenance and expansion.

1.2 Objectives

3. This Initial Environmental Examination (IEE) has been prepared for Section-1, as part of the ADB supports (ADB Loan 2655-GEO) in undertaking the feasibility/design of the Engineering, Procurement, Construction Management and Supervision of the overall Modernization of Tbilisi-Rustavi Section of the Tbilisi-Red Bridge (Azerbaijani Border) Road of 17.1 km. The objective of the study is to help the Government prepare and implement an efficient, safe and sustainable transport network, in accordance with international environmental safeguards.

4. In addition, the IEE aims to identify the likely impacts, both positive and negative and assess the impacts on the environment of the proposed intervention undertaken by the MDF. The basic objective is to ensure that nobody is made worse off as a result of such development. The overall aim is to ensure that the proposed project is environmentally sound and sustainable following the international requirements laid out in United Nations Framework Convention on Climate Change to which Georgia is a signatory (Ref: Short List of the Ratified Conventions in Section 1.2.4 of Volume-II).

1.3 Methodology for IEE

5. This IEE follows the methodology outlined in the ADB Guidelines; ADB Safeguard Policy Statement, June 2009 (SPS 2009) and environmental Laws of the Government of Georgia. The experiences of other studies in preparing IEE documentation for transport sector have also been reviewed. This IEE is prepared based on review of preliminary design, collection of primary, secondary data and information, field visit, discussions with the MDF and Environment Department, and stakeholder consultations.

6. This report covers the description of existing environmental conditions, assessment of environmental impacts of proposed road project, recommended management and mitigation measures and monitoring of selected parameters. The environmental impact was considered for activities during pre-construction, construction and operation phases of the Project. The scope of the IEE covers the natural and human environment, their interaction and any induced change brought about by the road construction/reconstruction activities.

7. Further, various environmental activities were carried out at the project feasibility and planning stages. Sector experts conducted both office studies and field investigations and on-site assessment of the environmental condition. A full set of the required environmental and social information has been collected. The National Environmental Agency took samples of surface water, soil and ambient air and analyzed them. The design team checked the background noise and radiation along the entire alignment for the proposed route. Emission impacts of the traffic were analyzed using licensed software "Ecolog – Magistral".

8. Sensitive environmental and social receptors were analyzed in the project area and the results of the analysis were considered in design and planning of mitigation measures. The land acquisition and resettlement issues are submitted as a separate document – Resettlement Action Plan. Mitigation measures were integrated within the Environmental Management and Monitoring Plan

9. The IEE document is structured as main text and annexes. The main body of the text provides concise and logical description of the environmental condition, sensitive receptors, potential environmental impacts and relevant mitigation measures, integrated in the Environmental Management Plan (EMP). The annexes provide more detailed information regarding particular issues, like: the report of the he National Environmental Agency on the environmental pollution (water, soil and ambient air), the results of traffic pollution modeling.

10. However, the data from the following disciplines were also reviewed and incorporated in to the IEE study.

- Engineering
- Hydrology
- Ground water
- Public Health
- Land Acquisition and Resettlement

11. Thanks should be acknowledged to the MDF, concerned agencies, field level personnel, and local people who assisted in the studies.

2. DESCRIPTION OF THE PROJECT

2.1 Overview

12. The proposed Project is an Investment Program under MFF for the SUTIP-P1. The interventions considered under this Tranche include road shoulder improvement, road widening for development of 4 or 6[1] lanes from existing 2 lanes, pavement strengthening, drainage improvement, construction of new bridges/railway bridges, retaining walls, interchanges, overpass and underpasses for easy crossing of the local people and animals. The length of 17.1 km is divided into 3 sections. As such, Section-1 starts from 0.0 to 4.0 km; Section-2 from 4.0 to 10.5km[2] and Sectin-3 is 10.5 to 17.1km. This IEE is developed for Section-1from Tbilisi to Phonichala.

[1] The section 1 (km 0 – 4) will be widened from 2 current lanes to 6 lanes, while sections 2 and 3 will be reconstructed into 4 lane road.

[2] Under the Subproject 2 (Phonichala subproject) currently several alternative options are considered: the first variant envisages the upgrading of the existing road from 2 lane to 4 lane and other 3 options consider construction of 4 lane road with alternative alignments. For all of these alternative options the starting point is KM 4.0 of the existing road, and the end point is KM 11.

13. In addition, the project's special focus will also be given to the improvement of the express bus services linking Rustavi to Tbilisi, with specific facilities such as bus stops, road marking, footbridge or underpass will be developed to ensure a quick, safe and reliable bus services and guarantee proper physical connection with metro network at the entrance of the city.

2.2 Type and Category of Project

14. This is a road upgrading project from 2 lanes to 6 lanes. This reconstruction is to meet four lane Georgian design standard within the existing right-of-way (RoW) and categorized by ADB as Environment Category B since some adverse issues of lesser degree are involved with it for environmental assessment and therefore, an IEE is prepared.

2.3 Need for Project

15. Georgia's geographical location positions the country at the center of both East-West (the Black and Caspian Seas) and North-South (between Russia and Turkey) transit routes. Trade with neighboring countries is an important feature of the Georgian economy and estimated to be worth 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 the sustainable economic development of the country, the Government has managed to substantially increase investments in these sectors.

16. One of the Government's priorities has been to develop Georgia's competitiveness as a transit country by improving its East-West Transport Corridor and this is recognized in the National Development Plan. In the years 2003-2004 Louis Berger and Transprojekt Roads Survey and Design Institute of Georgia prepared a TACIS funded study on Rehabilitation of Caucasian Roads. This provided a significant amount of data for the existing roads and an improvement strategy with additional by-pass options to relieve traffic volumes and congestion in the urban areas through which the existing main highway still passed.

17. By now, the construction of some sections (Tbilisi-Agaiani, Agaiani-Igoeti, Igoeti-Gori) of the Eurasian corridor (E-60 highway) highway is accomplished and the construction of Kobuleti bypass is underway. At the same time, the modernization projects of other sections of the road are being developed.

18. International road Tbilisi–Red Bridge (Azerbaijan border) is an integral part of TRACECA Transport Corridor. The road links Georgia with Azerbaijan as well as with Europe and Asia. The modernization of Tbilisi-Red Bridge (Azerbaijani border) road allows transporting the passengers and various goods to Baku, the capital of Azerbaijan through the improved and modern road. This road will also make Tbilisi and Georgian Black Sea resorts and ports more accessible to the population of Azerbaijan. Tbilisi-Rustavi design freeway envisaged by the present project is a part of Tbilisi-Red Bridge road.

19. The design Tbilisi-Rustavi section of Tbilisi-Red Bridge (Azerbaijani border highway) road links the capital of Georgia with the major industrial and administrative center Rustavi and the district center Gardabani. Rustavi with its population of 120 thousand people is the main satellite city of Tbilisi megalopolis. Thus, the travel between Rustavi and Tbilisi is intense. This is natural if considering that many Rustavi inhabitants commute on daily basis towards Tbilisi to work or study. The existing 2-lane highway (one in each direction) has not enough capacity to carry the whole traffic entering or exiting Tbilisi at peak hours.

20. According to the data of the Road Department of the Ministry of Regional Development and Infrastructure of Georgia (hereinafter referred to as "The RD"), the given section of the design

road is overloaded, with the traffic intensity exceeding 14.000 vehicles a day, while the maximum carrying capacity of the existing road is 7.000 vehicles a day. The overloaded traffic often causes traffic jams creating major discomfort for the passengers. In addition, the increased amount of fuel used leads to the increased proportion of emission of products of combustion in the atmospheric air and deterioration of the atmospheric air quality in the adjacent settled areas.

21. Technical parameters of the existing road do not meet safety requirements, resulting in frequent accidents leading to injuries and human toll as well as economic loss. Sharp increase in the traffic intensity in terms of improper conditions of the road infrastructure often leads to car accidents. In this context, the Georgian Government has decided to improve the capacity of Tbilisi-Rustavi link by upgrading the road into a freeway.

22. After the further sections of the road are designed and constructed, the capital of Georgia will be linked to Azerbaijan and its capital Baku through the modern road meeting the international standards. This road will be used to comfortably transport the cargo and passengers to Tbilisi and Black Sea ports. The design road is also very much important for the social-economic development of the population of Kvemo Kartli region, particularly for the population and industries in the city of Rustavi and Gardabani region.

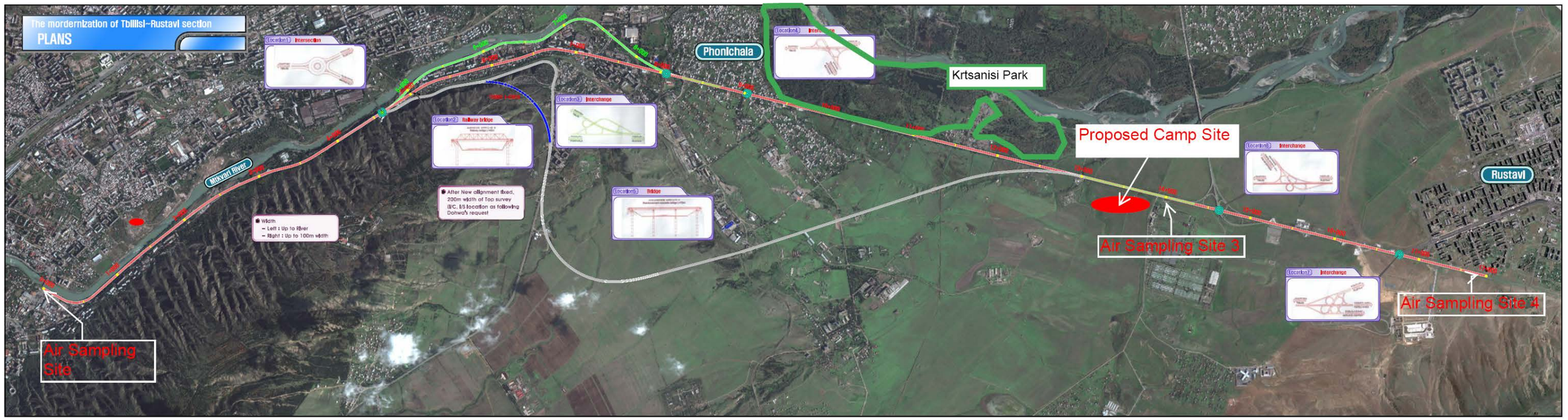
2.4 Location

23. Tbilisi-Rustavi road is located in Tbilisi and Gardabani district. The length of the design Tbilisi-Rustavi road is 17.1km. Generally, the aim of the project was to lay the road along the route recommended by the Feasibility Study Report; however, rerouting of some sections turned out to be necessary, in particular:

24. **Section 1: Tbilisi – Phonichala** has 4.0km long length of road alignment on the Project. Tbilisi-Ponichala section of the project alignment is entirety located in Tbilisi, passing through narrow paths between Shavnabada and the river Mtkvari. It will be considered upgrading the existing section of the road between Tbilisi (Gulia street square) and Phonichala Settlement (Kvemo Phonichala). The existing 2 lanes road will be upgraded to 6 lanes of which the width of each lane has 3.50m. The central barrier is of 6m width. Side walk for pedestrian will be installed on both sides – of 2.5~3.0m width. Pavement is of asphalt concrete. The new road infrastructure includes one bridge at interchange and the other two bridges over the dry gorges descending from adjacent slopes to the existing road, and one interchange. Construction of the infrastructure will entail acquisition of additional private land and will affect private structures and businesses somewhat. Besides, construction of the road will require replacement of the existing utilities and communication infrastructures either.

Table 2.1: Description of Section-1

Item	Length	Lane/ Width of cross section	Civil works items	Remark
Section-1	4.0 Km	6 lanes/ 35.0~36.0m	Interchange : 1EA Bridge : 3EA	



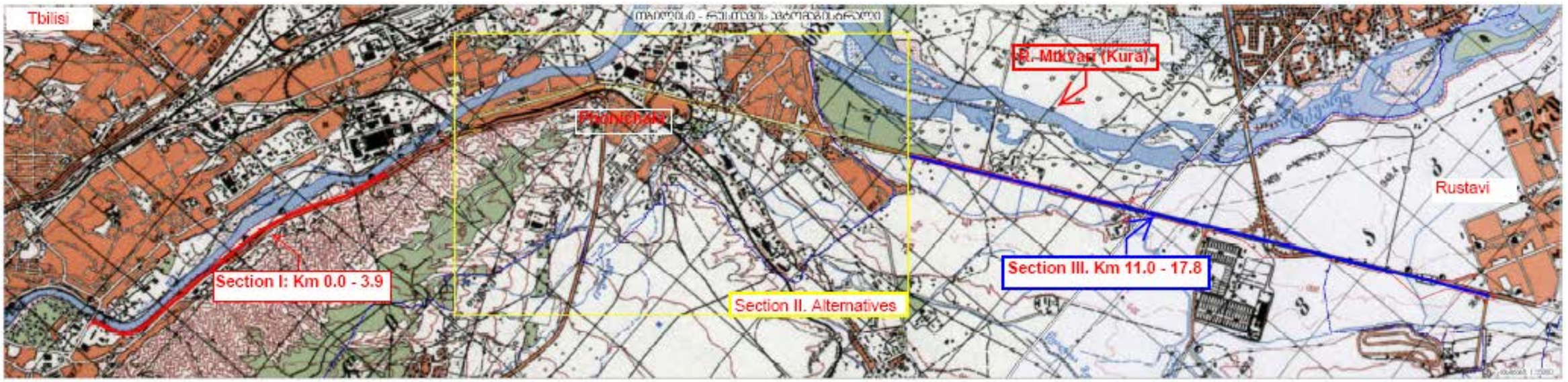


Figure-1 Topographic Map of the entire Tbilisi – Rustavi Section of the Highway

2.5 Proposed Schedule for Implementation

25. The Project is scheduled for implementation over a period of 17 months, starting in 2012.

2.6 Design Criteria and Parameters

Application of standard

Design loads– Georgian National Standards, TEM and SNIP
Bridges and overpasses –Georgian National Road Design Standards
–Georgian Seismic Standards
–SNIP
Traffic safety conditions - in accordance with TEM and SNIP standards.

Construction of 6-lane road in Tbilisi and 4-lane road after Tbilisi until Rustravi is envisaged in the design. Technical parameters adopted for the section Tbilisi-Ponichala are as follows:

- Design speed – 120 km/hr;
- Minimum radius of horizontal curve– 350 m;
- Maximum longitudinal slope – 4%;
- Minimum convex curve – 15 000 m;
- Minimum concaved curve – 5000 m;
- Crossfall – 2%;
- Number of traffic lanes - 6X3.5m
- Width of roadway – 28.5-34.5 m;
- Width of carriageway – 2X10.5 m;
- Width of lane – 3.5 m;
- Width of sidewalk - 2.5-3.0 m.

Roadway

Width of roadway without dividing strip adopted in the design for the road section Tbilisi-Ponichala is 28.5-34.5 m from PK 0+00 to PK 6+50 (km 0.0 – km0.65), whilst the width of roadway with the dividing strip from PK 6+50 to PK40+00 (km 0.65 – km 4.0) it is adopted 33.5-34.5 m.

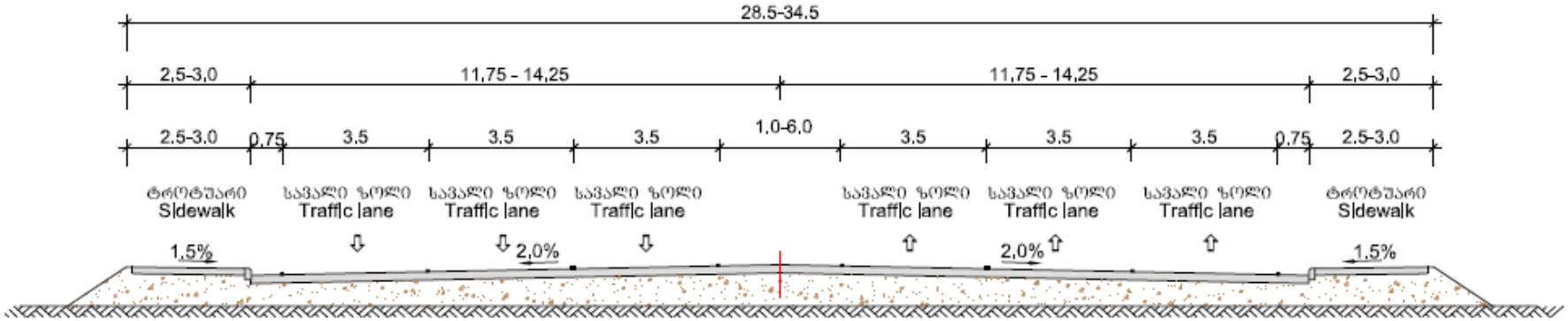
Fill slope adopted is 1:1.5.
Cut slope adopted is 1:1, whilst that adopted in rocky soil is 1:0.5.

Initial section of Tbilisi-Ponichala from PK 0+00 to PK 25+40, where existed a sanitary landfill in the past, contain soft soil and is classified as moist, brown, slightly sandy, slightly gravelly silty clayey soil with construction and household debris content. Constructon of crushed aggregates piles, paving of geotextile and geogrid within the mentioned road section is envisaged in the design to ensure roadway stability.

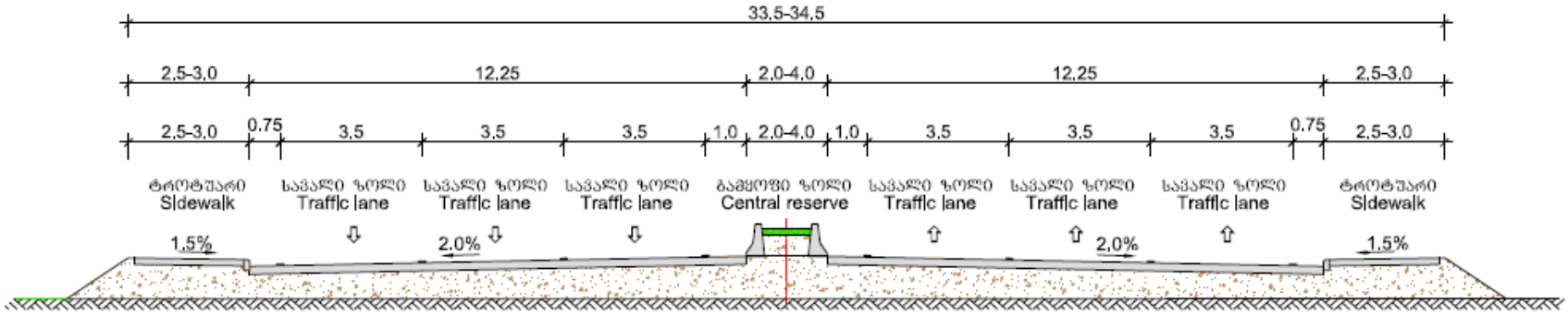
Volumes of earthworks are calculated according to the design cross profile.

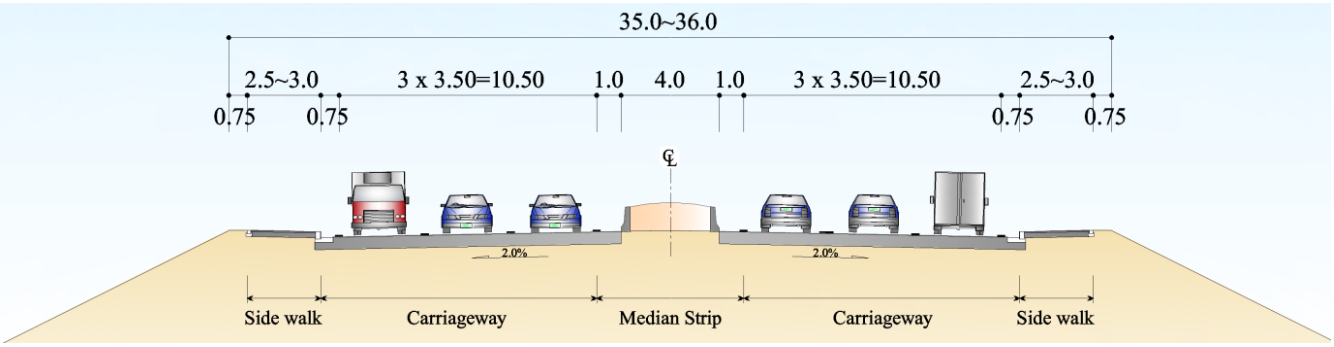
Widths of main lanes, paved shoulders and roadside are shown on the cross-sections, however widths of acceleration-deceleration lanes to be constructed at junctions and interchanges are not shown (see in a separate Table).

გზის ტიპიური განივი პროფილი
Typical cross section of road
პკ 0+00 - პკ 6+50



გზის ტიპიური განივი პროფილი
Typical cross section of road
პკ 6+50 - პკ 40+00





Details of the Project

Section 1

1) Length : 4.0km (STA. 0+000 ~ 4+000)
2) Width of Existing Road
   - STA. 0+000 ~ 0+640 : 19m (4 lanes)
   - STA. 0+640 ~ 2+600 : 32m (6 lanes)
   - STA. 2+600 ~ 4+600 : 10m (2 lanes)
3) Width of planning Road : 35~36m (6 lanes), width of each lane 3.5m
4) Bridge : 3EA / 105m
5) Interchange : 1EA
6) Special list
   - Sanitary land fill : STA. 1+800 ~ 2+700
   - Big slop face : STA. 3+600 ~ 4+000
7) Dividing central barrier 4m width
8) Side walk footway from both side 2.5 to 3.0m

2.7 Road Pavement Structure

26. Road pavement structure is designed considering technical and economic parameters and based on the following data:

- Traffic flow;
- Reliability factor;
- Service life.

Corresponding works for determining traffic flow were carried out, as well as expected future traffic flows for each year of the study were determined.

Traffic loads are based on the expected traffic flows.

Design reliability ensures good performance of pavement for the design period based on calculations of the expected traffic flows.

Design reliability of pavement is calculated for both traffic flows and service life, thus ensuring reliability means uninterrupted performance of pavement for the period of service life.

Design service life of pavement structure is at least 20 years.

Both rigid and non-rigid pavement alternatives were studied whilst selecting the road pavement structure. Comparison of pavement alternatives identifies that rigid pavement has some

advantages over non-rigid pavement. However, within the limits of Tbilisi application of non-rigid pavement has the advantage as in caselaying of utilities is required, cutting out the rigid pavement and its re-paving shall be complicated. Considering the above-mentioned, non-rigid pavement was applied on the section Tbilisi-Ponichala, whilst rigid pavement shall be applied on the section Ponichala-Rustavi.

1) **Non-rigid pavement** (asphalt concrete pavement)

Table 2.1 Non-rigid Pavement Structure : Pavement Layers and Thickness

Sl. No	Pavement Layers	Thickness of pavement layers, mm
1	2	3
1	Fine-grained dense asphalt concrete hot mix (wearing course)	50
2	Coarse-grained porous asphalt concrete hot mix (binder course)	100
3	Base course - crushed aggregates 0-40 mm and asphalt concrete granulate stabilized with the addition of bitumen emulsion (2.5 %) and cement 4% (15+10) cm	250
4	Sand and gravel mix (sub-base)	300

2.8 ENGINEERING STRUCTURES

Junctions and intersections

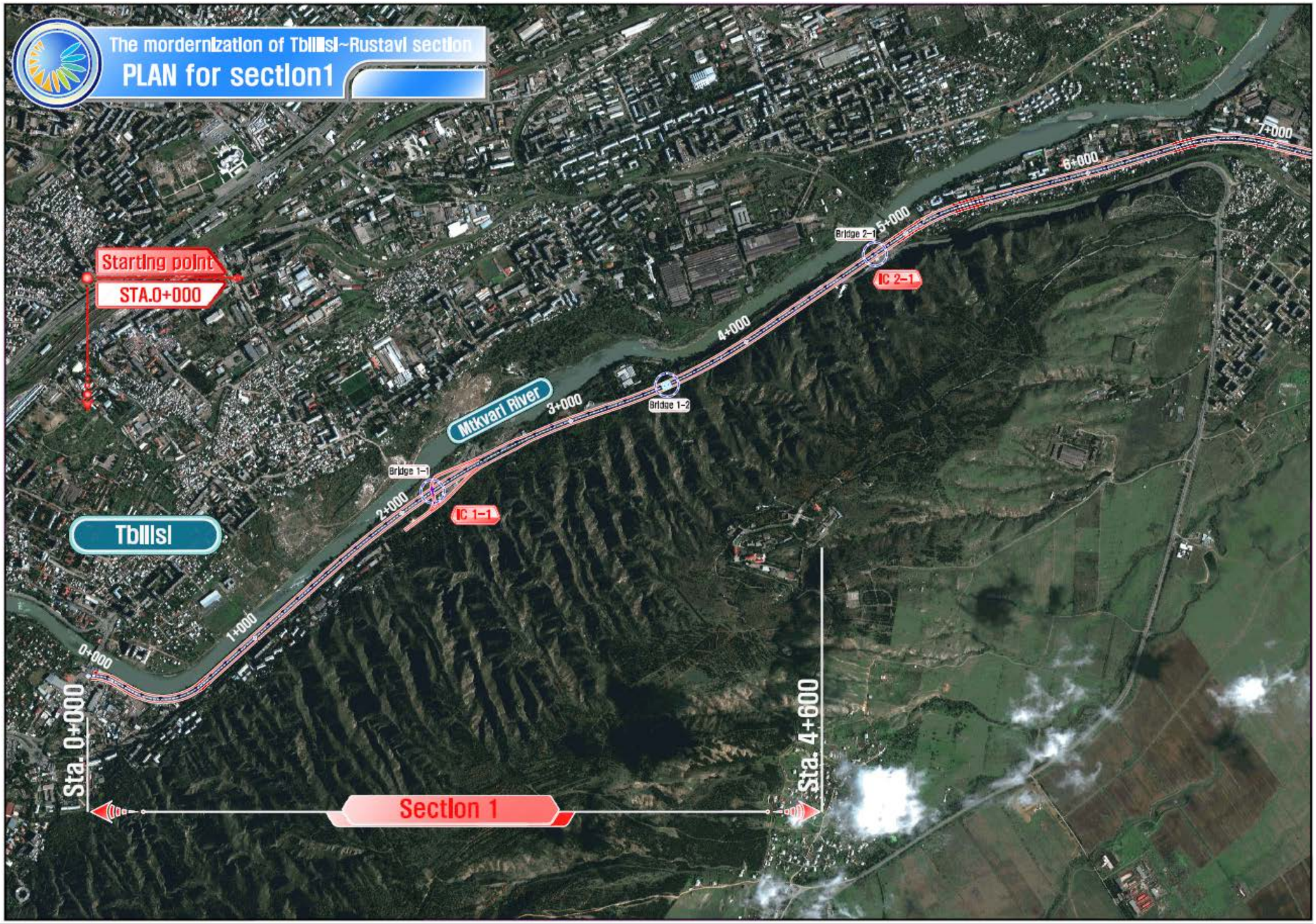
Construction of grade separate junctions and intersections is stipulated in the design:

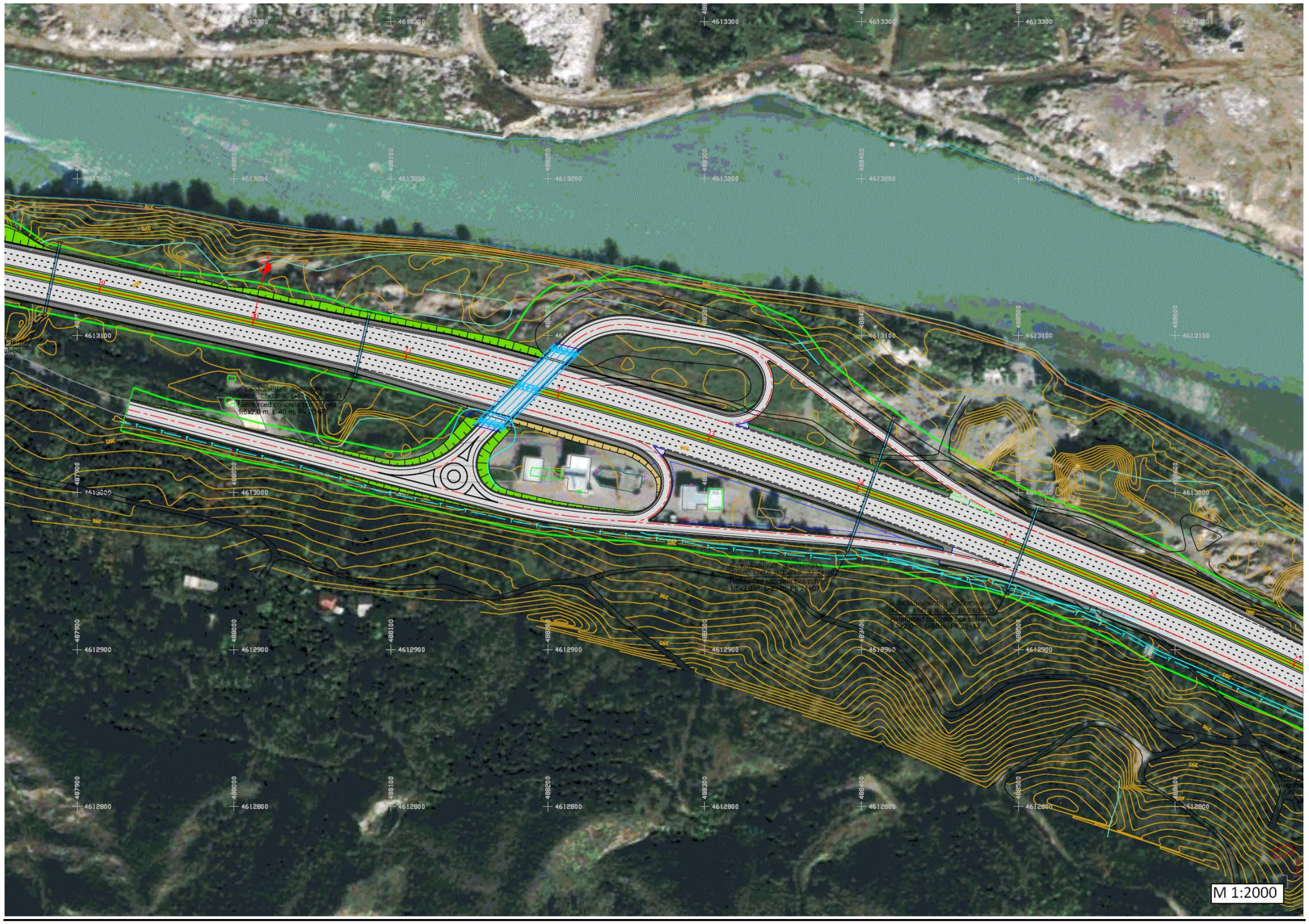
Interchange N1 on the road section Tbilisi-Ponichala
Interchange N1 shall be constructed at PK 21+80 (km 2.18). The interchange envisages junction of Gorgasali street with the motorway and construction of grade separate U-turn.

Bridges

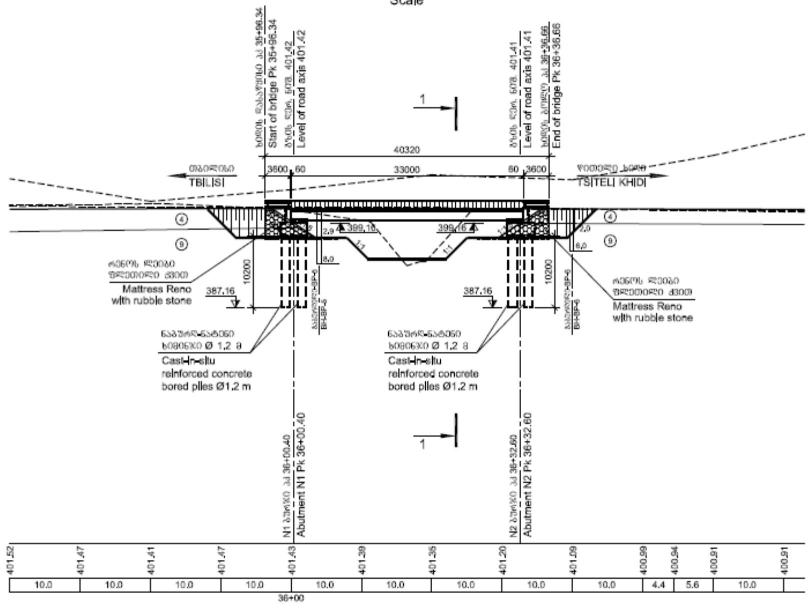
List of Bridges in the 1section

Bridge ID #	Station(km)		Bridge Name	Superstructure Type	Overall Geometry		
	Beginning	End			Length	Width	Skew
Br 01	2+180		BR. 1 (Overpass)	Pre-stressed reinforced concrete beams, L=33m	73.79	15.84	30°
Br 02	3+479.84	3+520.16	BR. 2	Pre-stressed reinforced concrete beams, L=33m	40.32	31.60	
Br 03	3+596.34	3+363.66	BR. 3	Pre-stressed reinforced concrete beams, L=33m	40.32	31.60	


The mordernization of Tbilisi~Rustavi section
PLAN for section1
Starting point
STA.0+000
Mtkvari River
Bridge 1-1
Bridge 1-2
Bridge 2-1
IC 1-1
IC 2-1
0+000
1+000
2+000
3+000
4+000
5+000
6+000
7+000
Tbilisi
Sta. 0+000
Sta. 4+600
Section 1


M 1:2000

ფასადი (მარჯვენა მიმართულება)
Front (right direction)
მასშტაბი Scale 1:400



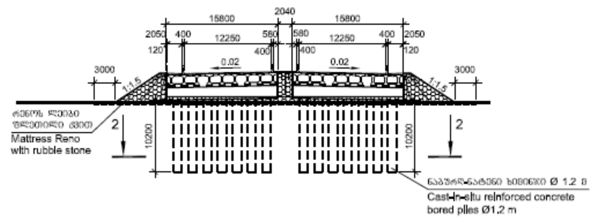
Cross-section of water course according to design is specified on the road axis
Design water course under the left bridge shall be conjugated with the existing water course
longitudinal slope of water course I=0.09
In order to remove water from the road, the chute shall be cut in the rocky soil in the slope on the right side of the road.
Depth of cutting shall be specified on the site, Depth of cutting of chute bottom into the rock shall be at least 1,5-2,0 m.

Soils

(4) Brown clay, semisolid, with up to 20% rounded gravel and rounded cobbles content - 8[b]
- 1:1 ρ=1.87 t/m³, φ=19.3°, I_L=0.12, e=0.873, C=0.046 MPa, R_0=0.3 MPa, E_0=18 MPa, E_{EL}=39 MPa

(9) Light brown-grayish sandstone, strong, thickly bedded (EOCENE) - 28[v]
- 1:1.05 ρ=2.59 gr/cm³, φ=39°, C=7.0 MPa, E_0=6*10³ MPa, E_{EL}=25*10³ MPa, Rc=59.7 MPa

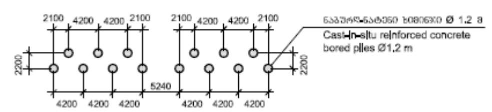
1-1 მასშტაბი Scale 1:400



Note

1.Pk values are given along the axis of road.

2-2 მასშტაბი Scale 1:400

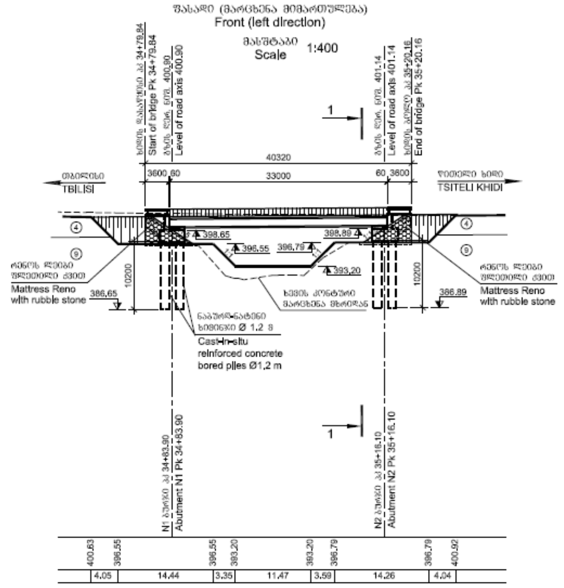


Deepening whilst construction of piles shall be determined on site, in accordance with geological changes.
Monitoring is indispensable part of the works.

Abutments shall be filled with coarse rocky soil (layers h=0.5 m shall be wedged) to improve their static and dynamic operation.

MINISTRY OF REGIONAL DEVELOPMENT AND INFRASTRUCTURE OF GEORGIA MUNICIPAL DEVELOPMENT FUND OF GEORGIA	CONSULTANT: DOHWA — SOUTH KOREA; TRANSPROJECT — GEORGIA	Road: Tbilisi-Tsiteli Khidi (Azerbaidjan border) Section: Tbilisi-Ponichala Pk 0+00 - Pk 40+00	APPROVED:	DRAWING No	3/1
				DATE -	2012
		BRIDGE PK 36+16.50 1x33.0 M GENERAL VIEW OF BRIDGE	DATE	SCALE	
				ORIGINAL DRAWING SIZE: A1 (841 x 594)	

ფასადი (მარცხენა მიმართულება)
Front (left direction)
მასშტაბი / Scale 1:400



საპროექტო კალაპოტის კვეთი მოცემულია გზის ღერძზე,
საპროექტო კალაპოტი მარცხენა ხიდის ქვეშ უნდა შეუღლდეს არსებულ კალაპოტთან
საპროექტო კალაპოტის გრძივი ქანობი შეადგენს i=0,087
Cross-section of water course according to design is specified on the road axis
Design water course under the left bridge shall be conjugated with the existing water course
longitudinal slope of water course i=0,087

გრუნტების დასახელება

(4) თიხა ყავისფერი, ნახევრადმაგარი ხვინჭის და ლორღის შემცველობით 20%-მდე - 8^b
- ρ=1.87 გ/სმ³, e=0.873, I_L=0.12, φ=19,3°, C=0,046 მპა, E=18 მპა, E_{el}=39 მპა R_0=0.3 მპა, 1:1

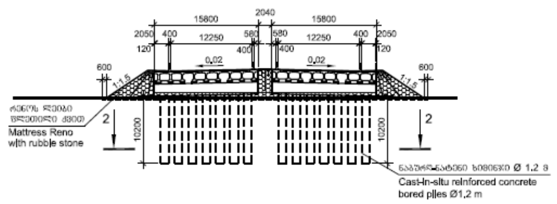
(9) ქვიშაქვა ღია ყავისფერ-მონაცრისფრო, მტკიცე, სქელშრეებრივი (ეოცენური) - 28^B
- ρ=2.59 გ/სმ³, φ=39°, C=7,0 მპა, E=6*10³ მპა, E_{el}=25*10³ მპა, Rc=59,7 მპა, 1:05

Soils

(4) Brown clay, semisolid, with up to 20% rounded gravel and rounded cobbles content - 8^b
- ρ=1.87 gr/cm³, e=0.873, I_L=0.12, φ=19.3°, C=0.046 MPa, E_0=18 MPa, E_{EL}=39 MPa R_0=0.3 MPa, 1:1

(9) Light brown-grayish sandstone, strong, thickly bedded (EOCENE) - 28^V
- ρ=2.59 gr/cm³, φ=39°, C=7.0 MPa, E_0=6*10³ MPa, E_{EL}=25*10³ MPa, Rc=59.7 MPa, 1:05

1-1 მასშტაბი / Scale 1:400



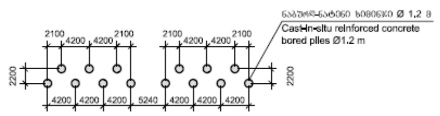
შენიშვნა

1.პკ მნიშვნელობები მოცემულია გზის ღერძზე.

Note

1.Pk values are given along the axis of road.

2-2 მასშტაბი / Scale 1:400



ხიმინჯების მოწყობის დროს ჩაღრმავების სიღრმე დაზუსტდეს ადგილზე გეოლოგიური ცვლილებების შესაბამისად.
მონიტორინგი წარმოადგენს ამ სამუშაოების განუყოფელ ნაწილს.

Deepening whilst construction of piles shall be determined on site, in accordance with geological changes.
Monitoring is indispensable part of the works.

განაპირა ბურჯების სტატიკური და დინამიკური (სეისმური) მუშაობის გაუმჯობესების მიზნით ბურჯების შემოყრა ხორციელდება მსხვილნატეხოვანი კლდოვანი გრუნტით 0,5 მ ფენებით, ჩასოლვით.

Abutments shall be filled with coarse rocky soil (layers h=0,5 m shall be wedged) to improve their static and dynamic operation.

საქართველოს რეგიონული განვითარებისა და ინფრასტრუქტურის სამინისტრო
საქართველოს მუნიციპალური განვითარების ფონდი
MINISTRY OF REGIONAL DEVELOPMENT AND INFRASTRUCTURE OF GEORGIA
MUNICIPAL DEVELOPMENT FUND OF GEORGIA

კონსულტანტი / CONSULTANT

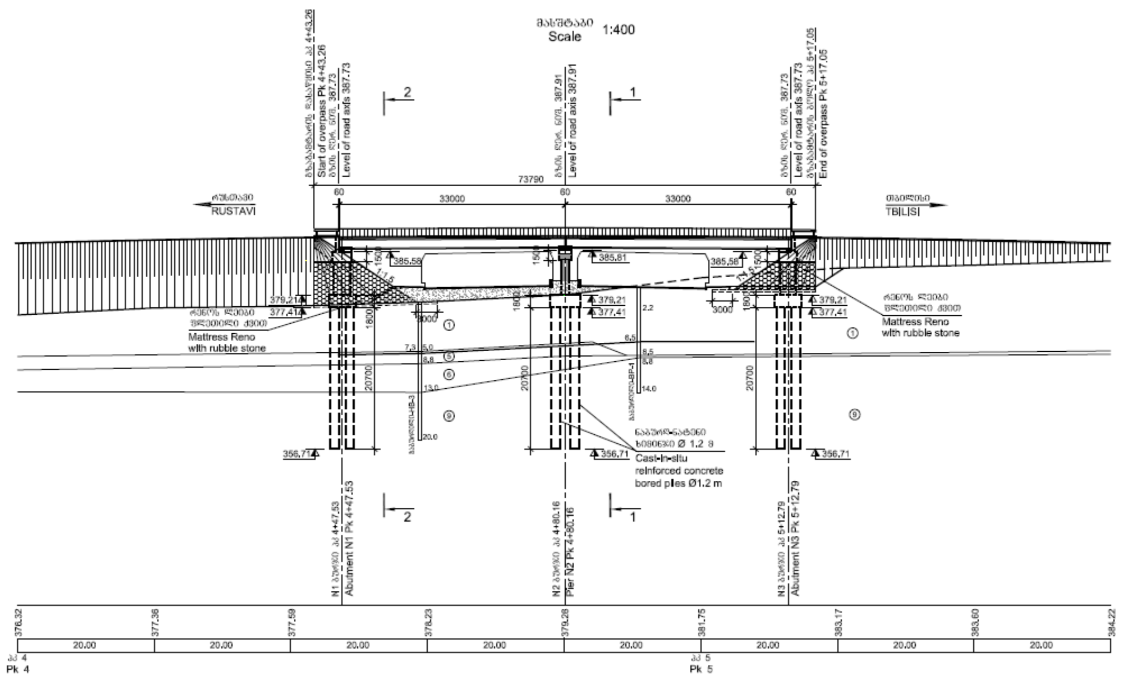
DOHWA — სამხრეთ კორეა / SOUTH KOREA
საქართველო / GEORGIA

საავტომობილო გზა: თბილისი-წითელი ხიდი (აზერბაიჯანის საზღვარი)
მონაკვეთი: თბილისი-ფონიჭალა პკ 0+00 – პკ 40+00
Road: Tbilisi-Tsiteli Khidi (Azerbaidjan border)
Section: Tbilisi-Ponichala Pk 0+00 - Pk 40+00

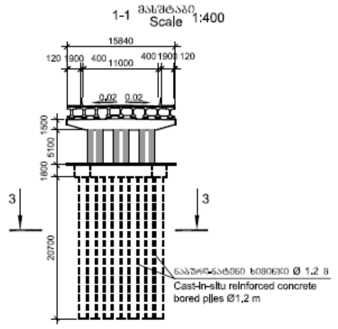
ხიდი პკ 35+00 1x33,0 მ
ხიდის საერთო ხედი
BRIDGE PK 35+00 1x33.0 M
GENERAL VIEW OF BRIDGE

დაამტკიცა: APPROVED:	
თარიღი DATE	
ნახაზის ნომერი DRAWING No	2
თარიღი DATE	2012
მასშტაბი SCALE	-
ნახაზის ორიგინალური ზომა ORIGINAL DRAWING SIZE: A1 (841 x 594)	

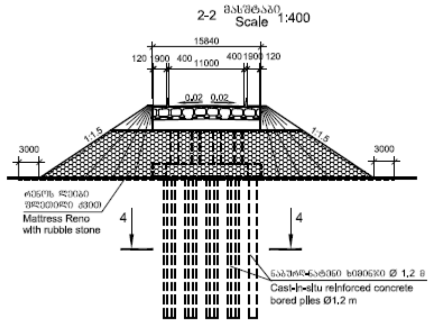
მასშტაბი Scale 1:400



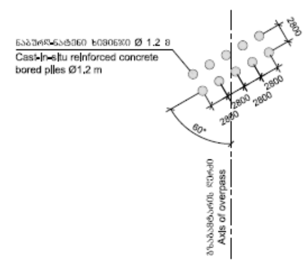
1-1 მასშტაბი Scale 1:400



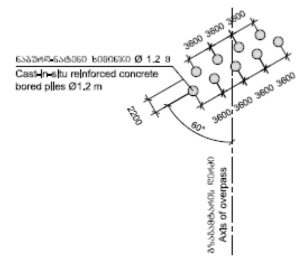
2-2 მასშტაბი Scale 1:400



3-3 მასშტაბი Scale 1:400



4-4 მასშტაბი Scale 1:400



გრუნტების დასახელება

1. სამშენებლო და საყოფაცხოვრებო ნაგავი მონაცისფრო-ყავისფერი თიხნარის შემავსებლით, ფხვიერი 24
   - ρ=1,4 გ/სმ³, R_0=0.05 მპა, 1:1.5
5. თიხა ნაცრისფერ-მოყავისფრო, რბილპლასტიკური 8
   - ρ=1,77 გ/სმ³, e=1,182, I_L=0,59, φ=11,3°, C=0,028 მპა, E=6,5 მპა, E_{el}=12 მპა R_0=0,05მპა, 1:1.5
6. ხრეშოვანი გრუნტი, წვრილმარცვლოვანი ქვიშის ლინზებით, საშუალო სიმკვრივის, წყალგაჯერებული 6
   - ρ=1,80 გ/სმ³, φ=30.0°, C=0.01 მპა, E=40 მპა, E_{el}=300 მპა R_0=0,4 მპა, 1:1.5
9. ქვიშაქვა ღია ყავისფერ-მონაცრისფრო, მტკიცე, სქელშრეებრივი (ეოცენური) - 28
   - ρ=2.59 გ/სმ³, φ=39°, C=7,0 მპა, E=6·10³ მპა, E_{el}=25·10³ მპა, Rc=59.7 მპა, 1:0.5

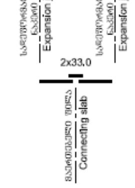
შენიშვნა

1. გზაგამტარი განლაგებულია ვერტიკალურ მრუდზე R=3000 მ.

Note

1. The overpass is located on vertical curve R=3000 m.

მალების გაერთიანების სქემა
Scheme of connection of spans



Soils

1. Construction and household debris with grayish-brown loam filler, loose - 24
   - ρ=1.40 gr/cm³, R_0=0.05 MPa, 1:1.5
5. Gray-brownish clay, plastic - 8
   - ρ=1,77 gr/cm³, e=1,182, I_L=0,59, φ=11,3°, C=0,028 MPa, E_0=6,5 MPa, E_{EL}=12 MPa R_0=0,05 MPa, 1:1,5
6. Gravelly soil with fine grained sand lenses, medium dense, saturated - 6
   - ρ=1,80 gr/cm³, φ=30,0°, C=0,01 MPa, E_0=40 MPa, E_{EL}=300 MPa R_0=0,4 MPa, 1:1,5
9. Light brown-grayish sandstone, strong, thickly bedded (EOCENE) - 28
   - ρ=2,59 gr/cm³, φ=39°, C=7,0 MPa, E_0=6·10³ MPa, E_{EL}=25·10³ MPa, Rc=59,7 MPa, 1:0.5

Deepening whilst construction of piles shall be determined on site, in accordance with geological changes. Monitoring is indispensable part of the works.

Abutments shall be filled with coarse rocky soil (layers h=0,5 m shall be wedged) to improve their static and dynamic operation.

საქართველოს რეგიონული განვითარებისა და ინფრასტრუქტურის სამინისტრო საქართველოს მუნიციპალური განვითარების ფონდი MINISTRY OF REGIONAL DEVELOPMENT AND INFRASTRUCTURE OF GEORGIA MUNICIPAL DEVELOPMENT FUND OF GEORGIA	კონსულტანტი CONSULTANT DOHWA — სამხრეთ კორეა SOUTH KOREA საქართველო GEORGIA	საავტომობილო გზა: თბილისი-წითელი ხიდი (აზერბაიჯანის საზღვარი) მონაკვეთი: თბილისი-ფონიჭალა პკ 0+00 - პკ 40+00 Road: Tbilisi-Tsiteli Khidi (Azerbaijan border) Section: Tbilisi-Ponichala Pk 0+00 - Pk 40+00 გზაგამტარი პკ 21+80 2x33,0 მ გზაგამტარის საერთო ხედი OVERPASS PK 21+80 2x33,0 M GENERAL VIEW OF OVERPASS	დაამტკიცა: APPROVED: თარიღი DATE ნახაზის ნომერი DRAWING No: 1 თარიღი DATE: 2012 მასშტაბი SCALE: - ნახაზის ორიგინალური ზომა ORIGINAL DRAWING SIZE: A1 (841 x 594)

Superstructure

Pre-stressed reinforced concrete beams, length L=33m are applied in superstructure of bridges. Beams are united in the cross-section by means of longitudinal reinforce concrete seam.
Superstructure is strengthened by means of cast in situ reinforced concrete slab h-10 cm, constructed directly on beams. The slab operates together with superstructure beams. It also has the function of leveling layer under the asphalt layer.

There are 8, 9 and 11 beams in the cross-section. Bridge spans are united in one continuous temperature system (4 spans at most) for more effective live load performance and for the improved ride comfort. Thickness of asphalt concrete pavement on carriageway is h-7 cm. The bridges has sidewalks for maintenance. Abutment cones located along the reinforced concrete barriers represent the drainage system on bridge. Open spillway into the cones takes place when the cross-fall is 2.0%, then water happens under the superstructure, into the longitudinal culvert and on into treatment facilities.
Superstructure is based on rubber bearing parts, which are calculated to reduce seismic impact of 8 points earthquake (bearing parts are adopted in accordance with the typical design decision).
Structure of railing shall be of steel section. Barriers are of cast in situ reinforced concrete. Movement joints are with rubber compensators (acceptable in seismic regions).

Piers

Structure of piers is similar for each bridge. Columns based on raft foundation with cast in situ concrete bored piles were adopted as piers (11 piles).
Pier body consists of 3, 4 reinforced concrete ellipse-shaped columns with reinforced concrete cross-beams based on them, with maximum console length 3.6 m. Stops against seismicity shall be constructed on cross-beams.

Abutments are of one types that type is adopted for the approaches with high fills- it's a structure of 4 columns based on raft foundation with cast in situ concrete bored piles (cross-section of columns on abutments is identical to that of piers). Reinforced concrete cross-beams, wing-walls and end-walls are constructed on columns in accordance with the design. Reinforced concrete parapets shall be constructed on wing walls.

For foundation of substructures, cast-in-place bored pile with reinforced concrete was adopted due to local field condition, environment effect, supply of materials and etc. The diameter of bored pile is 1.0m for all bridges.
Concrete bored piles are constructed by Reverse Circular Drilling (RCD) method. Drilling into ground is reached until the design depth or foundation bearing layer. After the hole is then cleaned, steel reinforcement cage is placed into the hole and then pour concrete into the hole until cut-off level of the pile designed.

Gabion retaining wall

Gabion retaining wall will be constructed with 3~5meter height and 66.5 meter length because left side of main road at station 3+801.5~3+868 is adjacent Mtkvari River and it is to protect embankment slope

Revetment

Revetment is designed for the project with height of 3.0~9.0 meters and length of 150 meters to protect slope damage from flood due IC 1-1 of Junction at station 0+290~0+440(right side) and slope of embankment is adjacent Mtkvari River.

Utility Relocation

The Consultant have been in contact with a number of Utility companies which on the project area and had quite a few times of meetings for the utilities relocation works. The Consultant has been under preparation of utility relocation design for the project site area.

Table 9.1: List of Utility companies & utilities relocation design companies on Project area

No	Name of company	Utility Type	Description of Utility Relocation
3	GWP	Water supply and sewage	Existing Φ800 Water pipes along track Highway from STA. 0+000 to STA. 4+000
4	JSC Telasi	Power supply	Existing 6KV cables along track Highway from STA. 0+000 to STA. 4+000
6	SINATLIS QALAQI LTD and relevant organizations in Rustavi and Gardabani	Electric poles	Existing lighting poles track Highway from STA. 0+000 to STA.4+000
7	Caucasus Online	Internet	Existing internet lines track Highway from STA. 0+000 to STA. 4+000
8	Silknet	Internet and telephone	Existing internet and telephone lines track Highway from STA. 0+000 to STA. 4+000
9	Akhali Kselebi	Telephone	Existing telephone lines track Highway from STA. 0+000 to STA. 4+000
10	CGC	Cables	Existing cables track Highway from STA. 0+000 to STA. 4+000
11	FOPTNET	Cables	Existing cables track Highway from STA. 0+000 to STA. 4+000
12	Deltacom	Cables	Existing cables track Highway from STA. 0+000 to STA. 4+000

Road Furniture and Equipment

Traffic regulations and safety

Construction of dividing strip, installation of road signs, pavement marking, installation of guide posts and steel guardrails shall be done under the present project to ensure traffic regulations and safety.

Road signs

Installation of standard III-type size road signs is envisaged in the design to ensure traffic safety on Tbilisi-Rustavi road km 0+000-km 4+000 (Tbilisi-Ponichala) section. Installation of road signs shall be done according to the requirements of GOST 10807-78, GOST 17918-80, ISO/ES, ASTM standards.

Frames of standard road signs are constructed from steel profiles galvanized with zinc, thickness 1.2mm. Road signs of individual design are constructed from aluminum profile with aluminum frame.

The images shall be applied on plates with light-reflecting film of „3M“ engineering-prism type, using appliqué method with cutting on plotters in advance. The film shall meet technical requirements of ASTM, EN 12899 standards.

- Standard - 86 units;
- Of individual design - 19 units.

Installation of II-type size road signs on subsidiary (junctions, intersections) roads is stipulated under the present design. Standard road signs and road signs of individual design shall be installed on shoulders on condition that the distance between the edge of the sign and the edge of carriageway should be at least 0.5m. Total number of signs to be installed on subsidiary roads is:

- Standard II-type size - 149 units;
- Individual – 2 units.

The road signs shall be installed on special berms outside the road bed. Standard road signs shall be fixed on steel posts, diameter 76-102 mm, thickness of wall 4 mm.

- 76 mm – 89 units;
- 102 mm – 45 units.

Plates of road signs of individual design shall be fixed on steel structures (three posts) and on full-frame structures.

- Steel full-frame structure - 6 units;
- Steel three-post structure - 9 units.

Carriageway Marking

Horizontal line marking of carriageway shall be carried out with two-component structural plastic with light reflecting glass balls, thickness 2 mm (to meet technical requirements of ISO 9001, EN 1423, EN 1424, BAST (German standards).

Design includes:

- Continuous lines (1.1) width 100-150 mm – 671.5 m^2
- Continuous lines of side marking (1.2), width 100-150 mm – 7191.2 m^2
- Double continuous lines (1.3) width 150-150 mm - 150 m^2
- Broken lines, (1.5) ratio 1:3, width 100-150 mm – 1046.5 m^2
- Broken lines, (1.6) ratio 3:1, width 100-150 mm – 27.3 m^2
- Marking of cross-road, broken lines, (1.7) $l_{1=}l_{2,}$ width 100mm – 40.1 m^2
- Broken lines, (1.8) $l_{1=}l_{2,}$ width 200-400 mm, $l_{1=}$1.0m, $l_{2=}$3.0 m – 674.1 m^2
- Marking 1.13, 1.13, 1.16.1; 1.16.2; 1.16.3, 1.20 – 1172.5 m^2
- Marking 1.18 length of arrow 5.0 m-7.5m – 1771.3 m^2
- Marking 1.19 length of arrow 5.0 m-7.5m – 270.1 m^2

Total horizontal line marking – 13029.6 m^2.

Road Barriers

Road fencing shall be constructed from steel guardrails (cinol alpol covered) f-3 in accordance with requirements of standards GOST 23457-86, GOST 26804-86 and EN 1317. Total length is 9188 L.m. Design envisages installation of plastic guide (signal) posts on shoulders - 722 units, plastic guide (signal) posts on marking line - 1004 units, reinforced concrete barriers on the dividing strip - 19639 linear m, concrete parapets of special profile – 64 units. Location of road signs, pavement marking, fencing and plastic guide (signal) posts is given on corresponding drawings. Details of road signs, pavement marking, barriers and plastic guide (signal) posts are given on corresponding schemes. The activities and decisions adopted in the design ensure proper traffic regulations and safety.

Sidewalks, Bus Stops and Shelters

Construction of sidewalks width 2.5-3.0 m on both sides of the road is envisaged in the design from PK 0+00 to PK 40+00 as the road section is entirely located in Tbilisi.

Bust stops with acceleration-deceleration lanes shall be constructed on Ponichala-Rustavi road section. Construction of shelters and footbridges on both sides of the road is envisaged in the design at PK 114+56 and PK 137+31.

2.9 Construction works

Preparatory works

During the road construction, the existing utilities and communications infrastructure, such as water supply and sewarege pipes, power lines, optical-fiber cables, etc., will be necessary to relocate. The utilities subject for relocation were listed above.

Prior to starting the road construction works, the project envisages the accomplishment of the preparatory works.

The preparatory works include:

- Fixing of road layout and construction corridor - 3.95 km
- Relocation of the utilities
- Tree felling and digging out - 1000 plants
- Felling and digging out of bushes - 1,8 ha
- Disassembly of the existing buildings and premises and all related works
- Freeing the building site for the road construction off archeological remnants.

The project also envisages giving out the compensations for land plots, premises and plantations within the ROW (comlte implementation of the LARP).

Earthworks

Fill volume - 65.610 m^3.
Cut volume - 238440 m^3
Spoil to be disposed - 201250 m^3
Filling materials to be transported from quarries and borrow pits for arrangement of the embankments - 28420 m^3
In addition, the project envisages cutting the topsoil (humus soil layer) for 15 cm from km 1.0 to km 3.9.

The volumes of earthwork according to the kilometers and types of treatment are given in the kilometer-based spreadsheets of earthworks.

The project envisages scattering and leveling of the vegetation ground layer over the fill slope and seeding perennial grass.

Blasting works

No blasting works are envisaged during the construction of Tbilisi-Ponichala section of Tbilisi-Rustavi road.

Removing the topsoil

Prior to making the subgrade, the project envisages cutting the humus soil layer for 15 cm from km 1.0 to km 3.9, and further using it to seed perennial grass over the fill slope.

<u>Waste Generation</u>

27. Various wastes will be produced throughout the construction process. The main waste producing areas are: construction sites and construction camps. Small amounts of waste are expected along the access and heavy equipment movement routes with ground and soil pollution.

Milling of the existing asphalt concrete pavement shall be done prior to the construction of roadway. About 10790 m^3 of milled asphalt should be stored in reserve and reused for construction of the road pavement.

Waste Classification

28. During the construction, the following types of waste will be produced:

- Household;
- Hazardous industrial;
- Non-hazardous industrial;
- Inert

Inert building materials. Generally, the major proportion of the remains generated in the road construction process is inert debris - fill of the cut ground and clastic rocks, and debris not used for construction purposes and subject to placement. The total amount of inert building materials generated during the construction of the design road section, is little as compared to other road sections:

- The mill of the existing pavement layer - 10.790 m^3 (must be placed as a reserve and further used for asphalt pavement or repairs of other road sections)
- Only a part of the ground generated in the section cuts will be used to make the fills. At least 201,250 m^3 spoil and cliffy material will be disposed off.

The sites of placement of inert waste will be selected by the construction contractor in agreement with the local authority.

Equipment Use During Construction

29. Table - 2.2 provides a list of the typical equipment that will be used to construct the highway. The actual machinery to be utilized for the construction will be the responsibility of the Construction Contractor. Any emission approvals required under the Georgian Law on Ambient Air Protection for temporary concentrations will be obtained on the basis of actually machinery used before construction begins.

Table 2.2 Typical List of Equipment for Construction Activity

Sl.No	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	Compressor	2
16	Mobile Generator	2
17	Water Tank with sprinkler	2
18	Crane	1
19	Concrete Paver With Electronic Sensor	1

2.10. A complex of auxiliary building objects

The construction contractor will make a decision in connection to the auxiliary building objects (structure, content, location, designing, etc.). Despite this, by considering the existing experience in carrying out the construction works along other sections of E-60 road, we suppose there will be a complex of auxiliary building objects built, including a construction camp to place 200 workers (covering approximately 1.5 ha area), transport and equipment yard for 100 vehicles and 150 heavy techniques (covering approximately 2 ha area) (bulldozers, excavators, cranes, etc.).

Decision on construction of the Asphalt Plant will be taken by construction contractor: he may chose to use existing suppliers of asphalt or install his own mobile asphalt plant.

In chapter 8.1.1.13 of EIA related to the mitigation measures, we described the procedures and conditions used to design and operate the above-mentioned building objects, as well as variants of optimal locations.

2.11 Quarries

30. Identification of qauerries and borrow pits is responsibility of the Civil Works Contractor (Contractor). Before start up of construction activities the Contractor has to define the quarries and borrow pits to be used and reflect this in the description of construction works and in work plans and specifications. At the same time, before engaging Contractor, the IEE should describe existing opportunities for fill material supply and potential impacts related to exploration and transportation of materials. Here below, we describe several quarries and borrow pits located in the project area, which could be used for project. Detailed information related to these quarries and filling materials produced are given in Annex 4.

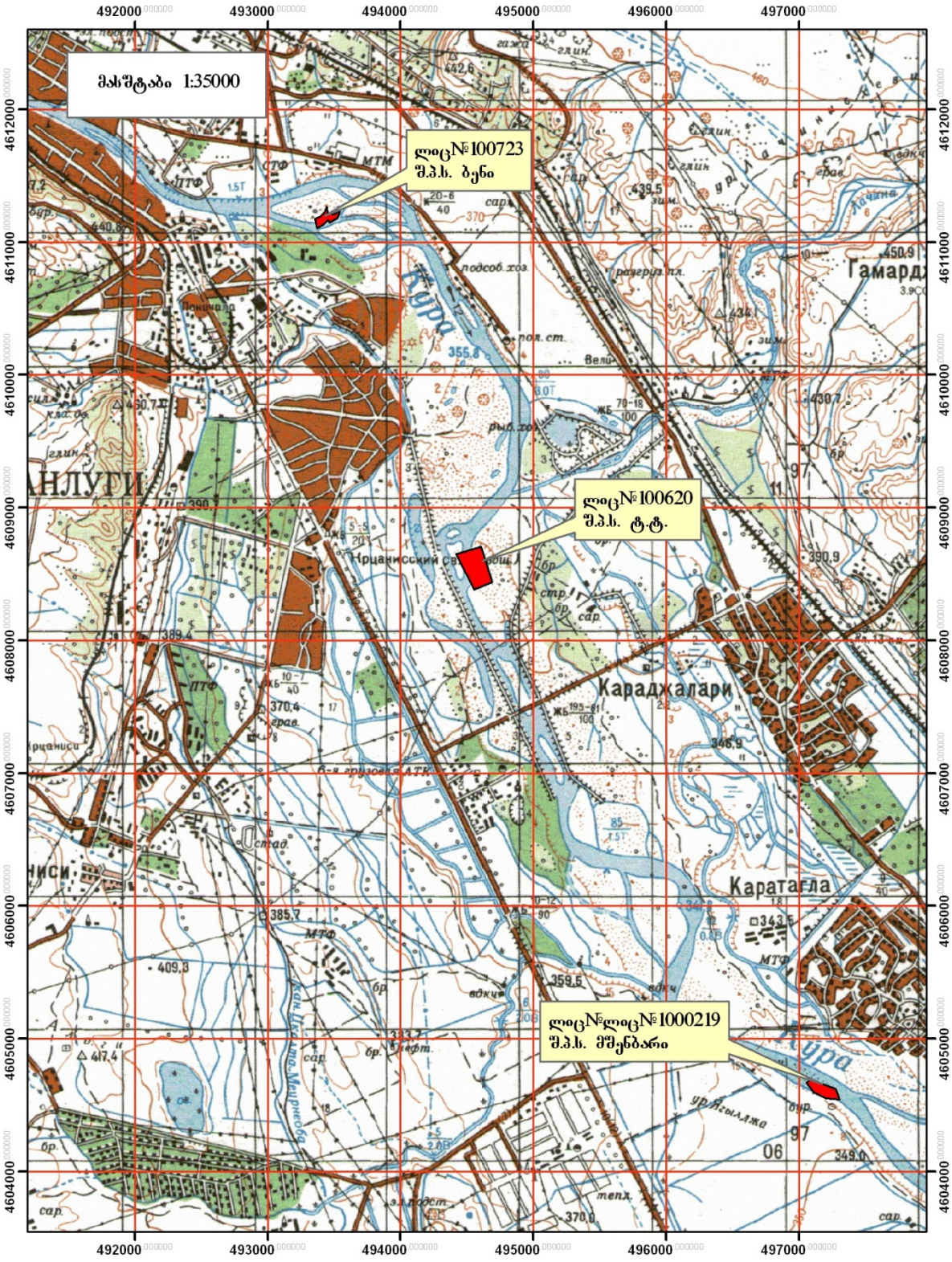


Figure- 2.3 Quarries and Borrow Pits in Project Area

3 GOVERNMENT POLICY LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 Introduction

31. Annex 1 describes in detail the environmental legal framework and administrative structure in Georgia including environmental regulations, measures required and indicates the institutions at the local and national levels responsible for issuing permits, licenses, and enforcing compliance with environmental standards. Below is a brief description of the environmental permitting process in Georgia, ADB safeguard requirements, and the differences between two systems.

3.2 Georgian Legislation Related to Environmental Permitting

32. 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.

In line with the mentioned laws, a provision “On the environmental Impact Assessment” is proved by Decree No. 14 of October 4, 2011 of the Minister of Environment and regulates the legal relations associated with the assessment of environmental impacts.

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 Ecological Examination: The Laws published on 14.12.2007 and in force since 01.01.2008. These new laws integrated all recent Georgian legislation.

The Law on Environmental Impact Permit: 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.

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 are 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.

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

Current Legislations Related to Environmental Permitting
Below is the list of laws relevant to environmental protection:

1994	Soil Protection
1996	System of Protected Ares
1996	Minerals
1996	Environmental Protection
1997	Wildlife
1997	Tourism and Resorts
1997	Water Protection
1997	Transit and Import of Hazardous Waste within and into the Territory of Georgia
1998	Resorts and Sanitary Protection of the Resort Zones
1998	Dangerous Chemical Substances
1998	Pesticides and Agrochemicals
1999	Atmospheric Air Protection
1999	Forest Code
2003	Red List and Red Data Book of Georgia
2005	Licensing and Permitting
2007	Environmental Impact Permit
2007	Ecological Expertise
2007	Cultural Heritage

Public Consultation Procedures

34. Clause 6 of the Law on Environmental Impact Permits provides detailed requirements and procedures for conducting public consultations and establishes timeframes for information disclosure and discussion.
According to Article 6, the developer is obliged to carry out public discussion of the EIA before its submission to an administrative body responsible for issuing a permit. Where an activity requires a construction permit this must be done before initiating stage 2 of the process for issuing a construction permit. The detailed description of Public Disclosure requirements is discussed more fully in this document in Chapter 9 on Public Consultation and in Annex 1.

Procedure of Official Submission of EIA/IEE to MoE

35. Article 8 of the Law on Environmental Impact Permits specifies the documents which must be submitted by an operator to obtain a permit:

(1) A written statement to the Ministry under the rules established by 'Law of Georgia on Licenses and Permits'.
(2) The following information:
    (a) An EIA/IEE 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 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

36. Article 9 of the Law on Environmental Impact Permits describes the procedures for issuing an Environmental Impact Permit. The issue is also 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 a decision on issuing Permit within the 20 days of the permit request by the project proponent.
2. MoE, in accordance with the law on Ecological Examination, ensures the quality of the submitted documentation and the Issuance of Conclusion on Ecological Examination.

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

Regulation on EIA issued by the MoE dated October 4, 2011

37. The Provision is proved by Decree No. 14 of October 4, 2011 of the Minister of Environment and regulates the legal relations associated with the assessment of environmental impacts.
The procedure to assess the environmental impact includes drafting the confirmatory documentation and permits for the businesses on the legally established list, identifying any source of expected environmental impact, its nature and degree and integrated assessment of their environmental, social and economic outcomes in obtaining the environmental expert conclusion.
The given Provision defines the procedure to draft the environmental assessment report by a business actor to ensure the environmental and social-economic balance of future economic development. It precedes the decision of the Ministry of Environmental Protection of Georgia about the purposefulness of the business and relevant project to be implemented by the business actor.
The assessment of the environmental impacts covers the identification and description of direct and indirect impacts in the context of the planned activity and study of their outcomes on:

- human's residential space and health; vegetation cover and fauna;
- natural and modified eco-systems; landscapes, air, water, soil, climate;
- historical monuments and cultural values;
- social-economic factors;
- assessment of the existing state of geological and hydrological environments and expected risks.

The objects of environmental assessment are the activities on the list under clause 1 of article 4 of the Georgian Law "On Environmental Permit".

The content of the EIA document is specified in the clause 5 of the Regulation as follows:

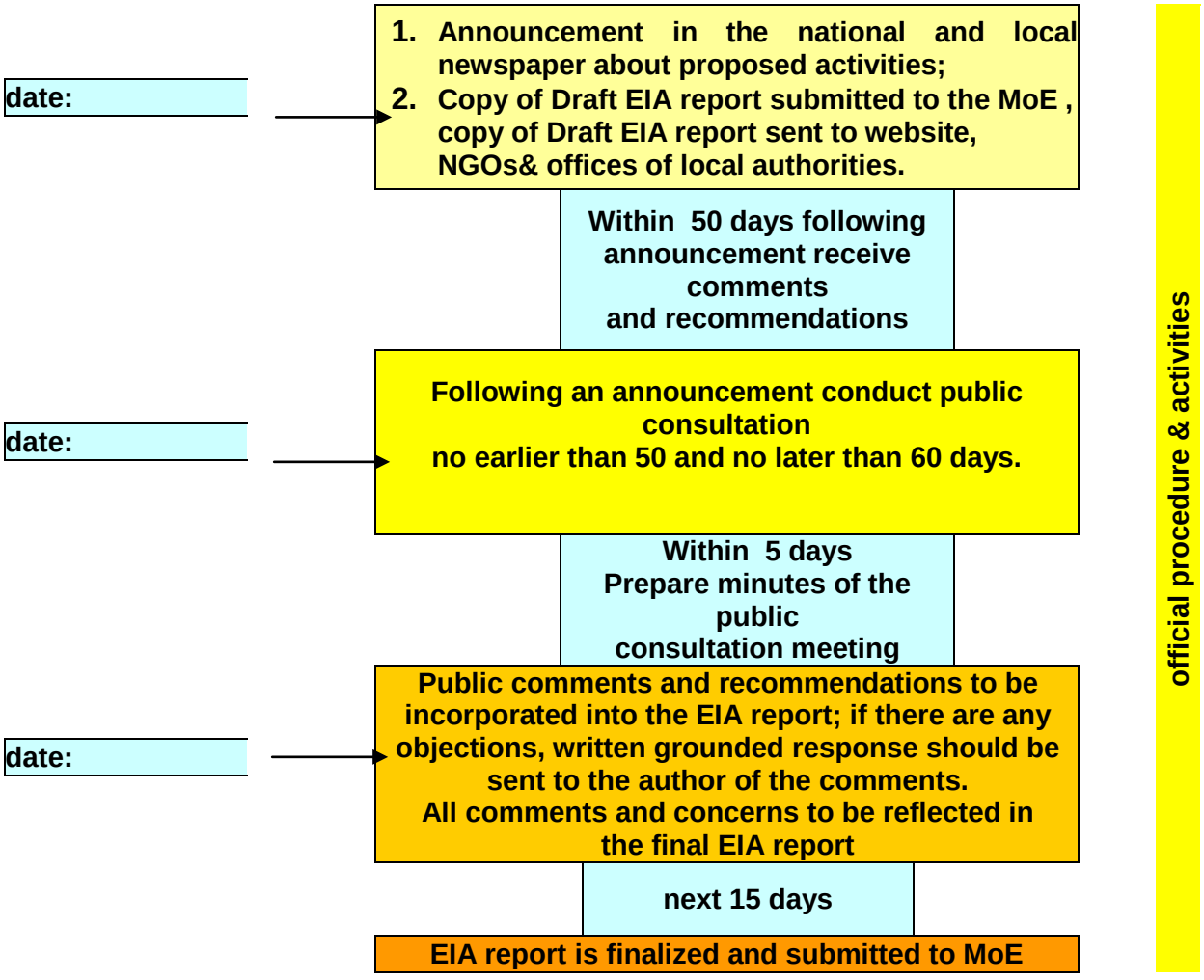
Article 5. Content of the environmental impact assessment

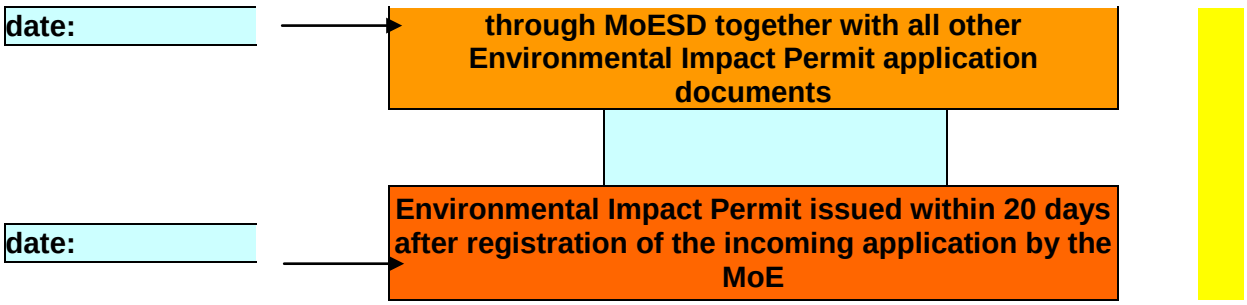
The Environmental impact assessment report should include the following information:

(a) Analysis of the existing state of the environment;
(b) Identifying the sources, kinds and objects of impact caused by the activity;
(c) Forecast of the changes of quantitative and qualitative characteristics of the environment;
(d) Determining the probability of emergency situations due to the activity and evaluating the expected results;
(e) Evaluation of the environmental, social and economic results of the planned activity;
(f) Specifying the reduction measures for the negative impact on the environment and human health and specifying the compensation measures as necessary;
(g) Identifying the residual (cumulative) impact and measures for its control and monitoring;
(h) Undertaking environmental and economic evaluation of the projects;
(i) Analysis of the alternative variants of the project implementation, selection and forming new variants;
(j) Identifying the ways and means to restore the initial environmental condition in case of terminating entrepreneurship or other activity;
(k) Informing the society and studying the public opinion;
(l) Plan for the post-project situational analysis;
(m) Identifying the kinds and quantities of the expected emissions;
(n) Forecast of the expected environmental state gained through the environmental impact factors;

Decree also requires development of the Monitoring Plan during the implementation of the project and at the end of the activity.

Figure 3.1 Disclosure and Environmental Impact Permit Procedure





Rules for Construction Projects by Government Ministries

38. In accordance with paragraph 1a of the Decree N 160 of the Georgian Government (08/23/2006), where construction is carried out by a Ministry of the Government of Georgia or an entity acting on behalf of Ministry, no Permit for the Construction is required to be formally issued. The project documentation and the review procedures should, however, comply with the requirements set forth under the Rules and Conditions for Issuing Construction Permit as described above.

3.3 ADB Environmental and Social Safeguards Requirements (SPS 2009)

39. According to ADB Safeguard Policy Statement (2009) and Operational Manual Fl (2010), the Project is classified as category "A" and therefore an EIA is required for the Project. The process of determining a project's environment category is to prepare a Rapid Environmental Assessment (REA). REA requires the completion of the environmental categorization form prior to the project initiation. REA uses sector-specific screening checklist, taking into account the type, size, and location of the proposed project; sensitivity and vulnerability of environmental resources in project area; and the potential for the project to cause significant adverse environmental impacts. A project is classified as one of the four environmental categories (A, B, C, or Fl) based on the most environmentally sensitive component. Categories are as follows:

40. **Screening and Categorization.** ADB will carry out project screening and categorization at the earliest stage of project preparation when sufficient information is available for this purpose. Screening and categorization is undertaken to (i) reflect the significance of potential impacts or risks that a project might present; (ii) identify the level of assessment and institutional resources required for the safeguard measures; and (iii) determine disclosure requirements.

41. **Environment Categorization.** ADB uses a classification system to reflect the significance of a project's potential environmental impacts. A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence. Each proposed project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. Projects are assigned to one of the following four categories:
(i) **Category A.** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
(ii) **Category B.** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.
(iii) **Category C.** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.

(iv) **Category FI.** A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI (paras. 65-67).

42. **Involuntary Resettlement:** ADB will screen all projects to determine whether or not they involve involuntary resettlement. For a project involving involuntary resettlement, a resettlement plan will be prepared that is commensurate with the extent and degree of the impacts. The degree of impacts shall be determined by (i) the scope of physical and economic displacement, and (ii) the vulnerability of the affected persons. For FI projects, see paras. 65-67.

43. **Information Disclosure:** In line with ADB's Public Communications Policy, ADB is committed to working with the borrower/client to ensure that relevant information (whether positive or negative) about social and environmental safeguard issues is made available in a timely manner, in an accessible place, and in a form and language(s) understandable to affected people and to other stakeholders, including the general public, so they can provide meaningful inputs into project design and implementation. ADB will post the following safeguard documents on its website:
(i) for environment category A projects, draft environmental impact assessment reports at least 120 days before Board consideration;
(ii) draft environmental assessment and review framework, draft resettlement frameworks and/or plans, and draft Indigenous Peoples planning frameworks and/or plans before project appraisal;
(iii) final or updated environmental impact assessments and/or initial environmental examinations, resettlement plans, and Indigenous Peoples plans upon receipt;
(iv) environmental, involuntary resettlement, and Indigenous Peoples monitoring reports submitted by borrowers/clients during project implementation upon receipt.

3.4 EIA Requirements under Georgian and ADB Procedures

The following Table presents EIA requirements under Georgian and ADB procedures

Table 3.1 EIA Requirements Under Georgian and ADB Procedures

#	Action	Georgian Legislation	ADB Requirements
1	Screening	Project Proponent in consultation with MoE	Bank and Consultant hired by Project Proponent
2	Scoping	Not required. Could be conducted voluntarily by Project Proponent.	Obligatory. Bank and Consultant hired by Project Proponent
3	Draft EIA	To be prepared by Environmental Consultant.	To be prepared by Environmental Consultant.
4	Public Consultations	The EIA should be available for public review during 45 days. Publication of information in central and regional mass-media. Arrange consultation not later than 60 days from the date of publication.	At least two consultations for Category A projects – one at the scoping stage and one for the draft EIA.
5	Final EIA	Consider all comments received during public consultations, incorporate accepted remarks and explain rational when the comments are disregarded.	Consider all comments from Bank and public. Agree with the Bank on each raised point. Incorporate accepted public comments and explain rational when the comments are disregarded.
6	Management Plans	No clear guidelines on format, content and timing	Incorporate Monitoring and Management Plans in the EIA.
7	Review and	MoE	Bank and separately - MoE (if

	Approval		the EIA is required by Georgian legislation)
8	Disclosure of final EIA	Not requested	Publication (mainly electronic) of the final EIA.

3.5. Environmental Screening for Current Project

44. In line with the legislation of Georgia, the activities related to the construction or reconstruction of the International and National motor roads and highways needs an Environmental Impact Permit to be issued and an Environmental Impact Assessment to be drafted.

The project is not related to the development of new territories or construction on the sensitive environmental sites. The project envisages the modernization of the existing road, i.e. its widening from a 2-lane road to a 6-lane road and construction of relevant infrastructure. Under ADB SPS 2009 - Provision on the Environmental and Social Safety Policy, the project belongs to category B. Preparation of the Initial Environmental Examination document is required for B category projects.

The format of required IEE for ADB and EIA for Ministry of Environment of Georgia is very similar, with some minor differences. In order to harmonize the ADB and Georgian requirements, one environmental assessment document will be prepared. It will be prepared in the ADB IEE format and in compliance with the requirements of Regulation on EIA issued by the MoE dated October 4, 2011. The Georgian version will be entitled as EIA.

Public consultation is necessary in line with the legislation of Georgia and requirements of ADB SPS 2009.

3.6 Administrative Framework

3.6.1 The Roads Department (RD or RDMRDI)

45. The Roads Department of Ministry of Regional Development and Infrastructure (RD or RDMRDI) is responsible for elaboration of policy and strategic plans related to developing motor roads, management of road and traffic related issues and construction, rehabilitation, reconstruction and maintenance of the roads of public use of international and national significance, utilizing funds from the state budget, lawns, grants and other financial sources.

Thus, the RDMRDI is responsible for the procurement of design and EIA/IEE studies, as well as works on construction and rehabilitation of roads and is responsible for ensuring compliance with the Georgian legislation and environmental and social requirements of the relevant donor organizations. Control of implementation of the Environmental Management Plan (EMP) is direct responsibility of the Roads Department.

Within the RD there is special unit dealing with the environmental issues. The name of the unit is Environmental Division. This division is supposed to review the EIA/IEEs and EMPs related to the Roads Department projects and perform monitoring of compliance of the contractor's performance with the approved EMPs, EIAs, environmental standards and other environmental commitments of the contractor.

3.6.2 Ministry of Environmental Protection (MOE)

46. The Ministry of Environment Protection is responsible for all environmental protection issues in
Georgia except natural resources which under the recent changes in 2011 are subject of regulation by Ministry of Energy and Natural Resources of Georgia (MoEP). The responsibilities of the Ministry as the competent authority are:

- To intermit, limit, or stop any activity having or likely to have adverse impact on the environment.
- To issue a series of licenses and permits (including for environmental impact).
- To control the execution of mitigation measures by the developer.
- To receive free and unrestricted information from the developer monitoring systems, waste management etc.

47. Connected with projects of the actions presented to ecological examination, department of the mentioned ministry of ecological examination and, examine, organizes discussion of an estimation of influence on environment and prepares the documentation (the project of the order of the minister) to let out the permission to influence to environment. This department is obliged to control realization also.
Agency of Protected Areas: This Agency is responsible for state reserves, national parks, natural monuments, managed reserves, protected landscapes, biosphere reserves, world heritage districts and wetlands of international importance. The main tasks of the agency are to control territories of multilateral usage, to implement activities of looking after protected areas, to supervise, preserve, rehabilitate and protect them.

48. National Environmental Agency (established 29 August 2008) is responsible for preparing informational documents, forecasts and warnings regarding to existing and expected hydro-meteorological and geodynamic processes, also environment pollution conditions in order to provide state security, existing and expected hydro meteorological forecasting of rivers, water reserves and the Black Sea territorial waters, to provide civil aviation with meteorological inform

3.6.3 Ministry of Economy and Sustainable Development (MoESD)

49. MoESD is responsible for carrying out the review of technical documentation (including conclusion of independent experts) and issuing Permits on Construction for projects, as well as for supervision over constructing activities and for arranging Acceptance Commission after completion of construction.

State supervision of construction and compliance monitoring is provided by the Main Architecture and Construction Inspection (MACI), which is operating under the Ministry of Economy and Sustainable Development of Georgia.

3.6.4 Other Responsible Governmental Institutions

50. The Ministry of Culture, Monument Protection and Sports is responsible on supervision of the construction activities in order to protect archaeological heritage. In case if construction is to be carried out in a historic sites or zones of cultural heritage, consent of the Ministry of Culture, Monument Protection and Sport is also required for issuing construction permit.

51. The “National Service for the Foodstuffs Safety, Veterinary and Plant Protection” of the Ministry of the Agriculture is responsible for implementation of complex sanitary protection measures in case of identification burial sites during earthworks. Information about suspicious burial sites should be delivered to the “National Service for the Foodstuffs Safety, Veterinary and Plant Protection” of the Ministry of the Agriculture by the Construction Contactor (field environmental officer) and RDMRDI field officer.

3.7 International Treaties and Conventions

3.7.1 The Convention on Biological Diversity, 1994

52. International cooperation is a dominant feature and driving force for environmental reforms in Georgia. Setting the goal to preserve its biological diversity and realizing the importance of international cooperation, Georgia signed the Convention on Biological Diversity in 1994. Thus, accepting responsibility to safeguard the nation's rich diversity of plant, animal, and microbial life to begin using biological resources in a sustainable way and to ensure equitable sharing of benefits from biodiversity.

The Convention on Biological Diversity is the first global agreement, which, along with biodiversity conservation, necessitates the sustainable use of biological resources. Georgia has been recognized as holding an important reservoir of biodiversity, which is very important in the global context -according to the surveys and assessments conducted at an international level, Georgia as a part of the
Caucasus, is recognized as:

One out of 34 biologically richest and endangered land ecosystems (Conservation International);
One out of 200 vulnerable ecoregions (WWF);
One out of 221 endemic bird habitats (Bird Life International);
One of the World Agro biodiversity Centers.

3.7.2 The Convention on the Conservation of Migratory Species of Wild Animals

53. The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention) aims to conserve terrestrial, marine and avian migratory species throughout their range. It was signed in 1979 in Bonn (Germany.) Georgia ratified the treaty in 2000 together with its three agreements:

- Agreement on "Protection of Populations of European Bats" (EUROBATS);
- Agreement on "Conservation of Cetaceans of the Mediterranean Sea, Black Sea and Contiguous Atlantic Area "(ACCOBAMS);
- Agreement on "Conservation of African-Eurasian Migratory Water birds" (AEWA).

54. Taking into account, that the Agreements have been initially designed as an instrument for facilitating the implementation of the CMS, the compliance with and enforcement of CMS in Georgia is mostly reflected in implementation of the Agreements.

3.7.3 Convention on Wetlands of International Importance

55. The Convention on Wetlands of International Importance, also called the Ramsar Convention aims to provide the framework for national action and international cooperation for the conservation and sustainable use of wetlands and their resources, especially as waterfowl. The convention was developed and adopted by participating nations at a meeting in Ramsar on February 2, 1971, and came into force on December 21, 1975. It entered into force on July 06, 1997 in Georgia.

3.7.4 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

56. CITES is one of the largest conservation agreements in existence, it is an international agreement between governments. The conventions aim is to ensure that international trade in

specimens of wild animals and plants does not threaten their survival and it accords varying degrees of protection to more than 33,000 different species of animals and plants. The text of the convention was agreed upon in 1973, and CITES entered into force on 1 July 1975. The date of accession for Georgia was September 13th, 1996 and the agreement entered into force on December 12, 1996 in Georgia.

4. DESCRIPTION OF THE ENVIRONMENT

4.1 Physical Resources in Project Area

4.1.1. Climate

57. According to the climatic zoning, the cities of Tbilisi and Rustavi are included in the moderately humid subtropical climatic zone. The territory of the design road is characterized by moderately warm climate, transient from steppe to moderately humid (with hot summer and moderately cold winter). Below, we give the brief climatic description of the area:

Temperature: The average annual temperature is 12.7^{0}C. The temperature of the coldest month (January) is +0.9^{0}C and that of the hottest months (July-August) is +24.4^{0}C, while the absolute maximum is +40^0. The soil freezing depth is 5 cm.

Atmospheric precipitations: The average and annual precipitations is 505 mm. The most rainy months and May and June, with the average precipitation amount of 86 mm and 72 mm, respectively. Average annual humidity is 66%. Snow cover appears on December 30 and disappears on March 1. The maximum of daily precipitations is 130 mm. Intense rains are frequent in Tbilisi with about 5 occasions a year on average.
In the Diagram below we give detailed information about the average monthly temperature and precipitation frequency in Tbilisi:

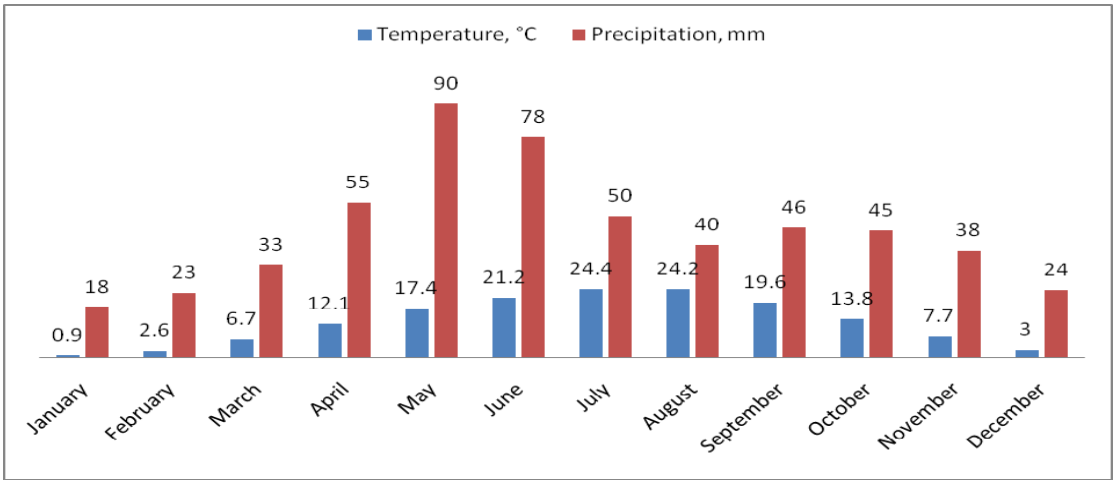


Figure-4.1a. Average monthly temperature and precipitation frequency in Tbilisi

Table 4.1b Climatic data for Tbilisi

The main climatic characteristics are given in the tables below.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Peak high °C	19.5	22.4	28.7	34.3	34.9	38.7	40.0	40.3	37.9	33.3	27.2	24.0	40.3
Average high °C	6.0	7.4	12.1	18.2)	23.4	27.5	30.8	30.8	26.0	19.8	12.9	7.5	18.7
Average low °C	-2.2	-0.9	2.4	7.4	12.2	15.7	19.0	18.6	14.7	9.2	4.1	-0.2	8.4
Peak low °C	-24.4	-14.8	-12.8	-4.8	1.0	6.3	9.3	8.9	0.8	-6.4	-7.1	-20.5	-24.4
Precipitations, mm	19	26	30	51	78	76	45	48	36	38	30	21	498

The tables below show the climatic data based on the continuous observations (1881-1960) of Tbilisi weather station.

Figure- 4.1.1 Duration of sunshine (hours)

m o n t h s												Annual Total
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
104	110	149	170	211	253	272	264	206	170	110	93	2112

Figure- 4.1.2 Air temperature °C

M o n t h s												Average Annual	Annual Ampli-tude
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
0.9	2.6	6.6	11.9	17.3	21.1	24.4	24.2	19.6	13.8	7.6	2.8	12.7	23.5

Figure- 4.1.3 Absolute minima of atmospheric temperatures °C

M o n t h s												Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
-23	-14	-13	-4	1	7	9	9	1	-5	-7	-19	-23

Figure- 4.1.4 Absolute maxima of atmospheric temperatures °C

M o n t h s												Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
18	22	29	32	35	38	40	40	38	33	27	22	40

Figure- 4.1.5 Soil surface temperature °C

M o n t h s												Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
0	3	8	15	22	27	31	30	23	15	7	2	15

Figure - 4.1.6 Absolute maxima of soil surface temperatures°C

M o n t h s												Annua
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
27	34	48	55	64	69	70	69	62	51	36	28	70

Figure- 4.1.7 Absolute minima of soil surface temperatures°C

M o n t h s												Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
-26	-16	-15	-6	-1	6	8	8	-1	-8	-13	-22	-26

Figure- 4.1.8 Annual repetition of wind directions

c a r d i n a l p o i n t s								
Nth	Nth/E	E	Sth/E	Sth	Sth/W	W	Nth /W	Calm

26	3	4	25	8	2	4	28	33

Figure- 4.1.9 Wind speed (m/sec)

Months												Average Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2.2	2.7	2.8	2.8	2.5	2.5	2.8	2.3	2.1	2.0	1.7	1.8	2.4

Figure- 4.1.10 Mean number of strong wind days (≥15m/sec)

Months												Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2.0	2.2	2.9	2.5	1.4	1.1	1.0	1.1	1.0	1.0	1.2	1.3	19

Figure- 4.1.11 Average atmospheric precipitation (mm)

Months												Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
16	22	31	52	86	72	48	37	42	42	35	22	505

Figure- 4.1.12 Maximal atmospheric precipitation (mm)

Months												Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
68	87	88	130	198	220	175	203	179	139	126	83	767

Figure- 4.1.13 Minimal atmospheric precipitation (mm)

Months												Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
0	0	1	5	5	3	1	0	1	4	1	0	241

Figure- 4.1.14 Maximum daily precipitation

Months											
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
23	27	30	43	109	126	80	147	77	57	75	46

Figure- 2.1.15 Relative air humidity (%)

Months												Average Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
73	69	66	62	64	60	56	57	64	73	77	76	66

Figure- 2.1.16 Air absolute humidity (mb)

Months	Average

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
5.2	5.4	6.1	8.6	12.4	14.8	17.2	16.7	14.2	11.0	8.2	5.9	10.5

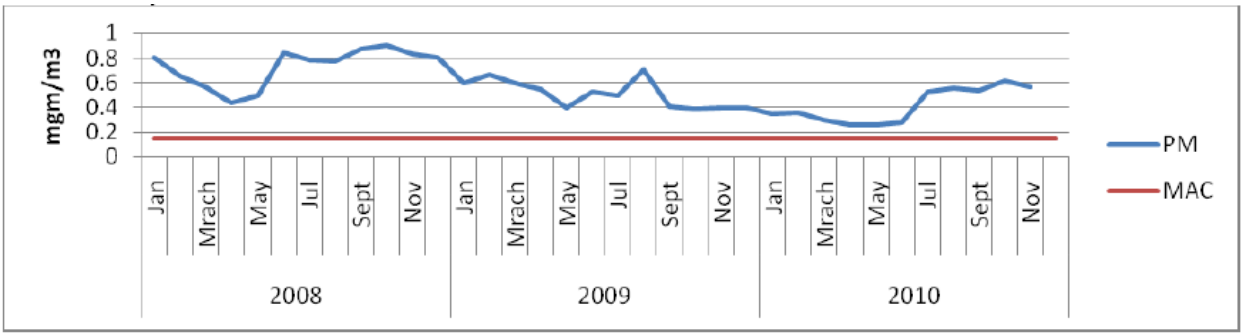
4.1.2 Air Quality

The available data on the air quality in Tbilisi

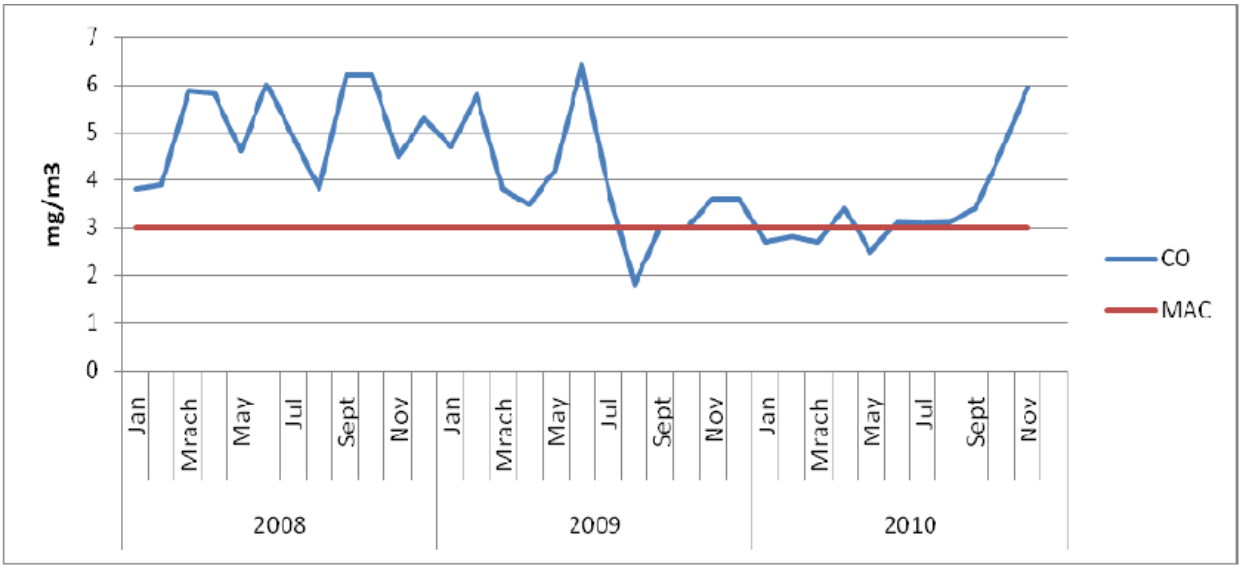
58. At present the National Environmental Agency monitors the air quality in Tbilisi in three points located in Agmashenebli, Tsereteli and Moscow avenues. The last two ones were installed in 2009 and at present only CO and SO_2 concentrations are measured. The observation point at Agmashenebeli Avenue is in a relatively better condition measuring the following parameters of the ambient air: the total amount of particulate matter, carbon oxide, Nitrogen dioxide (NO_2), lead (Pb) and low level ozone concentrations.

4.2 – 4.6 Charts show the ambient air pollution levels in Agmashenebeli Avenue observation point.

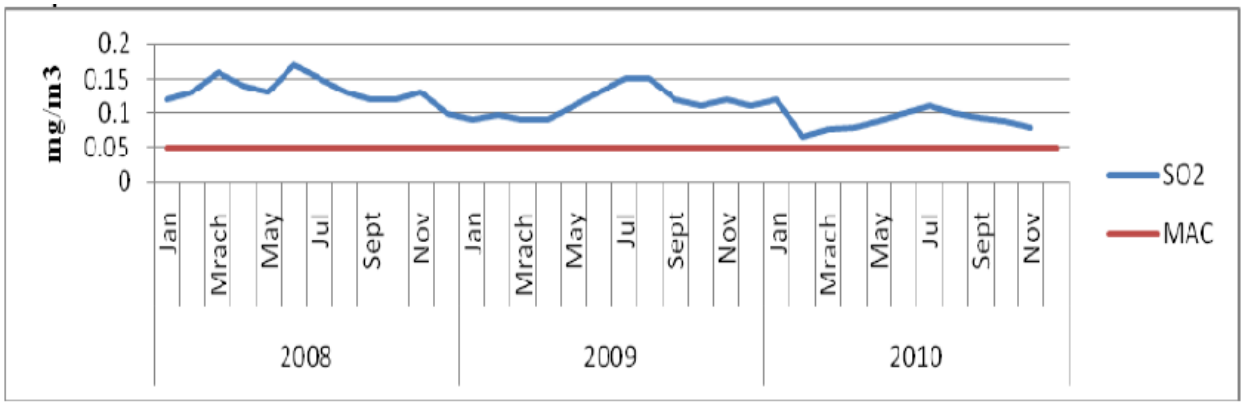
4.2 Chart. Average monthly concentrations of particulate matter (PM) measured in Agmashenebeli Avenue in 2008-2010. They are compared with the average daily maximum allowable concentrations.



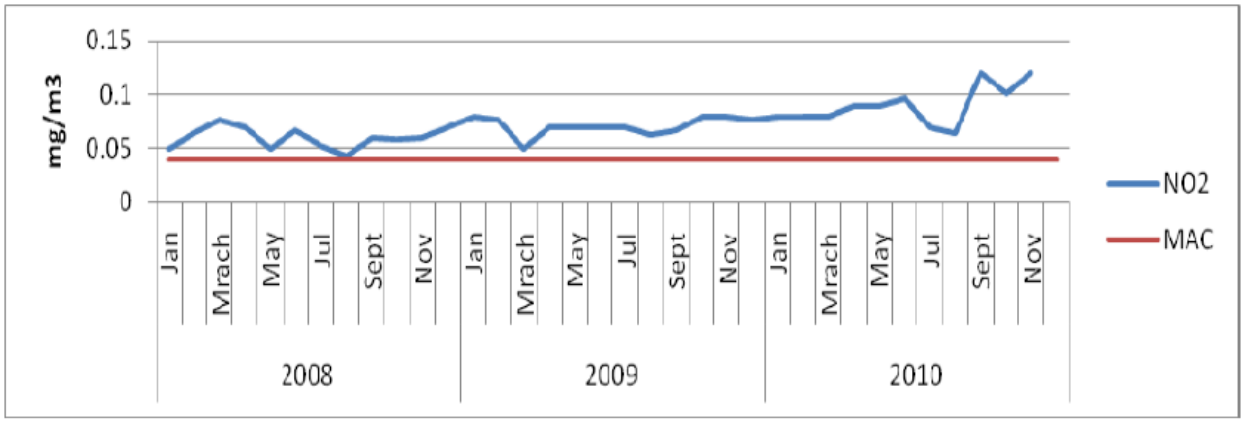
4.3 Chart. The average monthly concentration of carbon oxide (CO) in Agmashenebeli Avenue in 2008-2010. They are compared with the average daily maximum allowable concentrations.



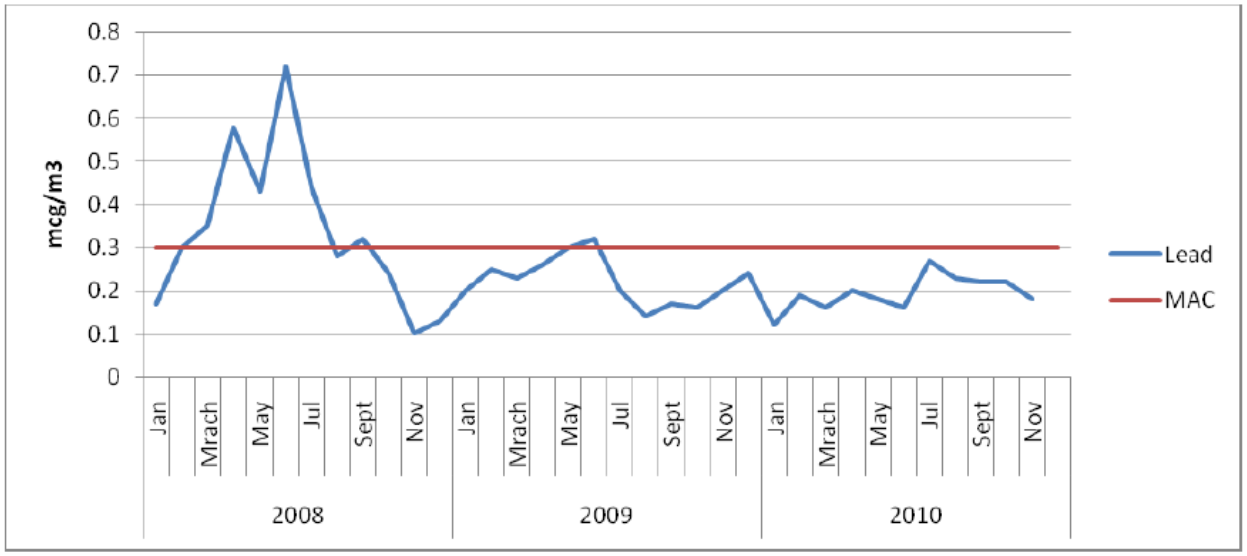
4.4 Chart. The average monthly concentration of sulphur dioxide (SO_2) in Agmashenebeli Avenue in 2008-2010. They are compared with the average daily maximum allowable concentrations.



4.5 Chart. The average monthly concentration of nitrogen dioxide (NO_2) in Agmashenebeli Avenue in 2008-2010. They are compared with the average daily maximum allowable concentrations.



4.6 Chart. The average monthly concentration of lead (Pb) in Agmashenebeli Avenue in 2008-2010. They are compared with the average daily maximum allowable concentrations



59. The following can be concluded based on the available data on the ambient air quality in Tbilisi:

- the concentrations of CO, SO_2, NO_2 and particulate matter in Agmashenebeli Avenue which has heavy traffic and is located in the center of Tbilisi exceeds the national standards in 2004-2010. The lead concentration has decreased since 2008. and is now slightly lower than the national standard. Low-level ozone measurements started in 2010. These measurements are carried out only in Agmashenebeli Avenue and according to the National Environmental Agency the concentration of this pollutant is within the limits of the maximum allowable concentration (MAC).
- The data of 2010 showed that CO and NO_2 concentrations in Tsereteli Avenue, where the trafiic is heavy, exceeded the national standards.

60. In 2010 CO concentration was within the limits of the national standards in Moscow Avenue, which is quite far from the city center. However, NO_2 concentration in this area exceeded the national standard.

Project study data

61. Within the limits of the presented IEE, the air sample analysis on 4 project sites was made by the Environmental Agency. The objective of the air pollution analysis is to give an approximate evaluation of the existing situation on a particular project site, which can be used to forecast the data of the project impact analysis and traffic pollution. The report of the Environmental Agency showing the results of the air sample analysis is given in Annex 2. Below, we give a short abstract.

Table 4.2
Results of measuring the polluting substances in the atmospheric air

No.	Site of measurement	t^0	Humidity %	Concentration mg/m^3			
				Dust	CO	NO_2	SO_2
1	Ortachala (0,0km)	2.6	26	0.176	2.36	0.113	<0.1
Max. permis. concent.				0.5	5.0	0,2	0,5

Note: Date of measurement: 12.12.11 compared with the maximum single maximum permissible concentrations.

As the Table shows, the indicators of background emissions along the project road are within the established norms.

Fig. 4.2.

4.1.3. Background noise

62. In March of 2004, the Institute of Geophysics of the Academy of Sciences of Georgia accomplished test studies in the residential areas at night and by day, in particular at 8 sites in Digomi massif in windless weather. The same group made similar measurements at 10 points of Old Tbilisi in December of 2005. The averaged noise does not exceed the parameters established for the residential areas.[3] In particular, the maximum permissible level is 55 dB 2 m from the residential houses by day and it is 45 dB at night.
It is established that noise in the central streets and mains of Tbilisi exceeds the admissible level in rush hours (See Table 4.3) and reaches 78 dB on some sites of major road mains and streets, while the maximum permissible level from 7 pm to 11 pm is 65 dB and from 11 pm to 7 am it is 55 dB along the central road mains. The highest indicator of 78-80 dB is fixed in Varaziskhevi.

Table 4.3. Background noise in some districts of Tbilisi

Measurement site	Noise level, dB	In excess of the admissible norm, dB
Rustaveli Avenue 15	76	11
Left bank of the river Mtkvari	76	11
Varaziskhevi	80	15
Melikishvili street	76	11

Source: Institute of Environmental Protection, 2002

The difference between the data is clear if considering that the main source of noise in Tbilisi is traffic.

Table 4.4 Admissible noise levels in Georgia for the areas in the immediate vicinity of the residential houses

[3] Decree No. 297/N of August 16, 2001 of the Ministry of Labor, Health and Social Affairs “On approving the standards of environmental quality”

Time	Admissible average noise, dB	Maximum admissible noise levels, dB
7.00 – 23.00	55 (65*)	70 (80*)
23.00 – 7.00	45 (55*)	60 (70*)60 (70*)

Note. The equivalent and maximum sound levels (dB) for eth noise originating in the area due to the car and railway traffic, distanced from the construction isolating the first echelon of sound-protected residential houses, hotels, hostels by 2 m, directed towards the common city and regional mains and railway, is admitted to be 10 dB more (precision = +10 dB) than the value in Table 4.4.

Project study data

63. The background noise was measured along the most densely populated area at 12 pm on December 15, 2011, with its starting point at Ponichala 0.00 km, which is the point of air sampling. The existing background noise was measured with a device “PCE-EM882”. For half an hour, the readings were measured in every 5 minutes (total of 6 readings) and the average indicator was calculated for every noise point. The average noise level amounted to 64 dB and its maximum level was 78 dB. Thus, the fixed noise level is within the established norms, but is close to the limit.

Fig. 4.3. Noise-measuring device PCE-EM882

Fig. 4.4 Device СРП 6801

4.14. Background radiation

64. According to the existing data of 2009 of the Monitoring and Forecasting Center of the Ministry of Environmental Protection and Natural Resources of Georgia, the background radiation level for Tbilisi (exposition strength of γ-radiation in the near-ground atmospheric air) was 14.4 mR/hr.

Project study data

65. The radiation background was screened along the whole selected route of the mains section. Measurements were made on December 15, 2011 with a standard Russian device СРП 6801. The measurements were made during traveling by car all along the road and most densely populated stationery area (starting point of Ortachala 0.00 km). The radiation background levels varied between 6 to 8 mR/hr at different place.

4.1.5. Existing Information about the surface watercourses & quqlity and ground pollution

66. The surface water quality in Tbilisi and Georgia is monitored by the National Environmental Agency of the Ministry of Environmental Protection. The monitoring usually takes place in three sections of the river Mtkvari: 1) Zahesi, at the entrance of the city, near Zemo Avchalhesi (Avchala hydropower station); 2) Vakhushti bridge, in the center of Tbilisi; 3) Gachiani, along the river Mtkvari lower reach, beyond the city limits. 33 major parameters are examined monthly on

these sites. In addition, the National Environmental Agency ensures seasonal monitoring of microbial parameters near Ku lake.

A 10-year-long observation shows that the river Mtkvari in Tbilisi is mostly polluted with nutrients - ammonium ions, whose concentration at the three points of observation (above the reach, in the city center and below the reach) exceeds the maximum permissible standards of Georgia and European Union for several times. This is caused by the untreated sewage waters flowing into the Mtkvari threatening the trouble-free performance of the sewerage system and discharge water treatment plant. Another polluting substance for fish, sodium nitrite exceeds the maximum admissible concentrations fixed by EU only, but is within the limits of Georgian standards.

At the same places, particularly at Vakushti bridge and Gachiani (2008-09), high concentrations of biological oxygen demand (BOD-5) are fixed. On the other side, the concentrations of diluted oxygen meet Georgian and EU standards (admissible minimum) and are quite high for normal fish development what is presumably caused by relatively rapid flow and high water level. The concentration of other nutrients - sodium nitrites and phosphor ions is within the admissible norms.

The indicators of the water quality in the river Mtkvari in Tbilisi hydropower station section and river water regime in different phases are given in Table 4.5.

Table 4.5. Water quality in the river Mtkvari in Tbilisi hydropower station section

Water-bearing phase	pH	Ion content, mg/l								P mg/l	Si mg/l	Fe mg/l
		Ca^{2+}	Mg^{2+}	Na+K	HCO_3	SO_4^{2-}	CL	NO_3	NO_2			
Winter low-water season	7.61	45.4	12.6	7.0	163.5	35.6	4.3	3.00	0.002	0.023	7.00	0.04
Spring flood	7.39	36.0	5.1	10.5	122.6	23.0	3.3	3.50	0.019	0.001	3.0	0.02
Summer low-water season	8.02	55.7	11.9	26.2	180.0	76.9	8.5	1.50	0.007	_	4.3	0.02
Autumn freshet	7.59	46.2	11.9	17.0	167.8	49.9	6.4	_	_	0.038	2.9	0.01

Surface Water quality Data of Project Area

67. The water sample of the river Mtkvari was taken near the starting site of the design road (0.00 km - Ortachala). Along this section, the design road comes closest to the river Mtkvari, running in the immediate vicinity of the river bank. The report of the Environmental Protection Agency showing the results of the surface water samples is given in Annex 3. Below, we give a brief summary.

Table 4.6 Surface Water quality Data of Project Area

No.	Description	Maximum permissible concentration	Mtkvari - Ortachala
			N $41^0$40'31,6'' E$_O$ $44^0$50'10,0''
1	Turbulence, NTU		1.67
2	pH	6.5-8.5	8.211
3	Diluted oxygen, mg/l	4 – 6	8.15

4	Hydrocarbonates, mg/l		173.2
5	TDS, mg/l		257.0
6	Total nitrogen, mgN/l		2.772
7	Total phosphate, mg/l		0.266
8	Chlorides, mg/l	350	20.2
9	Oil products, mg/l	0.3	0.024

Information about the Ground Pollution

68. Within the limits of Tbilisi and particularly, near the design site, no information about the ground pollution could be obtained. Therefore, we rely on the project study data only. The samples were taken at the starting site of the design road (0.00 km - Ortachala) and Ponichala. Analysis to assess the pollution was made with heavy metals, particularly lead. The report of the Environmental Protection Agency showing the results of the ground sample analysis is given in Annex 3. Below, we give a brief summary.

Table 4.7: Design studies data on the pollution of soil with heavy metals.

No	Element	Ortachala (0,0km)	Ponichala (9,0km)
		N 41^{0}30'31,6'' E 44^{0}50'10,0''	N 41^{0}37'58,7'' E 44^{0}55'07,7''
1	Lead - Pb, mkg/g	73.4	15.4
2	Zinc - Zn, mkg/g	187.6	61.9
3	Copper – Cu,mkg/g	153	81.8
4	Nickel - Ni, mkg/g	29.9	18.2

Table 4.8: Tentative Allowable Concentration (TAC) of Heavy Metals in Soils of Various Physical-chemical properties (total content mg/kg)

No	Pollutant	Soil Type	TAC considering the background	Aggregate condition of the Pollutant in Soil
1.	Nickel	a) sandy and sandstone b) acid soils (clay and loam) PHKCI<5,5. c) neutral and close to neutral (clay and loam) PHKCI<5,5.5,5.	20 40 80	Solid: as salts, sorbed, in the composition of minerals
2.	Copper	a) sandy and sandstone	132	Solid: as salts, sorbed organic-mineral

		b) acid soils (clay and loam) PHKCI<5,5. c) neutral and close to neutral (clay and loam) PHKCI>(5,5.	33 66	compounds, in the composition of minerals
3.	Zinc	a) sandy and sandstone b) acid soils (clay and loam) PHKCI<5,5. c) neutral and close to neutral (clay and loam) PHKCI>(5,5	55 110 220	Solid: as salts, sorbed organic-mineral compounds, in the composition of minerals
4.	Lead	a) sandy and sandstone b) acid soils (clay and loam) PHKCI<5,5. c) neutral and close to neutral (clay and loam) PHKCI>(5,5	32 65 130	Solid: as salts, sorbed organic-mineral compounds, in the composition of minerals

4.1.6 Topography and Relief

69. Tbilisi is located in South Caucasus at 41^{0}43' North latitude and 44^{0}47' East longitude. The capital of the country is situated on the both banks of the river Mtkvari, at 380-770 m altitude above sea level. It has an amphitheatre shape and is bordered with mountains from its three sides. Tbilisi is bordered by Saguramo Ridge from the north, by Iori Plateau from the east and south-east and by the branches of Trialeti Ridge from the south and west (See Fig. 4.5). The city is stretched along 33 km along the river Mtkvari and covers the area of 372 km^2.

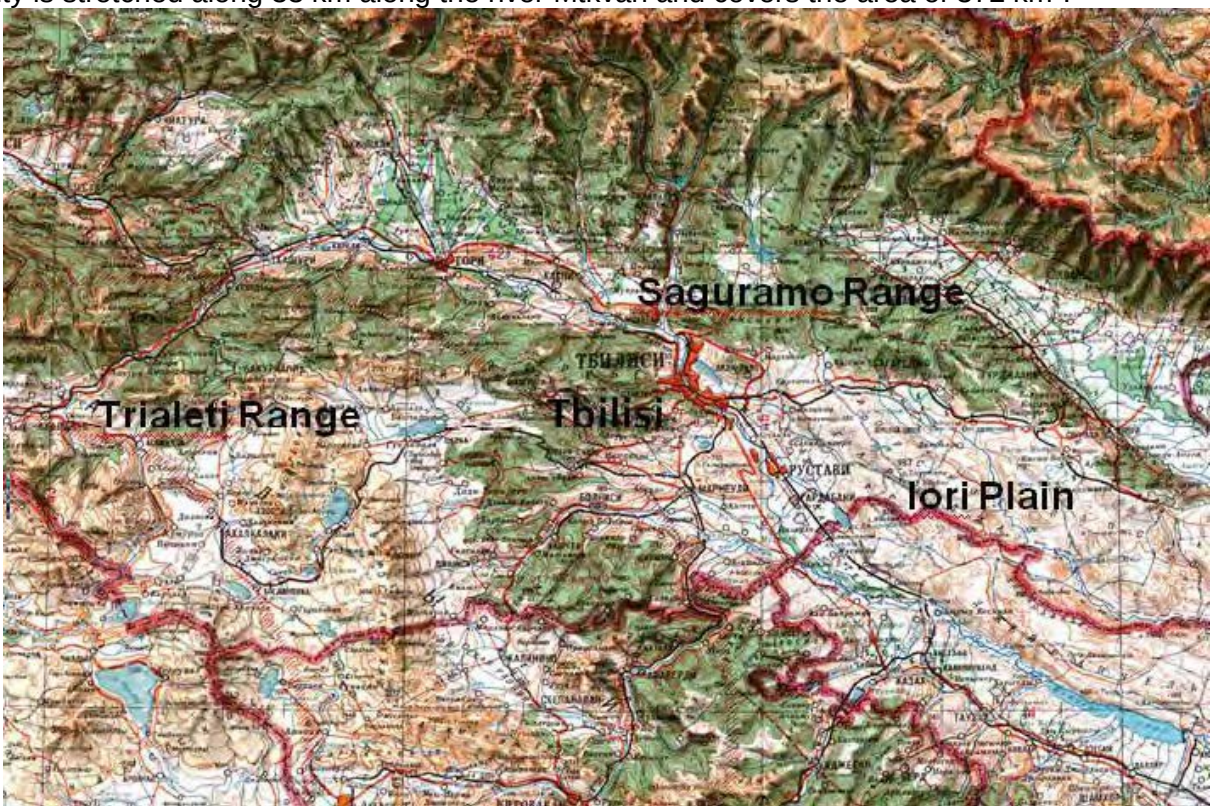


Figure 4.5 Topographic map of Tbilisi

The river divides the capital into two. The left part of Tbilisi exceeds its right part with its area and population. The portion of the city on the left bank of the river Mtkvari is stretched from Avchala district to the river Lochini, and the relief of its right bank is presented by the branches of Trialeti Ridge descending as escarps towards the Mtkvari gorge. Therefore, the major obstacles for the city to extend on the right bank of the river are mountains. Within such geographic environment, there are highly densely populated sections, while other areas of the city due to their complex topographic relief, are not developed. The south-eastern part of the city is located at 350 m above sea level and the settled areas of Mtatsminda are located at 550-600 m above sea level.

The relief of Tbilisi is complex and its diversity is the result of its geomorphological structure. The relief had been subject to a strong transformation for centuries. Out of the natural-tectonic phenomena, the landslides, mudflows, erosion and floods are active. Landslide and gravitational phenomena are the main factors hampering the development of Tbilisi and damaging the city infrastructure.

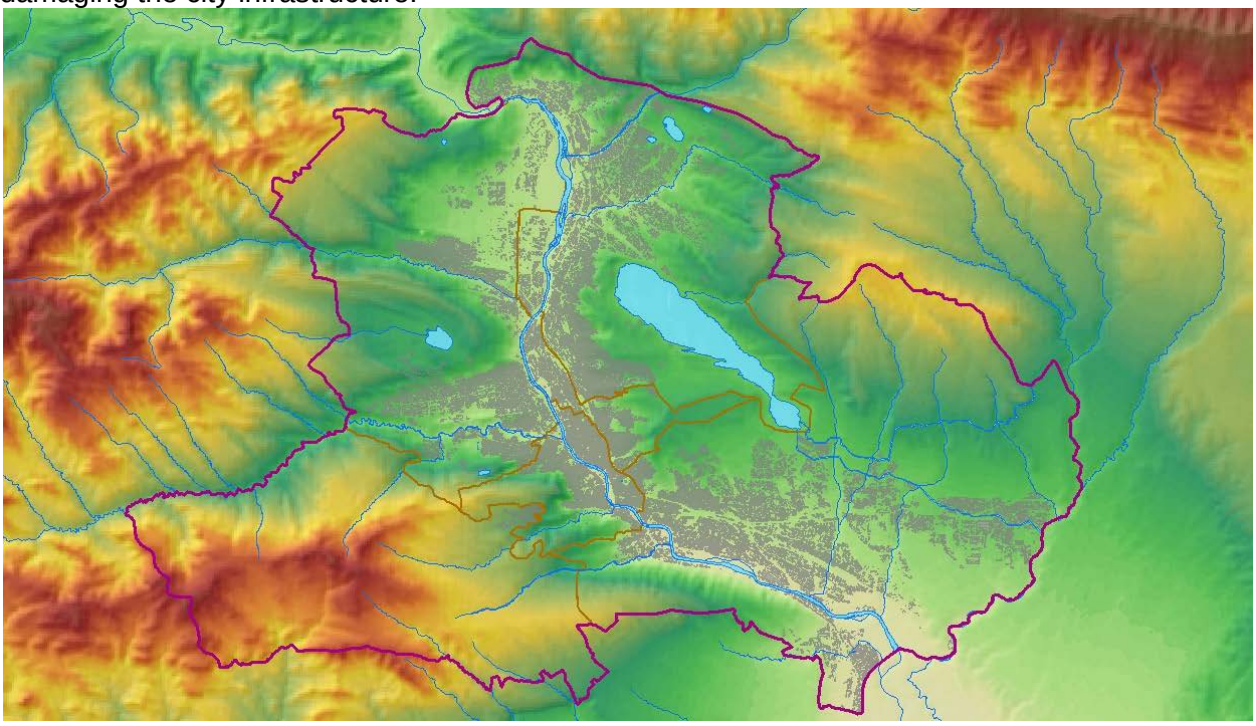


Figure- 4.6 Topography

70. There are two zones of modern relief identified within the limits of the study area, in particular, the Lesser Caucasioni and Kvemo Kartli Plain. The former morphological element is represented as Teleti ridge, which is the south-eastern end of Trialeti Ridge and covers the extreme northern-eastern part of the study area (a small part of it). The height of Teleti ridge gradually reduces eastwards and over the settlement adjacent to Soganlugi it merges with the alluvial plain of the river Mtkvari. The subsidence of the ridge in the east results from the subsidence of the paleogenic stratum in the same direction. The ridge is asymmetric in shape with its northern slope inclined more (20-45º) than its southern slope (15-20º). A coincidence of the morphological form and tectonic structure is observed over Teleti ridge. In particular, its crest coincides with Teleti anticline. The crest section of the ridge is characterized by hilly relief with its absolute heights varying from 440 m to 606 m. The relative height of the northern slope of the ridge in relation to the river Mtkvari varies between 80-200 m.

71. Kvemo Kartli valley covers a significant section within the limits of the study area, which is presented as Asureti-Tsalaskuri plain and is located between Teleti and Ialguja ridges. The territory is presented by the terrace surfaces of the river Mtkvari (the I and II right over-floodplain terraces). The surface of the plain is inclined south-east (up to 10º), towards the bottom of

Ialguja ridge. On its part, the surface of the plain is slightly complicated with small gorges (Tsiviskhevi, Satirmatsaskhevi), flowing across the villages Soganlugi and Krtsanisi.

4.1.7 Geological conditions of the study area

72. According to the tectonic zoning of Georgia (E. Gamkrelidze, 2000), the study area is included in the southern and Bolnisi sub-zones of the folded system of the Lesser Caucasioni. The geology of the area is participated by the rocks from the Middle Eocene through the Quaternary periods.

The deposits of volcanogenic-depository formation of the Middle Eocene are spread in the north-western part of the study area. The area of spreading of these deposits coincides with that of Teleti anticline and they are represented by layered tufas and tufa-breccias. The stratum is characterized by facial modifications, which are strongly dislocated.

The deposits of the Upper Eocene are spread in the north-western part of the study area. Lithologically, the Upper Eocene is divided into two strata: the lower Navtlughi stratum and the upper Tbilisi stratum with nummulites. Only the former stratum is spread over the study area. It is mainly represented by marls, argillite-like clays with sandstone and tufa-sandstone interlayers. The total thickness of Navtlughi stratum in the environs of Teleti ridge varies from 150 to 260 m.

The Oligocene (Khadum horizon) deposits are spread in the central part of the study area, which are mostly represented by clays with gypsum and rarely with sandstones. The thicknesses of Khadum horizon clays reach 50-70 m.

The Lower Miocene deposits, which are spread in the southern part of the study area, is presented by two lithological strata: the lower sandstone stratum belongs to Sakaraulo horizon, and the upper stratum, which is almost totally structured with Maykop habitus clays, belongs to Kotsakhuri horizon. Sakaraulo deposits almost horizontally lie over the deposits of the Oligocene age. The horizon is structured with strong sandstones with quartz-arkose content with clay and micro-conglomerates interlayers. The sandstones are of a typical whitish color. The total strength of the horizon reaches 600 m. The deposits of Kotsakhuri Age are presented by non-carbonate thin-layer dark clays, which reach 600 m when weathered. The dark clays of Kotsakhuri Age disintegrate into thin brown slates during weathering. At some places, there are broken sandstones and sand interlayers spread in the given clays. The average strength of the horizon is 600 m.

The deposits described above over the study area are covered with the Quaternary deposits of different thicknesses almost everywhere, which on their turn are presented by the I and II right over-floodplain terraces of the river Mtkvari of alluvial genesis and deposits of deluvial-proluvial genesis. The deposits of alluvial genesis in the study area are spread most of all and are presented by marly, well-treated shingle with the admixture of boulders (5%) and sand-gravel filler (15-20%). The thickness of the mentioned deposits within the limits of the study area reaches 10-15 m.

Deluvial-proluvial deposits in the study area are mostly spread in its northern part and are presented by clay ground (clay and loam) with the admixtures of detritus and grit (20-25%). Their thicknesses, if considered visually, vary between 3 and 5 m.

The greatest tectonic unit in the study area is the eastern end of Bedena-Teleti anticline, which on its part is divided into Teleti and Tabori anticlines. On their part, these anticlines are divided by Krtsanisi and Tsalaskuri synclines.

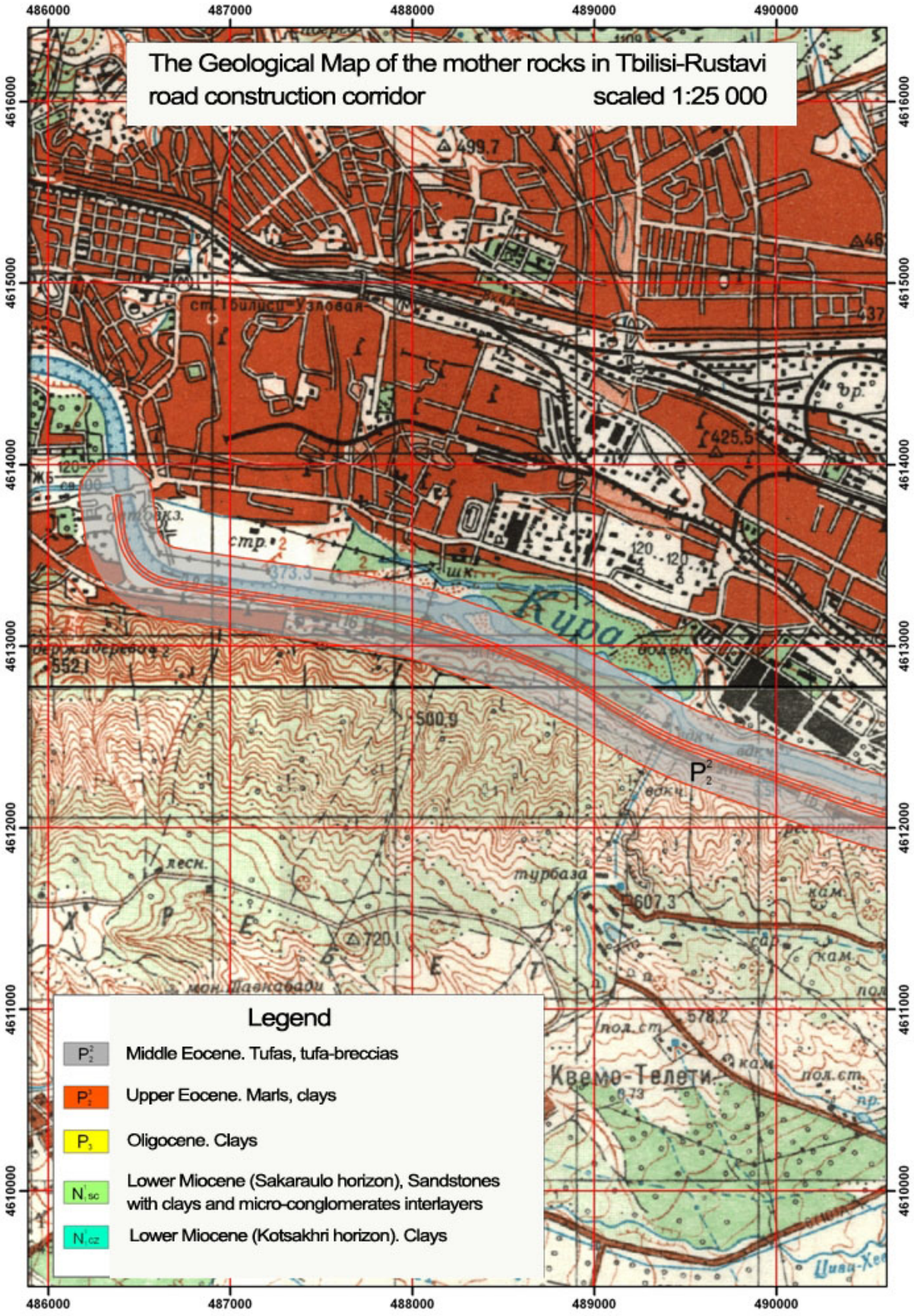


Figure-4.7 Geological Map of Project Area

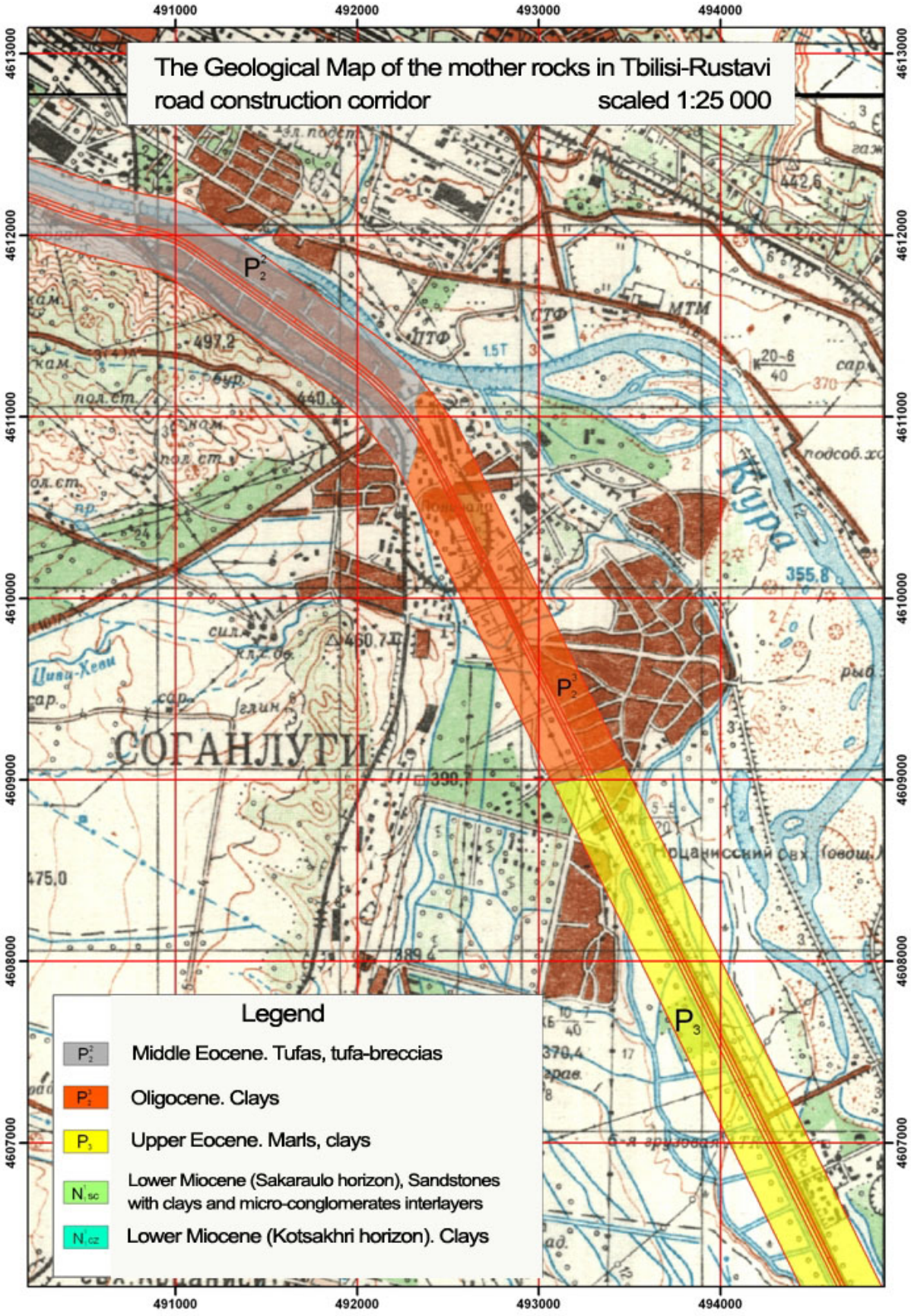


Figure-4.8 Geological Map of Project Area

Seismicity

73. The study area is located within the limits of Aspindza-Tbilisi morphostructural unit, which on its part is complicated by tectonic faults crossing one another. The zone is located within the high-risk area of seismicity. According to the macro-seismic zoning of Georgia, the study area belongs to point 8 seismic zone (Decree No. 1-1/2284 of the Minister of Economic Development of Georgia of October 7, 2009, Tbilisi "On approving building standards and rules - "Earthquake-resisting construction" (PN 01.01-09)). The settled areas in the study area, which are Tbilisi, Soganlugi and Rustavi, face the danger of point 8 earthquakes. According to the existing statistical data, high-magnitude earthquakes capable of significantly damaging the modern engineering structures (including the road) and impacting the morpho-dynamics of the relief, have occurred more than once historically as well as in the near past. Below, we give the existing statistical data.

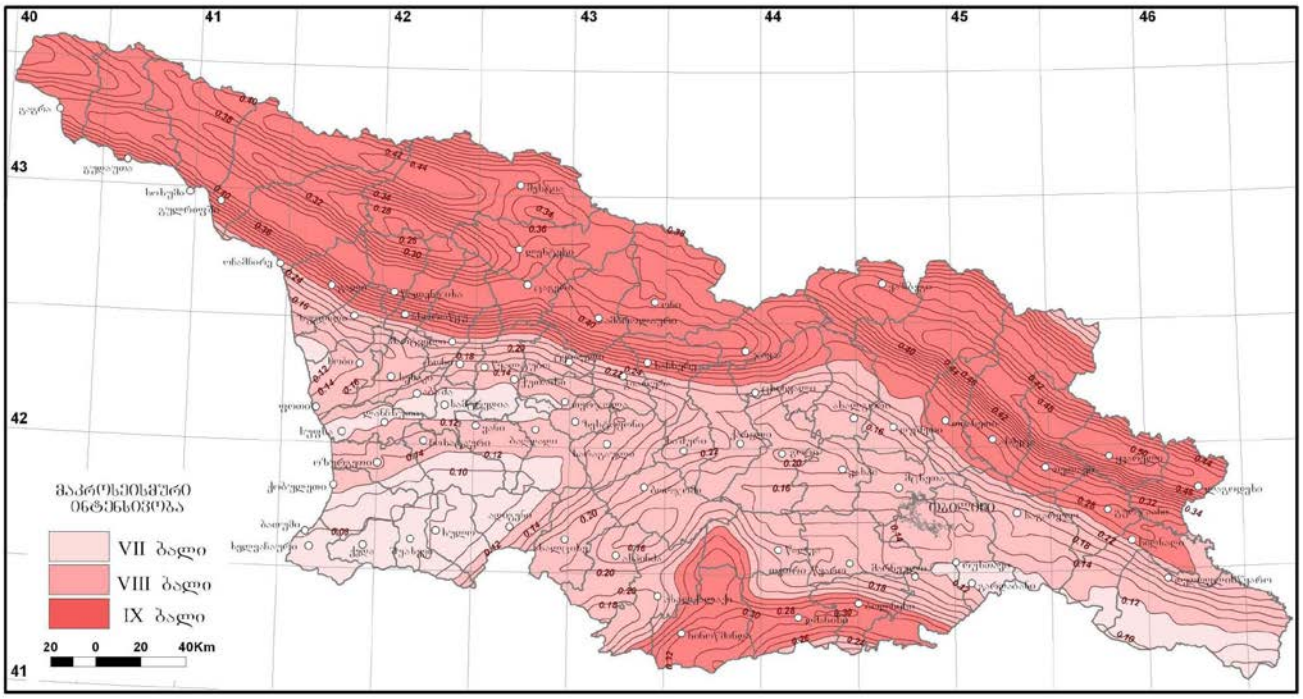


Figure-4.9. Seismic Hazard Map indicating maximal horizontal acceleration and intensity
Note: accelerations are given in "g" units.

74. A 6-7-point earthquake in Tbilisi took place in the years of 1283, 1318, 1803, 1827, 1859, 1909, 1920 and 2002. According to the earthquakes occurred during the XX century, the duration of quakes varies between 2.1 and 3.6 seconds. The nature and direction of spreading the seismic waves mostly depend on the location of tectonic fault structures. The dominating direction (sub-lateral) of spreading of the seismic waves in the study area is northern-western-southern-eastern.

Below we give the characteristics of maximum horizontal accelerations of seismic waves (dimensionless coefficient of seismicity) for the settled areas within the limits of the study area:

1. 0.17 m/sec^2 in Tbilisi
2. 0.12 m/sec^2 in Rustavi
3. 0.174 m/sec^2 in village Soganlugi.

Hydrogeology

75. According to the hydrogeological zoning of Georgia (Buachidze I. (1979)), the study territory is located in the region of porous and fissure waters of Marneuli-Gardabani artesian basin of block Artesian basin of Georgia and in the region of fissure and fissure-karst waters of Tbilisi water-pressure system of water-pressure system of Adjara-Trialeti folded zone.

76. Two principal hydrogeological complexes may be identified within the limits of the study area: the water-bearing horizon of main rocks and the water-bearing horizon of Quaternary rocks. The water-bearing horizon of the main rocks is presented by Eocene, Oligocene and Miocene water-proof laguna-marine and volcanogenic deposits: tufas, tufa-breccias, clays, sandstones, marls, argilites. Out of the volcanogenic rocks of the Middle Eocene, there are rare fresh and cold water outcrops at the bottom of the gorge edges as seepage waters. An exception is the thermal waters of deep circulation in the rocks of the same age. According to their chemical content, the underground waters associated with the Middle Eocene rocks, are of two main types:

(a) Thermal curing waters with their outcrops associated with tufogenic waters. With their chemical content, these waters are chloride-hydrocarbonate-sodium, with the mineralization of 0.25-0.34 gr/l and sulfate-chloride-sodium-calcium, with the mineralization of 0.68-0.87 gr/l. Their temperatures vary from 26 to 50ºC.

(b) Cold water outcrops, which are associated with volcanogenic rocks, are hydrocarbonate-calcium-magnesium, with the mineralization of 1.4 gr/l to 2.6 gr/l and sulfate-hydrocarbonate-calcium-sodium, with the mineralization of 0.6 gr/l. The temperature varies from 6 to 18ºC. It should be noted that the underground waters of deep circulation of the Middle Eocene are characterized by high content of hydrocarbon of up to 12 mg/l. These waters often contain methane of up to 19.26-22% and nitrogen.

The deposits of Oligocene-Lower Miocene - clays, sandstones, marls, argilites are characterized by low collector properties. Even some sandstone species, containing carbonates, are in fact waterproof. The underground waters in these deposits mostly circulate above the local erosion section level and locally outcrop over the edges of watercourses (rivers, gorges), where they cross water-bearing layers of minor thicknesses. The flow of the springs is little (one-hundredth of litre per second), and the springs associated with fissure sandstones have a greater flow (up to 0.3 m/sec). The underground waters are of different chemical content, with their mineralization mostly depending on the content of gypsum in the rocks. The waters are sulfate, sulfate-hydrocarbonate, sulfate-chloride and sodium-calcium-magnesium with the general mineralization of 3.2-6.6 gr/l. They are characterized by high value of hardness (pH=7).

Out of the rocks (alluvial, deluvial, proluvial) of the water-bearing complex structured with the Quaternary deposits, the high terraces of the river Mtkvari are mostly water-infused in the study area. The water outcrops associated with the given deposits are mostly of a little flow. With their chemical content, the waters are sulfate-hydrocarbonate and calcium-sodium-magnesium. Their general mineralization varies from 1.0 to 1.0 gr/l.

During the road construction and operation in fact no pollution of the underground waters along the road corridor is expected.

4.1.8 Assessment of the Design Corridor Engineering-Geological Conditions by pickets (kilometers)

Averaged physical-mechanical (geotechnical) properties of the grounds structuring the study area

77. The Averaged physical-mechanical (geotechnical) properties of the grounds structuring of the study area is provided below.

The density of tufas is 1.1 gr/cm^3, their porosity is 7%, their softening ratio is 0.86, the angle of internal friction is 37º, the adherence is 170, the temporal resistance uniaxial strength (Rc) is 70, the modulus of deformation is 2, and the modulus of elasticity is 4.

The density of sandstones is 2.30 gr/cm^3, their porosity is 8%, their softening ratio is 0.77, the angle of internal friction is 29º, the adherence is 9, the temporal resistance uniaxial strength (Rc) is 100, the modulus of deformation is 4, and the modulus of elasticity is 10.

The density of clays is 1.95 gr/cm^3, their coefficient of porosity is 0.70%, their plasticity index >17, index of consistency is 0.0-0.25, the filtration coefficient <0,001, the angle of internal

friction is 20º, the adherence is 0.60, the provisional estimate resistance (Rc) is 5 kg^{force}/cm^2, the modulus of deformation is 240, and the modulus of elasticity is 390.

The density of marls is 2.30 gr/cm^3, their porosity is 31%, their softening ratio is 0.81, the angle of internal friction is 31º, the adherence is 40, the temporal resistance uniaxial strength (Rc) is 50, the modulus of deformation is 2, and the modulus of elasticity is 5.

78. The density of argilites is 2.0 gr/cm^3, their porosity is 32%, their softening ratio is 0.30, the angle of internal friction is 19º, the adherence is 3, the temporal resistance uniaxial strength (Rc) is 10, the modulus of deformation is 2, and the modulus of elasticity is 4.

The density of loams is 1.75 gr/cm^3, their porosity is 05%, the number of plasticity is 10, the consistency index is 0.0-0.25, the filtration coefficient is 0.05, the angle of internal friction is 21º, the adherence is 0.25, the provisional estimate resistance is 2 kg/cm^2, the modulus of deformation is 190, and the modulus of elasticity is 340.

Shingle with boulder admixtures (5%) and sand-and-gravel filler. The density of the given ground is 1.95 gr/cm^3, the porosity coefficient is 0.60, the filtration coefficient is 50 m/day, the angle of internal friction is 35º, the adherence is 0.07, the provisional estimate resistance (R_0) is 6 kg^{force}/cm^2, the modulus of deformation is 480, and the modulus of elasticity is 3800.

The constituent grounds of the road corridor are mostly characterized by favorable bearing properties and in fact no complications in this respect are expected during the road operation.

General description of the engineering-geological conditions of the road construction corridor with the indication of piquets (kilometers)

79. The construction corridor of Tbilisi-Rustavi road starts adjacent to the highway stream crossing over the river Mtkvari, Ortachala district, Tbilisi. Below we give the general description of the engineering-geological conditions of the road construction corridor with the indication of piquets (kilometers).

The road construction corridor along the section of KP 00km+00m-KP 00km+600m, runs within the borders of the I right over-floodplain terrace surface of the river Mtkvari. The territory is strongly anthropogenized and is occupied by the buildings and premises of different designations (See Figgure- 4.10). The geology of the territory is participated by shingle of alluvial genesis with the admixtures of boulder and sand-and-gravel filler as well as tectogenic ground. According to the complexity of the engineering-geological conditions, the given territory belongs to the I (simple) category.

Figure-4.10

80. The corridor along the section of KP 00km+600m-KP 04km+600m belongs to the right bank of the river Mtkvari with the river terraces preserved as rare fragments only and the outcrops of the mother rocks (Middle Eocene - tufas, tufa-breccias) directly flow into the bed of the river Mtkvari (See Figure- 4.11). The initial section of the territory is occupied by the buildings and premises of different designations. Most of the section is characterized by complex relief conditions. The slopes here are strongly inclined and sometimes steep.

The geology of the territory is participated by the deposits mentioned above (tufas, tufa-breccias), as well as a strong train of deluvial-proluvial deposits (loams with detritus and grit),

which are mostly spread at the endings of the gullies over the northern slopes of Teleti ridge (See Figure- 4.12). The engineering-geodynamic state of the section is complicated. The road widening may entail such phenomena, as rock falls and rock avalanches and no-large-scale landslide processes. Therefore, the project shall envisage the relevant protection measures, including building the walls. According to the complexity of the engineering-geological conditions, the given territory belongs to the II (average) category.

Figure- 4.11

Figure- 4.12

81. The report is attached by a schematic map of zoning of the construction corridor of the design road and adjacent territories according to the engineering-geological conditions (degree of geological hazards), with three categories identified according to the given sign: sections of the I (simple), II (average) and III (complex) categories. The areas are categorized by considering different factors, in particular, by geomorphologic conditions; geological conditions – relation of the premises and communications to the geological environment; hydrogeologycal conditions; geological processes and their possible impact on premises and communications; presence of specific grounds and their impact on communications, etc.

82. The I (simple) category unites the territory located within one geomorphologic element, with its surface being horizontal and not dissectioned. In a geological respect, the territory is presented by no more than two lithological layers with their location being horizontal (or slightly inclined), or by rocky rocks, which be may covered with non-rocky rocks of a little strength, outcropping onto the surface. As for the underground waters, they are either absent, or presented by one sharply expressed horizon and having a homogenous chemical composition. No hazardous geological processes or specific grounds (settling, swelling, etc.) are found here.

83. The II (average) category includes the territories, which are spread within the limits of several geomorphologic elements of a similar genesis, with their surfaces slightly inclined and dissectioned. In a geological respect, the territories are presented by no more than four lithological layers. The rocky rocks have uneven surfaces and are covered with non-rocky deposits. The underground waters are presented by two or more formed horizons and have different chemical composition. Hazardous geological processes are limited. As for the specific grounds, they do not play an important role in making a design decision.

84. The III (complex) category includes the territories, which are spread within the limits of several geomorphologic elements of different genesis, with their surfaces strongly dissectioned. In a geological respect, the territories are presented by more than four lithological layers with their strengths sharply varying. The rocky rocks are very much weathered and fissured. They are covered with non-rocky rocks. The horizons of the underground waters are not sharply distinct. Some areas are structured with alternating water-bearing and water-resistant rocks. Hazardous geological processes are widely spread, or the territory is potentially dangerous in respect of origination and activation of hazardous geological processes. The mentioned circumstances and existence of specific grounds are of a decisive importance when making decisions during the designing and building of new communications and in the exploitation phase.

85. As a conclusion, this may be noted that in the final account, the study section of Tbilisi-Rustavi road, in respect of geological hazards, is in fact characterized by favorable engineering-geological conditions. However, along the section of KP 00km+600m-KP04km+600m, certain complications are expected during the road construction and operation, in particular rock falls and rock avalanches and no-large-scale landslide processes. The given circumstances will be necessarily considered under the project and as a result, the relevant protective measures will be developed (arranging the walls, regulating the surface waters, etc.).

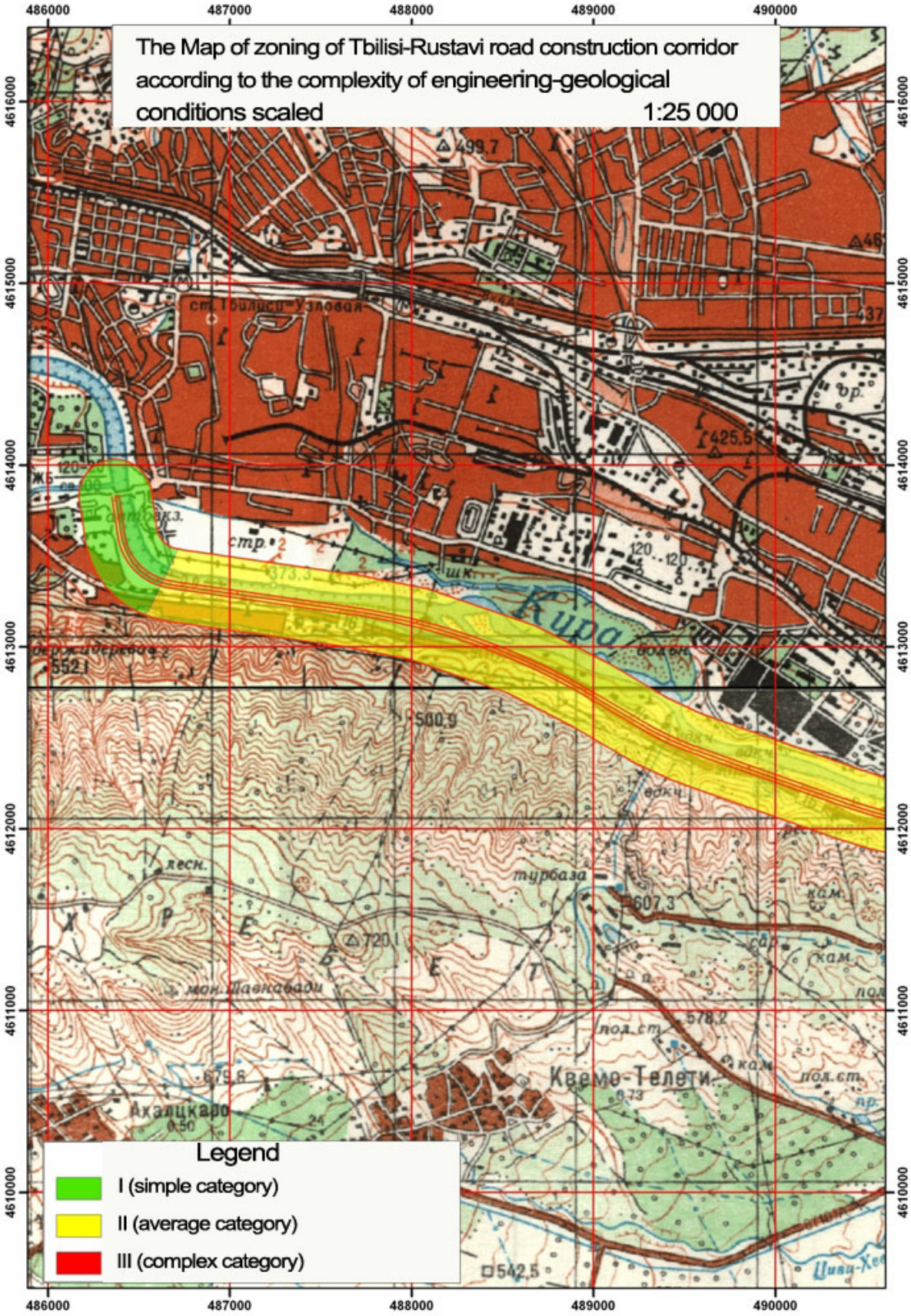


Figure-4.13 Geotechnical Map of Complexity of the Geoengineering Conditions

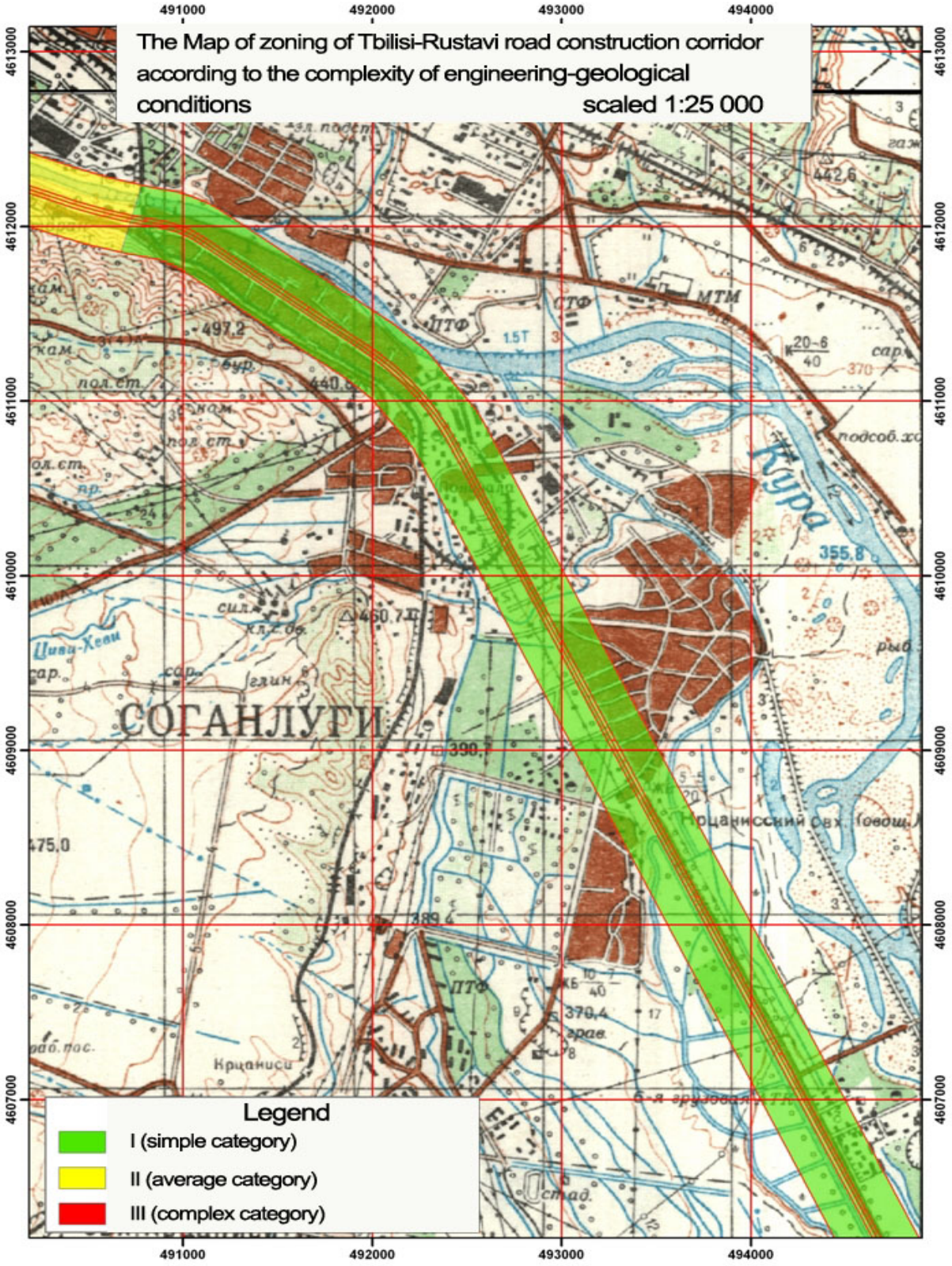


Fig 4.14 Geotechnical Map of Complexity of the Geoengineering Conditions

4.1.9 Water Resources

4.1.9.1 The river Mtkvari

86. The bed of the river Mtkvari runs all along Tbilisi-Rustavi rehabilitation road. The river Mtkvari, the biggest river in South Caucaus, heads from the springs at the altitude of 2720 m above sea level on the northern slope of Kizil-Gyadik mount in Turkey and flows into the Caspian Sea on the territory of Azerbaijan. The length of the river is 1364 km and the area of its catch basin is 188.000 km^2. The length of the river across the territory of Georgia is 350 km. The hydrographic network of the river along this section is made up of 12211 rivers with the total length of 35465 km.

87. The basin of the river Mtkvari has an asymmetrical shape and covers Main Caucasioni ridge on the territory of Georgia, Somkhit-Javakheti high mountainous zone and intermontane tectonic lowland. The lowest part of the basin is the intermontane lowland, which is Kartli Plain.
The geology of the upper part of the river basin is presented by the rocks of a volcanic origin. The geology of the piedmont is presented by Paleozoic, Jurassic and Cretaceous sandstones and Eocene clays. The geology of Kartli valley is presented by Old and Modern alluvial deposits. There are brown and black soils spread along the river across the plain.
The vegetation cover of the basin above 2500 m altitude is presented by alpine vegetation, with a wide band of subalpine vegetation below. There is a mixed forest growing in the piedmont with dominating hardwood species. Kartli Plain is mostly cultivated with agricultural crops.
The river is fed with glaciers, snow, rain and ground waters. Its water regime is characterized by spring floods caused by seasonal snow melting and summer and winter relatively stable low-water periods. The most water-bearing period is spring with 47-58% of the annual water flow. The flow in summer is 22-27% and exceeds that in autumn or winter. In some years, spring floods coincide with freshets caused by rains and leads to catastrophically high water levels. The flood of April 18 of 1968 is a classic example of such a catastrophe, when the peak water level in Tbilisi exceeded 5-6 m above the normal level.
Low water levels and discharges are mostly fixed in winter. In this period, the icy phenomena are instable. The average number of icy days is 8-14 on average.
Along the rehabilitation road section, the river Mtkvari flows through a single, non-branched bed, with its banks protected with concrete dikes (KP 0+000 to KP 2+200).

The river Mtkvari is widely used for irrigation, power engineering and industrial water-supply purposes. The closest HPP plants are located upstream from project sites in Ortachala district of Tbilisi and in Zahesi (between Tbilisi and Mtskheta).The headworks arranged past the city of Rustavi supplies the irrigation and power engineering water to Gardabani irrigation system and Gardabani thermal power plant. r. Mtkvari is not used for navigation. Fishing in r. Mtkvari has no economic value but mostly a leisure meaning.

4.1.9.2 Brief Hydrographic Characterization of Gorges Crossing Tbilisi-Rustavi Road

88. The nameless gorges crossing the first section of Tbilisi-Rustavi road (from KP 0+500 till KP 7+000) start from the northern slopes of Teleti ridge between the altitudes of 785 to 525 m, while gorges crossing the following sections (from km 7+000 till km 17+800) – from the northern slopes of Iaghluji ridge within the same altitudes. The majority of the mentioned gorges join r. Kura from the right side, while some of the gorges spread on the right terrace of r. Kura and disappear within the terrain until crossing the rehabilitation road. Part of the small gorges fall into the “water household” irrigation channel running parallel to the rehabilitation road. The channel does not function at present.

89. The geology of the dry nameless gorge basins is composed of the Quaternary period deposits, which are covered with loamy soils. Gorge basins are stripped of forest cover. Only thin shrubbery and grasses are present from vegetation here. The beds of the gorges from

Iaghluji ridge are utilized through industrial areas and agricultural crops on the right terrace of r. Kura after crossing Tbilisi-Rustavi road.

90. The gorges are dry the most part of the year. Water flows in the gorges only in the period of intensive rain and melting of the thin snow cover. Discharges and levels of the flash floods caused by rain significantly exceed the same values caused by snow melting.

91. Gorges crossing rehabilitation Tbilisi-Rustavi road have not been studied in hydrological terms. Hence, the values of maximal water discharges of these gorges crossing the rehabilitation road are identified using the method given in the "Technical Instruction for Calculation of the Maximal Discharge of Rivers in Conditions of Caucasus."

According to the mentioned method, the values of maximal discharge of those rivers and gorges, the area of the water catchment basin of which does not exceed 400 km^2, are calculated with the below formula:

$$Q = R \cdot \left[\frac{F^{2/3} \cdot K^{1,35} \cdot \tau^{0,38} \cdot \bar{i}^{0,125}}{(L+10)^{0,44}} \right] \cdot \Pi \cdot \lambda \cdot \delta \text{ m}^3/\text{sec}$$

Where R – it is the rayon parameter. Its value in Eastern Georgia is deemed as 1.15;

F – the area of the water catchment basin in cross-section for calculation in km^2;

K – climate rate of the rayon, the value of which is taken from special map and in our case is 5;

τ - recurrence in years;

$\bar{i}$ - leveled inclination of the river flow or gorge in units from the starting point till cross-section for calculation in km;

Π - rate of characteristic of soil cover in the river basin. Its value is taken from a special map and respective table;

λ - rate of the basin forestation, the value of which is calculated as follows:

$$\lambda = \frac{1}{1 + 0,2 \cdot \frac{F_t}{F}}$$

Where F_t - the area of forested basin in %;

δ - rate of basin form, the value of which is calculated as follows:

$$\delta = 0,25 \cdot \frac{B_{\max}}{B_{sas}} + 0,75$$

Where $B_{\max}$ - the maximal width of the basin in km;

B_{sas} - average width of the basin in km, the value of which is calculated by relation $B_{sas} = \frac{F}{L}$.

92. During the calculation of the maximal discharge of those small gorges, the area of the water catchment basin of which is less than 5 km^2, the below specially processed rates corresponding to the areas of the water catchment basins are introduced in the above formula:

Table 4.9 Calculation of Maximum Discharge in Gorges

F km^2	<1	1	2	3	4	5
K^{I}	0.70	0.80	0.83	0.87	0.93	1.00

93. The values of morphometric elements required for the calculation of the maximal water discharge of the gorges crossing the rehabilitation road are identified using 1:25000 scale topographic map as well as the values of the maximal water discharge for recurrence of 100 years, 50 years and 10 years. The values are given in the below Table 4.10.

Morphometric Elements and Maximal Water Discharge in M^3/Sec for the Gorges Crossing the Rehabilitation Road

Table 4.10 Table 4.10 Morphometric Elements and Maximal Water Discharge in M^3/Sec for the Gorges Crossing the Rehabilitation Road

Gorge # or name	F km^2	L km	i kal	Π	K	λ	δ	K^1	Maximal discharge			
									$\tau =$ 10 years	$\tau =$50 years	$\tau =$20 years	$\tau =$10 years
1	0.86	1.60	0.234	1	5	1	1	0.70	10.1	7.73	5.46	4.20
2	0.04	1.20	0.267	1	5	1	1	0.70	1.33	1.02	0.72	0.56
3	0.23	1.15	0.248	1	5	1	1	0.70	4.26	3.28	2.31	1.78
4	0.67	1.20	0.229	1	5	1	1	0.70	8.61	6.62	4.67	3.60
5	0.32	1.30	0.188	1	5	1	1	0.70	5.10	3.92	2.77	2.13
6	0.27	1.25	0.196	1	5	1	1	0.70	4.59	3.53	2.49	1.91
7	0.59	1.10	0.200	1	5	1	1	0.70	7.80	6.00	4.24	3.26
8	0.18	0.75	0.260	1	5	1	1	0.70	3.69	2.84	2.00	1.54
9	0.19	0.70	0.250	1	5	1	1	0.70	3.83	2.94	2.08	1.60
10	0.31	0.72	0.236	1	5	1	1	0.70	5.25	4.04	2.85	2.19

94. In addition to the gorges crossing the rehabilitation road, r. Kura maximal annual discharges have also been identified for Tbilisi-Rustavi section. The analogue method is used for the determination of the maximal discharges of r. Kura within Tbilisi-Rustavi section. The data of r. Kura – hydrological point Tbilisi are taken as analogue. The date comprises 66 years of observations (1925-1990). Within the mentioned period the maximal discharges of r. Kura in hydrological point Tbilisi cross-section had fluctuated from 448 m^3/sec (1947) to 2450 m^3/sec (1968).

95. In The variation row of maximal water discharges within 66 years of hydrological post in Tbilisi cross-section for r. Kura have been statistically processed following SNiP (СниП) requirements 2.01.14-83 using the method of moments. As a result of the processing, the below parameters of distribution have been received:
The average perennial value of maximal discharges Q_0=1162 m^3/sec;
Variation rate Cv=0,31;
Asymmetrical rate value Cs=4Cv, which is received through the closest empirical and theoretical point coincidence on the probability cell.
Assessment parameters of representativeness of the variation range of observations have been determined – relative average square error of the average perennial maximal discharge value and variation rate, which lies within acceptable limits. The average square deviation has also been identified and is δ=360.
From the received parameters and ordinates of three parameter gamma-function the maximal discharge of various supply waters of r. Kura has been calculated. The maximal discharges of various supply waters have been identified through Gumbel method as well, during which the recurrence rate K for extreme values (according to Gumbel distribution) is selected through specially processed table according to observation period (in our case 66 years).
The maximal discharges of r. Kura in Tbilisi are calculated on the basis of individual catastrophic maximal discharges determined by the Institute of Hydro-Meteorological Scientific Research as well. According to the mentioned calculations the below parameters of the distribution function have been identified:

Average perennial value of maximal discharges: Q_0=1148 m^3/sec;
Variation rate Cv=0,56;
Value of asymmetry rate Cs=2Cv=1,12.

96. Through the received parameters and binominal distribution function ordinates values of various supply of r. Kura are determined.
The values of the various supplies of maximal discharges of r. Kura in Tbilisi hydrological post cross-section according to the determined three parameter gamma-distribution, Gumbel distribution and the Institute of Hydro-Meteorology are given in Table- 4.11.

R. Kura – Hydrological Point Tbilisi

Maximal Water Discharges Q M^3/Sec

Table 4.11 Values of the Various Supplies of Maximal Discharges of r. Kura in Tbilisi Hydrological Post Cross-Section

Supply P%	0,1	1	2	5	10	20
Gamma-distribution	3030	2300	2140	1835	1630	1425
Gumbel distribution	3100	2395	2185	1900	1680	1500
Hydro-meteorological Institute	3480	2910	2765	2475	2270	2060

97. The maximal discharges of r. Kura identified by the Institute of Hydro-Meteorological Scientific Research of Georgia are accepted as calculation values for hydrological point Tbilisi cross-section.
98. As there is fairly insignificant difference between the water catchment basins of hydrological point Tbilisi cross-section and Tbilisi-Rustavi rehabilitation road section, the maximal discharges of r. Kura identified for hydrological point Tbilisi cross-section are deemed as calculation values for Tbilisi-Rustavi rehabilitation road section
.

4.2 Ecological Resources – Landscape and Flora

4.2.1 Landscape and Soils

99. Landscapes of Tbilisi are diverse. Many regions of specific landscape border each other in the surroundings of Tbilisi. Due to these particular components of landscapes and the whole landscape itself are so diverse. Plain and hilly part of Tbilisi environs developed the landscape typical for the grassland of Eastern Georgia, while the landscape of Western and Northern part is mainly woody and mountainous, creating altitude zones. Due to human impact original natural landscapes have been significantly modified on the territory of Tbilisi. Relatively untouched landscapes still remain in the zone of mountain-forests and, partially, in the areas unsuitable for rural development. In all remaining parts of the city there are modified, secondary natural or cultural landscapes.

100. Due to diversity of natural conditions and relief the soil of Tbilisi and its surroundings are of various types. There is grey-brown, meadow grey-brown, humus-sulphatic, alluvial, saline, alkali, forest brown and black soils. Erosion processes are observed in the surroundings of Tbilisi. Due to them a wide area is occupied by thin washed down soils with different types of bear land rocks. In the gardens and parks of Tbilisi there are soils cultivated to different degree. This soil has lost its natural shape and now represents a cultural variation of the original soil.

101. Large scale inflows of Internally Displaced People (IDPs), mainly ethnic Georgians followed conflicts in South Osssetia and Abkhazia in early 1990-is and the armed conflict between Georgia and Russia in August 2008. As reported, by the Ministry of Internally Displaced People, by August 2010about 95000 IDPs were registered in Tbilisi. Most of them live in the so called "collective settlements" in grave social, economic and living conditions. There are 756 "collective settlements" in Tbilisi. In the last few years the government launched the IDPs relocation programme. The Ministry of Internally Displaced People oversees the implementation of the programme. IDPs have beenrelocated from both the Iveria Hotel and the Adjara Hotel. They were given a monetary compensation (7,000 USD) in exchange for each occupied hotel room. Some other IDPs were offered to resettle in different parts of Georgia where the government renovated and prepared special buildings for them. However, the process of relocation of IDPs proves to be difficult: IDPs have more or less accommodated to Tbilisi over the years.

102. The city offers more job opportunities to them than any other place in Georgia. The majority of IDPs are engaged in small-scale trade and unskilled employment here. They have limited opportunities for permanent employment. Moreover, the unemployment level among IDPs is 2-3 times higher then among the local population. Nevertheless, many of the IDPs

prefer to stay in Tbilisi even in the dire living conditions rather than to move to new places where job opportunities for them will be more limited.

4.2.2 Vegetation

103. The report comprises the results of the review of literature and scientific research, which aimed at the study of the flora and vegetation within the corridor of the project of Tbilisi-Rustavi section of the Tbilisi-Tsiteli Khidi (Red Bridge – border with Azerbaijan) road and more specifically – the discovery of sensitive habitats and communities within the section.
Botanical description of the zone of interest is based upon the literature sources and field research as well as our own experience and knowledge. It should also be noted that research with the aim to obtain more detailed information enabled to fill in the existing gaps and obtaining detailed data on design and construction. Such data is necessary for environmental assessment in botanical terms. Consequently, as a result of the above mentioned researches the expected negative and residue impact on the flora and vegetation of the areas adjacent to the corridor have been revealed.

104. Communities and species (included in Georgian Red List, Red Book, endemic, rare) of various conservation value occur in the project impact zone as well as plants of economic value (medicinal, odorous, wild fruit, fiber, tubers, decorative, drinking, raw material and firewood forests, forage, hay meadow-pasture, wild predecessors of crops, etc.).
Along with endangered species and sensitive habitats with various conservation values forests are especially notable; if residual impact is determined on the forests, eco-compensation measures should be implemented, which comprises the restoration of equivalent forest habitat.

General review of flora and vegetation of the project corridor

105. The project area is located in the geo-botanical district of Kvemo (Lower) Kartli lowland. The cover has been severely modified by economic activities of man. Territories with natural vegetation are scarce in the district (one of the least within the regions of Eastern Georgia). It is especially true for plains, where natural vegetation had been substituted with landraces a long time ago. Vegetation cover developed within the district, despite significantly limited distribution, is very diverse and complex in terms of types of individual plants and genesis of formations as well as the development history. Forest vegetation is diverse in phyto-cenological terms. Mono-dominant forests of Georgian oak (*Quercus iberica*) and high mountain oak (*Quercus macranthera*) are developed on the highest part of the area. It is noteworthy that high mountain oak descends fairly low in the mentioned region. Oak-hornbeam (*Carpinus caucasica, Quercus iberica*) and poli-dominant leaved forest stands (Georgian and high mountain oak, European ash - *Fraxinus excelsior*, hornbeam - *Carpinus caucasica*, lime - *Tilia caucasica*, field maple - *Acer campestre*, etc.) are distributed in the area as well.

106. At some area of the district (mainly r. Khrami and Algeti basins) relict forest species have been preserved – remnants of arid open woodland: pistachio (*Pistacia mutica*) and Caucasian hackberry (*Celtis caucasica*). Many species typical for arid open woodland occur within the above: Georgian maple, Balkan maple (*Acer hyrcanum*), fig tree (*Ficus carica*), buckthorn (*Rhamnus pallasii*), Christ's thorn (*Paliurus spina-christi*), spirea (*Spiraea hypericifolia*), smoke tree (*Cotinus coggygria*), elm leaved sumac (*Rhus coriaria*), lonicera (*Lonicera iberica*), jasmine (*Jasminum fruticans*), etc. This relict forest vegetation, which had also been present in the driest south-eastern part of Eastern Georgia, formed large communities in Kvemo Kartli lowland too. These communites had been later destroyed due to irrational exploitation of men (chaotic logging, periodical grazing in the forest).

107. Floodplain forests have been also destroyed. They have been preserved in the form of remnants only (mainly in r. Iori floodplain). The following should be noted in the composition: willow (*Salix excelsa, S. alba, S. pseudomedii*) and asp-willow (*Populus canescens, P. nigra, Salix excelsa*) stands. Elm (*Ulmus foliacea*), nut tree (*Juglans regia*), mulberry (*Morus alba*), floodplain oak (*Quercus longipes*) are mixed in small amounts. The following are most typical

from shrubbery: salt cedar (*Tamarix ramosissima*), blackberry (*Rubus sanguineus*), blackthorn (*Prunus spinosa*), hawthorn (*Crataegus pseudoheterophylla*), Black Sea dogwood (*Thelycrania australis*), silk vine (*Periploca graeca*), old man's beard (*Clematis vitalba*), sea buckthorn (*Hippophae rhamnoides*), etc.

108. Xerophilous and hemi-xerophilous shrubbery is widespread within the district, namely, slopes of hills and plateaus - Christ's thorn (*Paliurus spina-christi*), oriental hornbeam (*Carpinus orientalis*), spirea (*Spiraea hypericifolia*), poli-dominant forb shrubbery. According to genesis, the mentioned shrubbery is secondary and developed in the former forest areas (oak, arid open woodland). Tragacanth communities are frequent on severely eroded dry slopes – milkvetch (*Astragalus microcephalus*) and prickly thrift (*Acantholimon lepturoides*).

109. Steppe grass formations are developed on plains and elevated areas (plateaus, hills). Beard grass (*Botriochloa ischaemum*) steppe is the most widespread. According to the origin, the beard grass steppe of the area is secondary and it has developed on the former forest areas (arid open woodland, floodplain forests, plain and mountain oak forests). Beard grass steppe is diverse in phyto-cenological terms. In some areas beard grass is combined with wormwood (*Artemisia fragrans*) and bi-dominant beard-grass – wormwood community is formed. Beard grass-glasswort (*Botriochloa ischaemum, Salsola nodulosa*) is relatively rare. Christ's thorn-beard grass (*Paliurus spina-christi, Botriochloa ischaemum*) complexes are common on elevated areas, while needle grass steppe (*Stipa pulcherrima, St. Lessingiana*) occurs in the form of smaller plots on hill slopes and in fragments. Poli-dominant grain-forb grass are present on larger areas (*Achillea micrantha, Agropyron repens, Bromus japonicas, Cynodon dactylon, Festuca sulcata, Filagoarvensis, Phleum phleoides, Ph. Paniculatum, Salvia sclarea, Xeranthemum squarosum,* etc).

110. Semi-desert vegetation occurs within the district (Marneuli and Gardabani plains). It is mainly developed on lowlands and depressions, chestnut and salinized soils. The semi-desert vegetation is mainly represented by wormwood (*Artemisia fragrans*) communities. Glasswort (*Salsola nodulosa*) communities and other semi-desert formations are relatively rarer. Edifier wormwood is entirely dominant in wormwood cenosis. The following other vegetation (characteristic species) is observed - *Caragana grandiflora, Scorzonera lanata, Sterigmostemum torulosm, Torularia torulosa,* etc. Ephemeras and ephemerids are abundant in cenoses in spring - *Alissum tortuosum, Brachypodium distachyon, Gagea commutata, G. dubia, Medicago minima, Pterotheca marschalliana,* etc. Wormwood semi-desert is the winter pasture of the best quality (mainly for sheep).

Wetland communities grow in marshes and wetlands. These communities are formed by cattail (*Typha latifolia, T. laxmannii*).

The detailed characterization of the flora and vegetation of the project corridor

111. It is noteworthy that detailed botanical research has been conducted within the project corridor of Tbilis-Rustavi road. Consequently, negative and residual impacts as a result of the planned project construction and operation have been revealed both in the project territory and flora and vegetation of the adjacent areas. Plant communities and species (Red List, endemic, rare) of various conservation value have been identified within the project impact zone as well as plants of economic value.

112. The section between KP 0 and 5 of the existing road, the axis line of which is a lawn with vegetation, is divided into two parts: left (northern) and right (southern) parts. Lawn and both parts of the road are represented by a one row stripe of false acacia with the occurrence of the following species: plane, European asp, poplar, thuja, pine. Roadside public gardens and objects, where coniferous plants – cypress, are especially developed, are frequent. The northern and southern slopes of the road are different in vegetation cover and species diversity.

Both parts of the research road are covered both with coniferous and leaved plants. It is noteworthy that Turkish pine occurs within the vegetation cultivated along the road
At KP 5 vegetation cover is decreased. Due to rocky strata and lack of moisture in the area mainly xerophyte vegetation is distributed with presence of Christ's thorn, spirea, barberries, dogrose, broom, cirsium, bluegrass, fescue, etc.
GPS coordinates of plot #1 are N41^{0}40'32.1''/E 044^{0}50'09.5'', 329 m a.s.l. The area adjacent to the former Ortatchala bus station is an urban landscape, a habitat with low conservation value.

Picture 4.15 Urban Landscape

GPS coordinates of plot #2 are N41^{0}40'17.8''/E 044^{0}50'25.8'', 394 m a.s.l. Old highway could be widened. Artificial plantations occur along the road. The following species are present: *Juglans regia, Cupressus sempervirens, Populus hybrida*. It is a habitat of medium conservation value.

Picture 4.16 Artificial Plantations with the Presence of Nut Tree and Pine

GPS coordinates of plot #3 are N41^{0}40'13.3''/E 044^{0}50'59.8'', 402 m a.s.l. Artificial plantations occur along the road. The following species are present: *Ulmus foliacea (=Ulmus minor), Koelreuteria paniculata, Salix alba, Populus gracilis, Robinia pseudoacacia, Fraxinus* sp., *Smilax excelsa*, etc. It is a habitat of medium conservation value.

Picture 417. Artificial Plantations with the Presence of Elm, Soapberry and Other Species

GPS coordinates of plot #4 are N41^{0}40'07.9''/E 044^{0}51'33.8'', 382 m a.s.l. Artificial plantations occur along the road. The following species are present: *Robinia pseudoacacia, Fraxinus* sp., *Salix alba, Cercis siliquestrum, Gleditchia triacanthos, Populus hybrida*, etc. It is a habitat of medium conservation value. Then the route follows the highway, which passes the pine stand – *Pinus* sp. (both black pine (*Pinus nigra*) and Turkish pine (*Pinus eldarica*) are present. The data on quantity and quality of these species will be specified during preconstruction detailed botanical surveys).

Picture 4.18 Artificial Plantations with the Presence of False Acacia and Honey Locust

4.2.3 Ecologically Sensitive Sites

Protected areas

113. The road project will not affect any of the protected areas. Gardabani reserve is located down the river Mtkvari flow. The only site possible to think of the area of a certain importance to protect the biodiversity in the region of Tbilisi-Rustavi road construction, is Krtsanisi Woodland Park. The forest in the park was restored in the 1940-50s. For a long time it was less accessible for the locals, and at the end of the Soviet era, it was used as a recreational area. A present, it has almost adopted the natural structure of the floodplain forest and there is a stable, though not very numerous animal population developed in it. However, the Park is located at a distance of more than 4km from the project road (Tbilisi-Phonichala section of the Tbilisi Rustavi Road) and is not under the project impact.

Relatively Sensitive Areas

114. After the completion of the detailed botanical survey of the designed project corridor the precise identification of sensitive areas and their detailed description has become possible. To

sum up, the below areas of medium sensitivity have been revealed proceeding from the review of the literature and field research.

Areas of medium sensitivity:

- GPS coordinates of plot #2 are N41^{0}40'17.8''/E 044^{0}50'25.8'', 394 m a.s.l. Old highway could be widened. Artificial plantations occur along the road. The following species are present: *Juglans regia, Cupressus sempervirens, Populus hybrida;*
- GPS coordinates of plot #3 are N41^{0}40'13.3''/E 044^{0}50'59.8'', 402 m a.s.l. Artificial plantations occur along the road. The following species are present: *Ulmus foliacea (=Ulmus minor), Koelreuteria paniculata, Salix alba, Populus gracilis, Robinia pseudoacacia, Fraxinus* sp., *Smilax excelsa*, etc.;
- GPS coordinates of plot #4 are N41^{0}40'07.9''/E 044^{0}51'33.8'', 382 m a.s.l. Artificial plantations occur along the road. The following species are present: *Robinia pseudoacacia, Fraxinus* sp., *Salix alba, Cercis siliquestrum, Gleditchia triacanthos, Populus hybrida*, etc. It is a habitat of medium conservation value. Then the route follows the highway, which passes the pine stand – *Pinus* sp. (both black pine (*Pinus nigra*) and Turkish pine (*Pinus eldarica*) are present. The data on quantity and quality of these species will be specified during preconstruction detailed botanical surveys);
- GPS coordinates of plot #5 are N41^{0}39'19.9''/E 044^{0}53'57.5'', 384 m a.s.l. In the lower part of the highway, where road could be widened, it is surrounded with pines – *Pinus* sp. (*Pinus nigra*, *Pinus eldarica*), cypress (*Cupressus sempervirens*), cedar (*Cedrus deodara*);
- GPS coordinates of plot #6 are N41^{0}37'40.2''/E 044^{0}55'21.4'', 360 m a.s.l. In the lower part of the highway at the edge of the forest-park along the road the following species are present: *Morus alba, Prunus divaricata, Ulmus foliacea, Cedrus deodara, Populs gracilis,* Pinus sp., *Platanus orientalis*;
- GPS coordinates of plot #7 are N41^{0}36'28.6''/E 044^{0}56'08.6'', 348 m a.s.l. At the side of the highway, at the end of the forest-park artificial pine stand is present – *Pinus* sp. (*Pinus nigra*, *Pinus eldarica*);
- GPS coordinates of plot #11 are N41^{0}39'07.4''/E 044^{0}55'13.1'', 368 m a.s.l. It is the area adjacent to Kvemo (Lower) Ponitchla). It is the old version of the alternative road (green line). A fragment of degraded floodplain forest is present – floodplain poplar *Populus hybrida, Elaeagnus angustifolia, Tamarix ramosissima, Smilax excelsa,* blackberry -*Rubus* sp., *Typha latifolia*. It is the habitat of medium conservation value.

Species Included in Red List of Georgia and Found in the Project Corridor

115. It is noteworthy that Red List of Georgia, which consists of 56 species of plants, is not full. At present the further modification of species in the Red List is being conducted. Namely, identification of grass species by **IUCN** categories (determination of their state and protection status categories) is in process. Through extrapolation of the mentioned data the number of the species shall increase significantly in the Red List.

As a result of the detailed field botanical research only two species from the list of species of the Red List of Georgia has been found - *Juglans regia* L. and *Ulmus minor* Mill.

The list and statuses of the species of Georgian Red List, which are observed in the project corridor, are given below:

No.	***Latin Name***	***Common Name***	***Category Reflecting State and Protection Status***
Angiosperms			
2	*Juglans regia* L.	Nut tree	VU
4	*Ulmus minor*	Field elm	VU

As a result of the preconstruction botanical surveys we presume that **other species of the Red List of Georgia** will not occur in the project corridor.
In addition, it is noteworthy that some rare, endangered and vulnerable species occur within the project area, i.e.: *Elaeagnus angustifolia* (rare plants), *Pinus eldarica* (species, which is becoming extinct). As a result of preconstruction botanical surveys the existing list of rare species shall presumably increase.

4.3 Ecological Receptors - Fauna

4.3.1 General description of fauna

In a zoo-geographic respect, the given territory may be attributed to the region of the river Mtkvari of Iran-Turan province of Mediterranean zoo-geographic sub-zone of Holarctic zone. The main landscape here, which is an accumulative plain, is covered with semi-steppe and steppe vegetation with Shybliak inclusions. There are animals here mostly preferring open arid habitats. At present, the given area is mostly covered with agricultural plots - pastures and cornfields near the bank of the river Mtkvari, with irrigated cornfields and vegetable gardens at some places. The floodplain landscape follows the river bank as a narrow strip. The abele, black poplar and willow riparian woodland on the right bank of the river Mtkvari with blackberry, lancelet and ivy undergrowth is preserved only on the territory of Krtsanisi woodland park and in the lower reaches of the river. There are large trees preserved in the woodland park. As for other areas, no forest vegetation grows here. The beds of small rivers are overgrown with reeds and bushes - blackberry, lancelet, blackthorn, hawthorn and lout. They are mostly used by the locals for their vegetable patches.

116. The fauna in the considered area - within the road corridor and adjacent areas - is very much impoverished as the human started to cultivate the given area long time ago, has densely populated it and intensely uses it for agricultural, economic, industrial, waste disposal and recreational purposes. A part of the construction corridor lies next to the territory of Krtsanisi woodland park, which is made up of the forests grown by humans and is a recreational site. Near location of the settled areas and absence of fence or other defensive structures has a negative impact on the content of fauna in the given area. As we have mentioned earlier, the Park is located at a distance of more than 4km from the project road (Tbilisi-Phonichala section of the Tbilisi Rustavi Road) and is imposed to direct or indirect impacts of the project.

117. Despite the fact that the fauna in the given area may be considered as a single complex, the extension area of different species over the sites covered with different biotypes is different. We think the identification of three groups of biotypes purposeful:
Urbanized sites (with dense town or village development and industrial enterprises) - all the variants from PK 0 to 2 km and from KP5 to 7 km with minor interruptions.

118. The animals dwelling in the developed areas, are used to people and cars, intense noise and illumination in the night period. There is a society developed in the given area made up of minor species. The number of individual species, except totally synanthropic species, such as rats, mice and sparrows, is generally great. However, the given societies are quite stable to the

changing conditions and anthropogenic impact. Due to a large number of wild cats, village and stray dogs, the appearance of any protected species in the given area is less likely. As for other species, they are under a tense pressure of preying.

Protected species

No.	Latin Name	English Name	Status	Usage
1.	*Rhinolophus euryale*	Mediterranean Horseshoe Bat	VU	Colonies in buildings and caves, feeds in forest
2.	*Rhinolophus mehelyi*	Mehely's Horseshoe Bat	VU	Colonies in buildings and caves, feeds in steppes

119. Habitats of bats (Mediterranean Horseshoe Bat and Mehely's Horseshoe Bat) are approved in Tbilisi, but their existence can only be supposed along the other sections of the road. The bats may be harmed if their shelters in houses or caves along the river banks or in the gullies are destroyed during the construction works.

One species of fish included in the National Red Data List dwells in the river Mtkvari and its tributaries - Goldside loach (*Sabanejewia aurata)*. Particular attention is needed to avoid fueling of techniques beyond the river floodplain borders so that to avoid the water pollution with fuel and lubricants.

Species not protected by the law

120. Small mammals and reptiles not included in the Red Data List may perish in minor quantities, if their habitats are disturbed during the construction works. For instance many European pond turtles (Emys orbicularis) may perish if fuel pours in the waters of the branches of the river Mtkvari at the right bank of the river or if the operation of the techniques causes the river banks destruction damaging the sites of their oviposition.
In the photo - European pond turtles on the bank of the Mtkvari river.
Particularly sensitive to the loss of shelter are cheiroptera, the bats. They use caves, old buildings and hollow trees as shelters. Small caves in the rocks on the right bank of the river Mtkvari may be demolished in case variant 2 is realized. Under the project, a great proportion of old buildings are to be demolished. Several large hollow trees are growing in the settled areas and zone of laying the road along the existing road, and they are to be liquidated. Depending on the dates of the construction start-up, there may maternal (nidifugous) or winter colonies be formed in the hollows. Prior to the construction works start-up, the trees must be examined for the presence of bats and any facts of bats dwelling in them must be communicated to the representatives of the Ministry of Environmental Protection of Georgia. There are 29 bat species in Georgia, and all of them are protected under the Agreement on the Conservation of Bats in Europe (EUROBATS). 13 bat species are likely to occur within the limits of the corridor (See Table 4.14). Only Common Noctule Bat (*Nyctalus noctula*) forms significant populations in the hollows of the aged abele tree hollows, the nidifugous colonies. Cutting down of such a tree during the breeding of young birds, will badly damage the given population of bats. Other bat species will be damaged less, if some individual trees are cut down.

Table 4.14 Cheiroptera species likely to dwell in the road construction corridor

No.	Latin Name	English Name	Shelters
1.	*Rhinolophus ferrumequinum*	Greater Horseshoe Bat	Buildings, caves
2.	*Rhinolophus hipposideros*	Lesser Horseshoe Bat	Buildings, caves
3.	*Rhinolophus euryale*	Mediterranean Horseshoe Bat	Buildings, caves
4.	*Rhinolophus mehelyi*	Mehely's Horseshoe Bat	Buildings, caves
5.	*Eptesicus serotinus*	Serotine	Trees
6.	*Myotis blythii*	Lesser mouse-eared bat	Buildings, caves
7.	*Myotis mystacinus*	Whiskered Myotis	Buildings
8.	*Pipistrellus pipistrellus*	Common Pipistrelle	Buildings
9.	*Pipistrellus pygmaeus*	Soprano Pipistrelle	Buildings
10.	*Pipistrellus kuhlii*	Kuhl's Pipistrelle	Buildings
11.	*Nyctalus noctula*	Noctule	Trees
12.	*Nyctalus leisleri*	Lesser Noctule	Trees
13.	*Plecotus auritus*	Brown Long-eared Bat	Buildings

121. The only group of animals under the danger of a significant harm during the road building and operation, is cheiroptera. Ten species of them form colonies - the nidifugous colonies when they breed young animals (maternity colonies) and winter colonies when they hibernate. The bats form colonies in less crowded basements or attics, underground communications and natural caves. Besides, three bat species (See Table 2) form colonies in tree hollows. The premises are to be demolished and old trees are to be cut down in the process of widening the existing Tbilisi-Rustavi road and construction of new sites.

All cheiroptera in Georgia are protected under the Agreement on the Conservation of Bats in Europe (EUROBATS). The presence of bat populations in the buildings to be demolished or trees to be cut down can be examined with ultrasound detectors.

It should be noted that there is a range of species spread in the construction area, which is a subject of societal interest. These are wild species and species interesting to tourists and ornithologists (bird-watchers). They include eight mammals given in table 3 below.

Table 4.15 Mammals interesting to the local population

No.	Latin Name	English Name
1	*Lepus europaeus*	European Brown Hare
2	*Myocastor coypus*	Coypu
3	*Canis lupus*	Grey Wolf
4	*Canis aureus*	Jackal
5	*Vulpes vulpes*	Red Fox
6	*Meles meles*	Eurasian Badger
7	*Martes martes*	European Pine Marten

8	*Felis silvestris*	Wild Cat

122. A red fox often appears on the road to seize the animals perished in the car accidents. Other animals in the table use the territory irregularly, with more or less probability, to find food or move along the river. Most of the mammals appear in Krtsanisi Woodland Park and on small wood and bush islands along the rivers and channels.

5. Socio-Economic Conditions

5.1. Demography

Tbilisi

123. Tbilisi population reached maximum in 1992 – 1.276 million people. In the following years, when political turmoil occurred, the city population has decreased by almost 15 %.
The population number more or less stabilized in 2004-2005 and reached 1.08 million. From 2005 unequal growth has occurred (Table 5.1). During the recent decade the low population growth rate has been caused by two major factors: low natality rate, which equals death rate and migration.

Table 5.1 Number of live births, deaths and natural growth of population in Tbilisi (2000-2010)[4]

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Population (thousands)	1,097.5	1,088.5	1,081.7	1,079.1	1,078.2	1,079.7	1,103.3	1,101.1	1,136.6	1,136.6	1,152.5
Number of live births	15,380	15,648	16,057	16,058	16,059	16,060	16,061	16,062	16,063	16,064	-
Number of Deaths	11,690	11,408	11,465	12,597	12,424	11,164	12,454	12,040	12,123	12,397	-
Natural Growth	3,690	4,240	4,592	3,461	3,635	4,896	3,607	4,022	3,940	3,667	-
Population growth rate in Tbilisi	-0.9%	-0.8%	-0.6%	-0.2%	-0.1%	0.1%	2.2%	-0.2%	3.2%	0.0%	1.4%

Tbilisi population has always been multi-ethnical. Many ethnical groups lived in the city along with Georgians – Armenians, Azeri, Russians, Ukrainians, Jews, Greeks, etc. In XIX Georgians were actually the minority in the capital. Table 5.2 shows ethnical groups of Tbilisi in 1876-2002.

Table 5.2 Ethnical Groups Living in Tbilisi

	1876	1897	1922	1926	1959	1979	1989	2002
Total population (thousands)	104.0	159.6	233.9	294.0	694.7	1056.1	1246.9	1081.7
Georgians	22.2	42.2	80.9	112.2	336.3	656.4	824.4	910.7
Armenians	37.6	47.1	85.3	100.1	149.2	152.9	150.1	82.6
Russians	30.0	44.8	38.6	45.9	125.7	129.1	124.9	32.6
Ossetians		0.9	1.4	2.8	15.6	27.9	33.2	10.3
Ukrainians		2.7			10.9	12.6	16.1	3.3
Jews	1.3	2.9	8.8	8.9	17.3	14.8	13.5	1.6
Azeries			3.3	5.8	9.6	12.9	18.0	10.9
Kurds				2.5	12.9	23.4	30.3	2.1
Greeks	0.4	1.2	1.3	1.4	7.1	16.2	21.7	3.8
Other ethnic Groups	11.6	17.8	14.3	14.1	10.1	9.7	14.7	23.8

[4] *Source: National Statistical Office of Georgia*, The number of people as of 1 January is provided for each year

Rustavi

124. Small increase of Rustavi population has occurred during the last five years. Table 5.3 shows the dynamics of Rustavi population growth according to 1 January, 2011 situation.

Table 5.3 Dynamics of Rustavi Population 2007-2011

Years	2007	2008	2009	2010	2011
Population (thousand people)	117.9	117.3	117.4	119.5	120.8

Table 5.4 Natality has increased in Rustavi in the recent years

Years	2006	2007	2008	2009	2010
Number of born	1238	1246	1619	1666	1824
Number of deceased	1144	1136	1151	1261	1095
Increase	94	110	308	405	729

The majority of Rustavi population is Georgian – 88 % of the population. Table 5.5 shows the distribution of the town population according to nationalities.

Table 5.5 Distribution of population by nationalities

Ethnical group	Number	Percentage
Georgian	102 151	88
Azeri	4993	4
Armenian	2809	2
Ossetian	1410	1
Russian	3536	3
Abkhazian	44	<1
Greek	257	<1
Ukrainian	395	<1
Iezid	293	<1
Other	4885	4

Gardabani

125. Gardabani municipality consists of 42 residential settlements, 1 town, 2 large villages and 39 villages. Large villages are: Gamarjveba – 53 thousand residents, Martkopi – 7.7 thousand residents, Sartitchala – 7.0 thousand residents. The total population is 114 thousand people. These are mainly ethnical Georgians – 54.2 % and Azeri – 43.6 %. Small group of Armenians is also present – 0.7 % as well as Russians – 0.7 % and Ossetians – 0.4 %[5].

Population density within the municipality is 100-125 residents per square km. Such industrial centers as Tbilisi and Rustavi are the main means of employment of the population. However, due to the fact that major part of the industrial enterprises has either stopped functioning or cancelled, the significant field of population employment is agriculture.

The main fields of agriculture are: vegetable growing, milk produce, fruit and flower growing.

[5]Statistics according to 2002 data

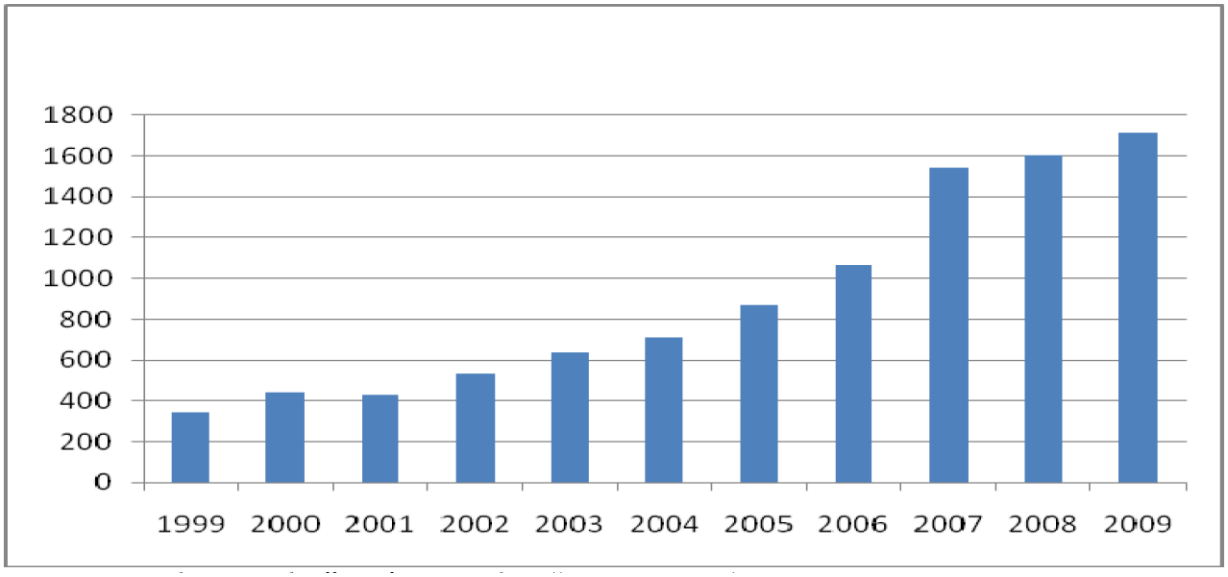
5.2 SOCIO-ECONOMIC CHARACTERISTICS

Industry

Tbilisi

126. Recovery of economic, including industrial, activities started in second half of 1990-ies and continued through the first decade of the new millennium Table 5.6. Despite the revitalization, industrial production in Tbilisi still remains very low compared to its levels in Soviet time. Many of large scale enterprises in the sectors of heavy machinery, electric machines and microelectronics, textile and others either do not function or manufacture goods in very limited amounts. Currently, relatively well developed industrial sectors are wine production, production of other alcoholic and nonalcoholic beverages, food processing (meat and dairy products, fruits and vegetables), production of construction materials (cement, asphalt).

Table 5.6 Production in industrial sector in Tbilisi (in current prices, mln GEL)[6]



T

Along with the growth of industrial production in Tbilisi, the share of the capital city in the countries total industrial production is also increasing. At present about 45% of Georgia's industrial products, in monetary terms, is produced in Tbilisi.

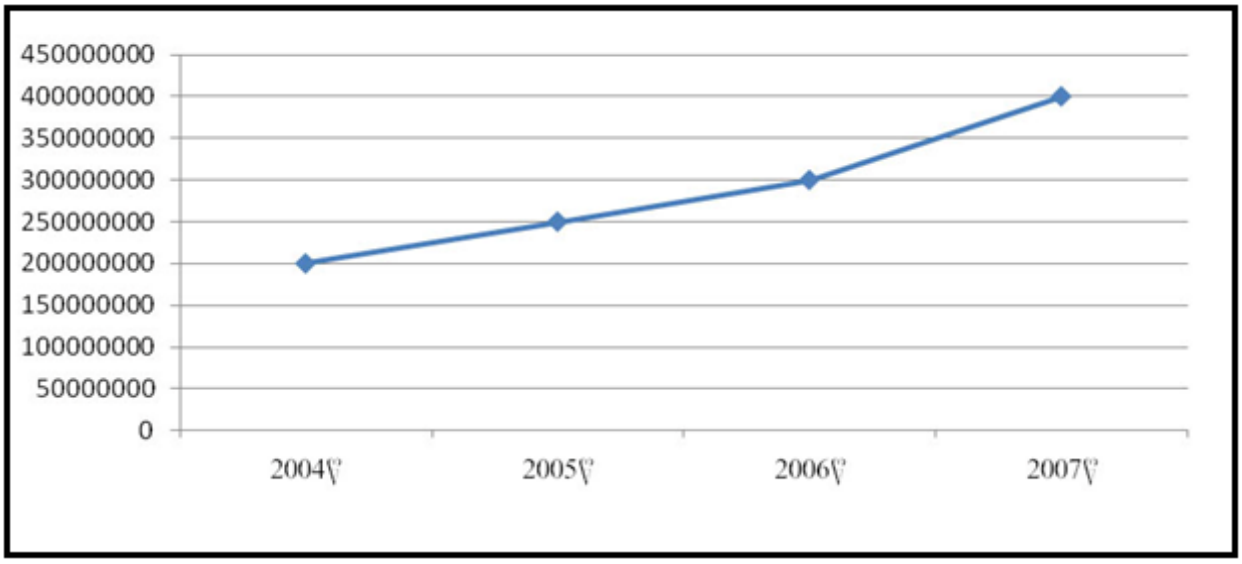
Rustavi

127. There are 26 large enterprises on the territory of Rustavi, from which the largest manufacturing companies are: JSC "Karat Plus" (former "Energy Invest"), JSC "Rustavi Metallurgical Plant", JSC "Heidelberg Georgia", JSC "Jeosteel", JSC "Kazbegi" and etc.
The growth of the cost of production and service of different branches and spheres in 2004-2007 made 98, 3% (Table5.7).

Table 5.7 Dynamics of growth of service and produced goods in 2004-2009[7]

[6] *Source: National Statistical Office of Georgia. http://www.geostat.ge/*

[7] Source: Department of statistics



According to 2007 data, manufacturing industry plays the leading role in Rustavi economics. It's share makes 89.9 % ; building industry makes – 2.7 % and the share of the rest branches and spheres is very little.

Gardabani

128. Electro energetics is noteworthy from industrial fields, as Gardabani thermal power station is located here, which is the largest in Trans-Caucasus and started functioning in 1963. 5 hydro power stations on the upper highway of Kura and Samgori are also important. The power produced by the stations is distributed in Tbilisi and Rustavi, as well as entire Georgia and other districts of Trans-Caucasus. Industrial enterprises of construction material, light and food production are located in Gardabani. Gardabani carton-ruberoid plant is one of the large enterprises of the district. Fruit, grape and vegetable processing plants should be noted from food industry..

Agriculture

Tbilisi

129. Agriculture was well developed in suburbs of Tbilisi until 1990-ies. Main agricultural products produced here included fruits, vegetables, meat and dairy products. The products were sold mostly to Tbilisi markets. 44 Agricultural production has been decreased dramatically over the last two decades. According to statistical information provided by the National Statistica Office of Goegria value added of agriculture in Tbilisi reduced amounted 1 mln GEL by 2009 (Table 5.8) It is unclear whether this statistical data include agriculture in the villages that joined the city in 2006. In general, there is very litle information available on agricultural activities in the city or around it. Moreover, there is further more limited information on environmental pressures related to this sector.

Table 5.8 Agriculture Prices between 2006 and 2008 (in mln GEL)

	2006	2007	2008
Agriculture (current prices, mln GEL)	1.4	1.0	1.0

Rustavi

130. There is scarce data on the agricultural activities in Rustavi and its surroundings. The total area of the city is 6060 ha. The total area transferred to physical and legal persons amounts to 435.68 ha, including 165.68 ha of non-agricultural lands and 270.00 ha of agricultural lands.

Gardabani

131. The total area of the district is 160900 ha, including 66899 ha of agricultural lands, 37035 ha of arable lands, 2193 ha of hayfields, 22183 ha of grasslands and 17079 ha of nonproductive land.

The dominant crops in the district are wheat and maize and the following annuals: tomatoes, eggplants, cabbages, onions, cucumbers, bell peppers, potatoes, carrots, grapes, wheat, water melons, melons, barley. etc.

An average of 70022 tons of agricultural products produced in the district are delivered to the local market annually, including 6900 tons of wheat, 1210 tons of barley, 35 tons of oats, 11500 tons of maize, 10 tons of beans, 967 tons of sunflowers, 45 tons of potatoes, 46780 tons of vegetables, 176 tons of pears, 98 tons of quinces, 224 tons of plums, 121 tons of cherries and sweet cherries, 121 tons of apricots, 56 tons of grapes, 1670 tons of grapes.

The agricultural production was a priority sector for Gradabani District. At present vegetable and grain production and poultry breeding remain the priorities of the region.

Employment and Unemployment Levels

Tbilisi
Unemployment level in Tbilisi is very high. During nearest last year's it's had achieved 29-30%.
Table 5.9 Employment and Unemployment Levels

Status	2005 y.	2006 y.	2007 y.	2008 y.
Active Population (labors)	429.8	434.7	480.7	430.1
Employed	305.0	303.6	346.1	302.1
Haired	248.9	248.8	291.0	240.6
Self employed	55.6	53.8	55.2	61.4
vague	0.5	1.0	0.0	0.1
Unemployed	124.8	131.1	134.6	128.0
Unemployment level (%)	29.0	30.2	28.0	29.8
Active level (%)	54.4	52.9	55.3	52.4
Employment level (%)	38.6	37.0	39.8	36.8

Despite the State Strategy on Gender Equality elaborated by the group of representatives of the Gender Advisory Council under the Chair of Parliament and the Governmental Commission working on gender equality issues in Georgia (including representatives of government and non-government sectors), the number of employed men in Tbilisi is higher than that of women (see Table 5.11).

Table 5.10 Unemployment and Gender issues (2000-2008 years) m-men; W-women

Status	2000y.	2001y.	2002 y.	2003 y.	2004 y.	2005 y	2006 y.	2007 y.	2008 y.
Unemployment level (%)	w.-9.7 m11.	w.-10.7 m-	w.-11.0 m-	w.-11.5 m-	w.-11.8 m-	w.12.6 m-	w.-11.7 m-	w.-12.6 m-	w.-16.8 m-

	0	11.6	14.0	11.5	13.4	16.8	15.2	13.9	16.1
Active level (%)	w-57.2 m-75.1	w-58.3 m-75.9	w-56.6 m-75.8	w-57.7 m-76.3	w-56.9 m-74.3	w-55.9 m-73.5	w-53.6 m-72.2	w-55.6 m-73.3	w-53.5 m-73.4
Employment level (%)	w-51.6 m-66.0	w-52.0 m-67.1	w-49.9 m-65.1	w-51.0 m-67.5	w-50.2 m-64.3	w-48.8 m-61.2	w-47.4 m-61.2	w-48.1 m-63.1	w-44.9 m-61.1

During nearest last 15 years employed pupil's wages are increased.

Table 5.11 Average wages. 1995-2008 year. (between employers)

Year	Amount	Currency
1995y	13.5	lari
1996y	29.0	lari
1997y	42.5	lari
1998y	55.4	lari
1999y	67.5	lari
2000y	72.6	lari
2001y	94.6	lari
2002y	113.5	lari
2003y	125.9	lari
2004y	156.6	lari
2005y	204.2	lari
2006y	277.9	lari
2007y	368.1	lari
2008y	534.9	lari
2008w	534.9	lari

Rustavi

132. According to 2008 data of department of statistics, 14 113 people were employed in Rustavi enterprises, among them 41,7% was woman and 58,3%- men. The total amount of employed people is divided according the following: large enterprises – 68,5%; middle-sized enterprises -14,2 %; small enterprises – 58,7%. According to kinds of economical activity, in the total number of employed people the most shares is on employees in manufacturing industry.

Gardabani

The population density varies between 100 and 125 inhabitants per square meter. The industrial centers like Tbilisi and Rustavi are the main means of employment provision. However, as many of the industrial enterprises stand idle or ceased their operations, agriculture provides a large share of employment. The main sub-sectors of agriculture are vegetable growing, dairy farming, fruit and flower growing.

Infrastructure and Development

Tbilisi

133. Sewage and drainage systems are covered 100% in the city. At the same time current infrastructure is very old and unsure. As for the existing situation in the water supply of Tbilisi, 70% of the city is supplied with no interruption, while 30% is supplied with water according to a set schedule. The city's water supply meets the national standards laid out in the law of Georgia "on potable water". In terms of ensuring the quality of the water supply, it should be noted that in the city's water supply company, Tbiltsqalkanali Ltd, which has a monopoly in the sector, 3 chemical-bacteriological laboratories and 1 chemical laboratory are in operation. These labs are 100% responsible for the quality of the city's water supply.

Throughout 2005- 2006 extremely important reconstruction and rehabilitation works have been carried out on the Tbilisi water supply network. The majority of central water pipelines have been replaced, which has significantly decreased the number of emergency shut-downs of the system and, accordingly, losses of water. A total of 59 km of the network in various districts of Tbilisi was replaced.

Municipal waste management has greatly improved recently. Private companies which service different districts of Tbilisi on the basis of tender results, acquired the respective equipment. Waste collection issue has drastically improved, two old landfills were closed and a new landfill in compliance with EU requirements was opened. Several companies obtained licenses for the treatment of hazardous waste of various types. It should be noted that hazardous waste management both in Tbilisi and entire Georgia remains one of the acute problems.

Rustavi

134. Rustavi public utilities have greatly improved recently. Limited power and gas supply, which had been an unsolved problem in Rustavi of the 90s, have been eliminated. Rustavi water supply is facilitated by "Rustavi Water". The mentioned company along with "Georgian Water and power" and "Mtskheta Water" is the member of the same investment group, which provides water supply and water related services to 51 621 subscribers in t. Rustavi. The majority of the rehabilitation works in the town has already been completed and the population is facilitated with water in almost uninterrupted regime. Waste water is directly discharged in r. Kura without any treatment.

Rustavi is supplied with gas by JSC "Rustavgas", which was established in 1996. In 2006 "Rustavgas" started individual meter installation and movement of the gas meters in entrances first time in Georgia. At present the town is entirely gasified. The cost of the used gas is $1m^3$ – 502 GEL and 790 GEL for legal entities.

Some improvements occurred in the solid municipal waste management. Company which serviced Rustavi purchased modern waste trucks and both metal and plastic containers. In 2011 a new landfill in compliance with EU standards was opened in Rustavi through EBRD and Sida funding. Hazardous waste management in Rustavi and entire Georgia is still a problem.

Gardabani

135. Gardabani water supply is facilitated by "Rustavi Water".The mentioned company along with "Georgian Water and power" and "Mtskheta Water" is the member of the same investment group, which provides water supply and water related services to 3984 subscribers in t. Gardabani. The company provides for both water supply and water related services. The waste water flows into Gardabani water treatment plant and after mechanical treatment is discharged in r. Kura. T. Gardabani is gasified and facilitated with natural gas.

Municipal waste management is undertaken by a private company, which has respective infrastructure, while waste disposal is conducted on Rustavi landfill.

Transport

Tbilisi

136. Transport servicing of the population is one of the most significant indicators of urban life. Tbilisi has always characterized with the diversity of the transport system. Tbilisi metro has offered services to many passengers since its opening. According to 2009-2011 data, the number of passengers was about 206 000 daily. Since 1st October, 2010 the travel cost in Tbilisi metro can only be paid via digital travel card.

Autobus along with metro has remained one of the main municipal transports. 476 movable units of M3[8] category of autobuses moves in the capital daily. The number of large load autobuses is 110 and medium load autobuses – 366 units. M2[9] category autobuses have 2128 movable units.

[8] Large and medium load autobuses
[9] Route taxis

Taxi - in Tbilisi as well as in any other city, taxi is the fastest above ground transport. Taxi is the only public transport in the capital which can be used 24 hours a day. Railway – the first train from Tbilisi to Poti arrived on 10th October, 1872[10]. At present there five railway stations in Tbilisi: Avtchala, Didube, Navtlughi and Tbilisi Central Station. The railway of the capital is linked with all regions of Georgia and Armenia, Azerbaijan and Russia. Railway will connect Georgia with Turkey in the nearest future.

Rustavi

137. The kinds of transport moving on intercity routs are: municipal transport (buses), private microbuses and taxes. Road signs and traffic lights are provided to regulate traffic. First in Georgia electronic boards, which reflect the schedule of bus movement were installed in Rustavi. The travelling fee by bus is 20 Tetris. The travelling by microbuses in the city is 50 Tetris. The fees of Rustavi-Tbilisi microbuses range from 1.30 to 1.50 GEL in accordance with the route you take. Travelling by taxi costs 1 km – 60 Tetris.

LTD "Rustavi Municipal Autotransportation Company" is in charge of municipal transport. It owns 33 buses, among them: makes "Bogdan", "i-van", 18 units, "Dafi" make- 8, and so called "Pazik" – 1 unit.

Gardabani

138. Transport infrastructure of Gardabani district is well developed. Broad network of both automobile and railway highways is present here. The types of transport on internal town routes are: municipal transport (autobus), private route micro-buses and taxi. Gardabani is connected to Tbilisi and Rustavi through private route micro-autobuses.

Healthcare

Tbilisi

139. Polyclinics, dispensaries, health centers, women consultation clinics, doctor ambulatories and
hospitals (inpatient healthcare) make up the core of the primary healthcare in Tbilisi.
Table 5.12 provides data of the healthcare system in Tbilisi.

Table 5.12 Health Care Facilities in Tbilisi

Number of hospitals 78	Number of hospital beds 4078
Independent woman consultations, clinics and dispensaries 117	Number of physicians (excluding dentists) 10098
Number of paramedical personnel 7079	
Number of hospitals 78	Number of hospital beds 4078
Independent woman consultations, clinics and dispensaries 117	Number of physicians (excluding dentists) 10098

At present, nearly all health care providers are private actors, independent of the state except the centres of tuberculosis, infectious disease and mental hospital. There are also various state programs in healthcare system for specified diseases covered from the public funds. Much hospital stock has been sold to the private investors for redevelopment and modernization. Mandatory social health insurance, introduced in 1995, which proved to be ineffective, was abandoned in 2007[11]. Private health insurance is being promoted by the current government as the main mechanism for the pre-payment of health services in Georgia. Private insurance coverage for households living below poverty line and teachers of the public schools of Tbilisi is

[10] The Academy of Sciences of Georgian SSR, economic-geographic research of VakhushtiBagrationi Institute of Geography, Tbilisi Press, Soviet Georgia, 1989
[11] National Healthcare System Analysis Report 2001-2007, Ministry of Health. 2009. http://www.moh.gov.ge/

paid from the public funds but all other individuals are expected to purchase insurance coverage on their own initiative. There are a number of private companies in the country offering medical insurance coverage, however as unemployment is high and average households income is low, many people cannot afford paing ensurance premiums30. Out-of-pocket payments remain the main source of funding for the health system in Georgia. This situation reduces access to appropriate medical services for much of the population.

Rustavi

140. In Rustavi operates three inpatient hospital, five outpatient clinics, and maternity homes. From July, in the New – Psycho-neurological clinic, which patients with mental problems as well as ambulatory and hospital services were provided. Also in town is the Blood Transfusion Centre, and anti-tuberculosis health centers. It also operates a national skrining – Center, which was created to prevent breast cancer and women age 40 and over is free mammology research. In addition, there are a number of diagnostic centers, medical, dental clinics and private offices.

Gardabani

141. The following function within Gardabani municipality: new Samgori doctors' ambulatory, children's polyclinic, Gardabani district infectious hospital, Gardabani maternity hospital, Davit Gugunashvili dental cabinet and therapeutic cabinet. Doctors' ambulatories also function in the following large villages and villages: Kesalo, Sarthitchala, Norio, Nazarlo, Martkopi and Kumisi.
Local self-government of Rustavi with Regional hospital of Gardabani , Tbilisi City Hospital # 5, mediation services and other health facilities supported by a number of medical action, to which free health examinations and various kinds of expensive medicines and other commodities have been granted. Demonstrations have already been used internally moved individuals, families' mothers, vulnerable families.

Education

Tbilisi

142. The legislative base of the education has greatly improved in Georgia recently, priority directions have been identified and public involvement increased in the educational process.
According to 2006 situation 15 elementary professional educational institutions have been recorded in Tbilisi, of which 2 are self financed. State funds 8 secondary professional educational institutions. The involvement of the local authorities into the social dialogue is very important for the effective use of the mentioned potential. The dialogue should aim at establishment of the workforce with quality professional skills on the labor market of the capital. Moreover, respective structures of the local authorities should coordinate the mentioned process.

Table 5.13 Higher Education Institutions Functioning in Tbilisi in 2002-2006[12]

Sector	2002/2003	2003/2004	2004/2005	2005/2006
Number of higher education institutions	105	102	116	106
State sector	15	15	15	13
Non-state sector	90	87	101	93

Rustavi

143. 26 public schools,20 private schools, 1 higher educational institution, 3 state profession re-qualification centers and up to 10 private colleges function in Rustavi at present,. The number of

[12]Source: Department of Statistics of the Ministry of the Economic Development of Georgia

pupils was 19 984 for the beginning of the 2010/2011 study year (according to data of 5th April, 2011).

As regards pre-school institutions, the legal status of Rustavi kindergartens changed in 2008 and non-commercial legal entity "Association of Kindergartens" was established. It is financed from the local budget.

Gardabani

53 public schools, 2 secondary professional institutions and 1 higher educational institution function within Gardabani municipality.

5.3 Expected social impact of the Project

5.3.1 General social impact of the Project

144. The proposed Project has short and long-term impacts on the local population. The social impact of the road reconstruction Project should be considered within the context of improvement of traffic safety and traffic conditions in big cities (Tbilisi, Rustavi) and transit potential of Georgia. The impact will be significant not only for the whole country, but for the population living along the road.

At present, the traffic safety level along Tbilisi-Rustavi road is not satisfactory (particularly complex is Rustavi-Ponichala section). The Project guarantees the traffic safety consistent with the international standards. The Project guarantees the international-level road capacity and safety of the transit cargo streams from Azerbaijan. The Project is important for cargo streams (by modernized mains from Rustavi to Tbilisi detour and then, by the detour) and passenger car streams, which will presumably travel through Tbilisi.

The Project is particularly important for the population of the city of Rustavi, whose great part works or studies in Tbilisi. The possibility of safe, rapid and comfortable travel will be an important positive social result for this social group. Improved roads ensure better integration of the local population in the social-economic system and better access to the markets, supplies and services. This includes better prospects of receiving timely medical aid.

5.3.2 Construction-related social impacts

145. In a short term perspective, the Project will bring a certain benefit for the local population, as it will create employment prospects (approximately 100 new jobs will be generated for the local population). The resettlement impacts are described in Section 5.3.

Impact. Negative impact caused by construction disturbance (dust, emissions, noise) is temporal, insignificant and controllable through using good construction practice.

Mitigation. Dust control by watering; using at least 2 tanks; noise control, installing mufflers to the equipment; working by day.

Impact. Secondary biological pollution (e.g. anthrax) caused by the ground works near the soil nidi of infection (e.g. unregistered anthrax pits).

Mitigation. Permanent monitoring during the ground clearance and excavation works. Stopping or suspending the construction works in case of a pit discovery. Notification of the local service of the veterinary department and using veterinary sterilization measures before renewing the works.

Impact. Dangerous traffic conditions with overlapping traffic flows with the existing traditional traffic.

Mitigation. Consideration of proper preventive measures and safety signs along the roads under the project, including illumination, and instructing the drivers.

Impact. Infrastructure. The major elements of communal infrastructure, which can come under the impact, are transmission lines, water-supply systems and irrigation pipes and channels.

Mitigation. Dislocation and rehabilitation of the infrastructural elements; permanent monitoring during construction; full rehabilitation in case of damage.

Impact. Potential conflict with the local population because of impact on water-supply and power-supply sources, as well as other infrastructure, impact on the access to ground or infrastructure, noise disturbance, conflicts with workers, etc.

Mitigation. A building contractor must assign an officer to communicate with the local population and must develop a communication plan. All conflicts must be settled by negotiations and reasonable compromises.

5.4 Land Acquisition and Resettlement

146. The detailed Resettlement Action Plan is under preparation and the first draft LARP will be submitted to ADB in 1 week. The census surveys, detailed measurements, sociological assessment and other field works are completed .

At this stage, it can be summarized, that this project will affect as minimum 52 households: 29 AHs are affected directly and 23 are the employees losing their jobs. Project impact is related to permanent take of 41 private land plots with total area of 25,486sq.m. Out of this amount 33 land plots are commercial and 8 agricultural, although not used for agricultural needs. No crops are cultivated on the affected commercial land plots. Acquisition of only 4 land plots is associated with losses of 48 productive trees and 1870 non-productive. Affected non-productive trees are in ownership of the plant nursery company Krtsanisi Ltd and are subject to replanting at the other land plots of the entity. The main impact is related to the loss of structures and businesses. In total 13 major structures and some ancillary facilities will be destroyed, including 5 autoservices (vehicle Maintenance Workshops), 1 shop, 5 petrol and 1 gas filling stations and 1 liquefied gas filling plant. 8 legal entities will suffer in terms of business impacts: either temporary interruption (1) or mostly permanent loss of business facilities(7). According to the ADB SPS 2009 this sub-project is thus classified as of category A and needs the preparation of a Land Acquisition and Resettlement Plan (LARP).

Severely affected households have benn identified. In this case, the land loss is not criteria for severity of impacts as nobody is losing agricultural land used for agricultural needs and thus the lost land parcels cannot be considered as income generating asset. Nobody is losing also residential land and houses. Severity of impact could be estimated only based on income loss. It should be noted, that for large companies, like Sokar Georgia or “Wissol Petroleum Georgia”, possessing expended networks of petrol stations over the whole Georgia, the loss of 1 petrol station is not sever impact. Amongst the smaller affected companies, one is not affected severely, as the small auto-service workshop is not the main source of income for this AH. On the contrary, for the owner of small gas filling plant and for four shareholders of the small auto service the impact is severe, as they are losing main source of their income. Thus 5 AHs are deemed to be severely affected and will receive allowances as defined in eligibility matrix. Besides that, all of the 23 employees losing their jobs are deemed to be severely affected, as their families lose more than 10% of their income.

Amongst the affected households 6are headed by the women without support of male member of family capable of working. Two of them are running small businesses with low annual income and 4 are employees. These 6 AHs and 1 refugee from Abkhazia are deemed as vulnerable and will receive allowances equal to 3 months of subsistence minimum. No one of affected AHs are under the poverty line. In total 7 vulnerable AHs are identified for section 1 of the Project.

The Land Acquisition and Resettlement Plan (LARP) will provide detailed census of affected households, inventory of loses, description of social status and identification of vulnerable groups. Compensation and rehabilitation plan will be elaborated upon completion of valuation of the lost assets. All the affected households will be provided with the adequate compensation according to the Georgian legislation and ADB SPS 2009 requirements. Vulnerable and severely affected households will be provided with the additional allowances.

Principles Adopted for the Project

148. To reconcile the gaps between Georgia laws/regulations and ADB's SPS (2009), MDFG has drafted this LARF for the Project, which, after endorsement by the Government, is seen as a tool for ensuring compensation at replacement cost of all items, the rehabilitation of informal settlers, and the provision of subsidies or allowances for AFs that may be relocated, suffer business losses, or may be severely affected.

LARF Principles and Entitlements adopted for this MFF

149. Based on the Georgian laws on land acquisition and the provisions on involuntary Resettlement in the ADB *Policy Safeguards Statement (2009)*, core involuntary resettlement principles are developed for this MFF which are as follows:

- Land acquisition, and other involuntary resettlement impacts will be avoided or minimized exploring all viable alternative project designs;
- where unavoidable, a time-bound LARP will be prepared and APs will be assisted in improving or at least regaining their pre-program standard of living;
- consultation with APs on compensation, disclosure of resettlement information to APs, and participation of APs in planning and implementing sub-projects will be ensured;
- vulnerable and severely affected APs will be provided special assistance;
- non-titled APs (informal dwellers or squatters) will receive a livelihood allowance in lieu of land compensation and will be fully compensated for losses other than land;
- legalizable APs will be legalized and fully compensated for land losses;
- provision of income restoration and rehabilitation to all APs;
- the LARP will be disclosed to the APs in the local language;
- payment of compensation, resettlement assistance and rehabilitation measures will be completed prior to the contractor taking physical acquisition of the land and prior to the commencement of any construction activities on a particular package; and
- establishment of appropriate grievance redress mechanisms to solve APs grievance if occurs.

Eligibility

150. APs entitled for compensation or at least rehabilitation provisions under the Project are:

- All APs losing land either covered by legal title/traditional land rights, legalizable, or without legal status;
- Tenants and sharecroppers whether registered or not;
- Owners of buildings, crops, plants, or other objects attached to the land; and
- APs losing business, income, and salaries.

151. Compensation eligibility will be limited by a cut-off date to be set for each subproject on the day of the beginning of the AP Census and DMS. APs who settle in the affected areas after the cut-off date will not be eligible for compensation. They, however will be given sufficient advance notice, requested to vacate premises and dismantle affected structures prior to project implementation. Their dismantled structures materials will not be confiscated and they will not pay any fine or suffer any sanction.

Compensation Entitlements

152. Entitlement provisions for APs losing land, houses, and income and rehabilitation subsidies will include provisions for permanent or temporary land losses, buildings losses, crops and trees losses, a relocation subsidy, and a business losses allowance based on tax declarations and/or lump sums. These entitlements are detailed below:

- **Agricultural land impacts** will be compensated at replacement value either with replacement plots of the same value of the land lost and at location acceptable to APs where feasible, or in cash free of transaction costs at current market rates or (if no land markets are active) based on the reproduction cost of the affected land. The cash at market rates option has been selected for the Program. When >10% of an AP agricultural land is affected, AP (owners, leaseholders and sharecroppers) will get an additional allowance for *severe impacts equal to* the market value of a year's gross yield of the land lost. In case of severe impact on other income, the APs will be paid additional compensation corresponding to 3 months of minimum subsistence income. Transaction taxes/fees will be paid by the EA or waived. Legalizable APs will be legalized and paid as titled owners. Non-legalizable APs will be compensated with one time self-relocation allowances in cash equal to 1 year of minimum subsistence income. Residual non-affected sections of a plot that becomes inaccessible or unviable to use after acquisition will also be compensated.
- **Non agricultural land (Residential/commercial land).** Legal settlers will be compensated at replacement rate either with replacement plots of same value as plots affected and at location acceptable to APs where feasible, or in cash at current market rates, free of transaction cost. The cash at market rates option has been selected for the Program. Renters/leaseholders will receive a 3 months rent allowance. Non-titled/non-legalizable land users will be compensated with a 1 time self relocation allowance in cash equal to 1 year of minimum subsistence income. This allowance is to be to be calculated based on a 5 people family and the monthly-updated benchmarks indicated by the National Statistics Office of Georgia at time of LARP approval
- **Houses, buildings, and structures.** In order to address potential damages of vibrations or discomfort caused by road traffic, these items will be compensated in full for the whole building irrespective of the specific degree of impact. Compensation will be provided in cash at replacement cost free of deductions for depreciation, transaction costs or salvaged materials. All relevant APs are entitled to this provision by default irrespective of the registration status of the affected item.
- **Crops:** Cash compensation at current market rates for the gross value of 1 year's harvest by default irrespective of whether the crops were already harvested or not at the time of impact. Crop compensation will be paid both to landowners and tenants based on their specific sharecropping agreements.
- **Trees:** Cash compensation at market rate based on type, age and productivity of trees.
- **Businesses:** If business is lost permanently it will be compensated in cash equal to a 1-year income based on tax declaration or, if unavailable, based on the official minimum subsistence income. Temporary business losses will be compensated in cash for the business interruption period based on tax declaration or, if unavailable, official minimum subsistence income.
- **Affected business workers/employees:** Indemnity for lost wages for the period of business interruption up to a maximum of 3 months.
- **Relocation allowance**: APs forced to relocate will receive a relocation subsidy sufficient to cover transport costs and living expenses for 3 months.
- **Vulnerable Peoples Allowance:** Vulnerable people (APs below poverty line and widow or elder headed households) will be given an allowance corresponding to 3 months of minimum subsistence income and priority in employment in project-related jobs. The allowance is to be to be calculated based on a 5 people family and the monthly-updated benchmarks indicated by the National Statistics Office of Georgia at time of LARP approval
- **Severe Impacts Allowance;** APs losing >10% of agricultural land or >10% of non-agricultural income will receive a 3 months severe impacts allowance. This allowance is to be calculated based on a 5 people family and the monthly-updated benchmarks indicated by the National Statistics Office of Georgia at time of LARP approval
- **Community Structures and Public Utilities:** Will be fully replaced or rehabilitated so as to satisfy their pre-project functions.

Compensation for Land

Compensation of land has been derived based on the feedback from the affected people and from the independent evaluator. For accurate valuation, the affected land was divided into 5 categories-Category1: **Agricultural** (not used for agricultural) – no trees, no crops, , (54 GEL/sqm), **Category 2:** Commercial Land km 0.0 – 0.5 (179 GEL/sqm), **Category 3:** Commercial Land km 0.5 – 1.0 (107 GEL/sqm), **Category 4:** Commercial Land km 1.0 – 4.0 (64 GEL/sqm) and **Category 5:** State Land with no price. No crops are cultivated on the affected commercial land plots. Table-9.1: show detail about compensation for land.

Table- : Compensation for Land Acquisition

Land Categories	No. of Plots	Area(sqm)	GEL/sqm	Total Price
Type 1 Agricultural (not used for agricultural) – no trees, no crops, (54 GEL/sqm)	**8**	2950sqm	54	159,300
Category 2. Commercial Land km 0.0 – 0.5 (179 GEL/sqm	12	5478sqm	**179**	**980,562**
Category 3. Commercial Land km 0.5 – 1.0 (107 GEL/sqm)	**4**	**607 sq.m**	**107**	**64,949**
Category 4. Commercial Land km 1.0 – 4.0 (64 GEL/sqm)	**17**	16,451sqm	**64**	**1,052,864**
Total	41	25,486 sqm		**2,257,675**

20 public plots of 117,263 sqm excluded from valuation for compensation

Below we provide summary of compensation for all types of impacts.

Table-: Summary of Compensation Costs

No.	Item	Cost in GEL	Cost in USD
A	**Compensation**		
1	Compensation for Land	2,257,675	
2	Compensation for Structures/Buildings	5181889	
3	Compensation for business loss	1,722,357	
4	Compensation for employees	**52512**	
5	Compensation for non-productive trees	3411	
6	Compensation for productive trees	7848	
	Sub Total A	**9,225,692**	

5.5 SOCIO-CULTURAL ENVIRONMENT

5.4.1 Historical Context

Tbilisi

153. Feudal Georgia and generally entire Trans-Caucasus was covered with great many caravan routes. Through these routes Georgia connected to such distant countries as Arabia, India, Persia, Byzantium, etc. According to foreign and Georgian historical sources, the capital

of Georgia – Tbilisi was a junction of trade caravan routes in the middle ages. The road of the developed centers of the old world and cultural realm also went through the city. Roads from different directions had resulted in many gates of the fortification of Tbilisi – Meidani Kari (Meidani Gate), Ganjis Kari (Ganja Gate), Mtsire Kari (Small Gate), Rabadis Kari (Rabad's Gate), Soghdebilis Kari (Soghdebil's Gate).

154. The capital of Georgia – Tbilisi is one of the oldest and most picturesque cities in the world located on the crossroads of the east and west. Its history comprising one thousand five hundred years is closely linked with the history of Georgian people. The city has witnessed peaceful life, intensive construction and cultural flourishing as well as countless invasions, ravaging and plundering and lengthy periods of foreign supremacy. Persians, Byzantines, Khazars, Arabs, Mongols, Turk-Selchukians and many more battled for Tbilisi and yet Georgian people have managed to preserve it as a capital of a strong united Georgian state.
As a result of archeological research it has been discovered that all districts of Tbilisi had been populated since fairly early periods (V-IV millennia B.C.) up to and including the late feudal age. Up to 250 archeological monuments of different periods have been discovered in Tbilisi so far. The stratigraphic layers of V-XIX c.c. urban life of Tbilisi have been most clearly revealed as a result of archeological excavations of territory adjacent to the garden close to Erekle II square; 8 m thick cultural layer comprised remnants of household and residential building of that period, water pipeline, ceramic and other craftsmanship remnants, imported and local burnt and un-burnt ceramics, precious stone, glass, gold and silver jewelry, local and foreign numismatic material.

155. Old districts of Tbilisi are located in the southern part of the town near hot sulphur waters. In IV c. a bridge (near Metekhi) was built over the narrowest part of r. Kura, while a citadel (called Kala, Narikala, Deda-Tsikhe (Mother-Fortress) etc. in different times) was constructed on the mountain and its slope of the right bank. The citadel had been the architectural dominant of the city of early and developed feudal ages.

156. The above determined the structure of the city of the period, which had not significantly changed until XIX c. The initial appearance and planning structure have been preserved almost to these days. Later Tbilisi grew towards and against the river flow outside Tiflis and Kala.
According to foreign and Georgian historical sources, Tbilisi was a typical feudal city – economically strong and facilitated with conveniences in the middle ages. Trade, craftsmanship, markets and squares had been well developed. It was a large center of international trade relationships. Development was diverse as well – royal and aristocrats' palaces, citizens' houses, bathes, inns, caravanserais, and café-shops and of course – first churches, the construction of which, according to the tradition, is assigned to the founder of Tbilisi King Vakhtang Gorgasali (452-502). Tbilisi has been multi-national city since ancient times. People of all nationalities and religions felt well in the city, which is confirmed by cult constructions of all confessions preserved till now.

157. Similar to the old capital of Kartli – Mtskheta, the majority of the first churches of Tbilisi were built according to the names of the monasteries of the Holy Land of Palestine, according to the legend: Sioni – Virgin Mary's church, Golgotha – St. Cross church, Bethlehem – Virgin Mary's church, later called Petkhain, Tabor – Transfiguration church and Metekhi – Virgin Mary's church, which has connotations with the church built on the tomb of the Virgin in Gethsemane, Jerusalem. The symbolic icon of Aton mountain, yet another holy place, is the prominent dominant of Tbilisi today – Mtatsminda.
The appearance of Tbilisi of the late feudal age has been preserved in sketches by XVII c. European travelers (Turnifor, Chardin) and city plan and description drawn by Prince Vakhushti in 1735.

Town-Fortress Rustavi

158. The town-fortress is located within the park of culture and recreation of modern t. Rustavi.

Town-fortress Rustavi, the center of historical province Kukheti, is one of the oldest towns of Georgia. Rustavi had be the royal domain throughout the entire political-administrative development of the feudal epoch, which is confirmed by the ancient name of the town-fortress – Bostan-Kalaki (in Persian Vostan means royal court, while Kalaki is town in Georgian) and the fact that construction of a channel from r. Kura in the area is assigned to King Trdat in the second half of IV c. Due to the channel the town was called "Rus Tavi" (Ru is a stream, Tavi – head, start). In V c. Vakhtang Gorgasali founded bishop cathedra in Rustavi.
According to written sources and archeological data, since IV-V c.c. till the second half of XIII c. Rustavi had be one of the most significant political, religious and trade-economic centers of Georgia. In 1265 the town was plundered by the Golden Horde Khan Berqa, as a result of which the town transformed into a smaller size village.
Archeological research of Rustavi clearly revealed its complex and difficult history. Archeological excavations have been undertaken since the 40s of the past century.
As a result of excavations remnants of fortification structures, gates, palaces, bathes, residential and economic buildings with communications and high quality consumption items of the early and developed middle ages (IV-VIII, IX-X and XII-XIII c.c.) have been found; burial mounds of early and developed middle ages; burial mounds of late bronze age and antiquity have been discovered as well.

159. Intensive urban life and close economic link with the remaining world is proved by Georgian and foreign coins (from Kupuri, Byzantium, Khorezm, Daruband, etc.) discovered as a result of excavations of the remnants of fortress and town.
The development of Rustavi into an urban center of the middle ages was greatly favored by the proximity to two significant caravan routes – Tbilisi-Bardavi and Southern Georgia-Kakheti-Hereti roads.

160. According to Arab and Persian geographers, Tbilisi-Bardavi trade road followed r. Kura gorge and passed through towns of Rustavi, Gardabani, Khunani, Shamkori, Ganja. From Bardavi the road divided into several directions.
Rustavi was built in the area, which could not be avoided if one was travelling to the heart of Kartli and of course the enemies invaded it first too. Excavations confirm numerous falls and revivals of the city.

5.4.2 Cultural Heritage in Project Area

161. It should be noted that the above described historical route does not coincide with the modern road of Tbilisi-Rustavi at all. According to the written sources, the old route – from Rustavi to Tbilisi crossed m. Iaghluja slope towards Kumisi lake, then entered Tbilisi from Tabakhmela-Shindsi. Remnants of route have been archeological confirmed on m. Iaghluja, it has been preserved till now and researchers have no doubts that it is the trace of the old route. Remnants of settlements and burial mounds dating back to antiquity and early middle ages have been discovered on m. Iaghluja as well.

162. As regards the17.1km project section of Tbilisi-Rustavi road to be reviewed; special scientific literature does not contain indications towards any cultural monuments within the sectionAccording to the information provided by Archaeological Department of Rustavi, the areas of the main and alternative alignment and adjacent territories have not been subject to special research until now. They have not heard about accidental discovery of archeological items in the area.

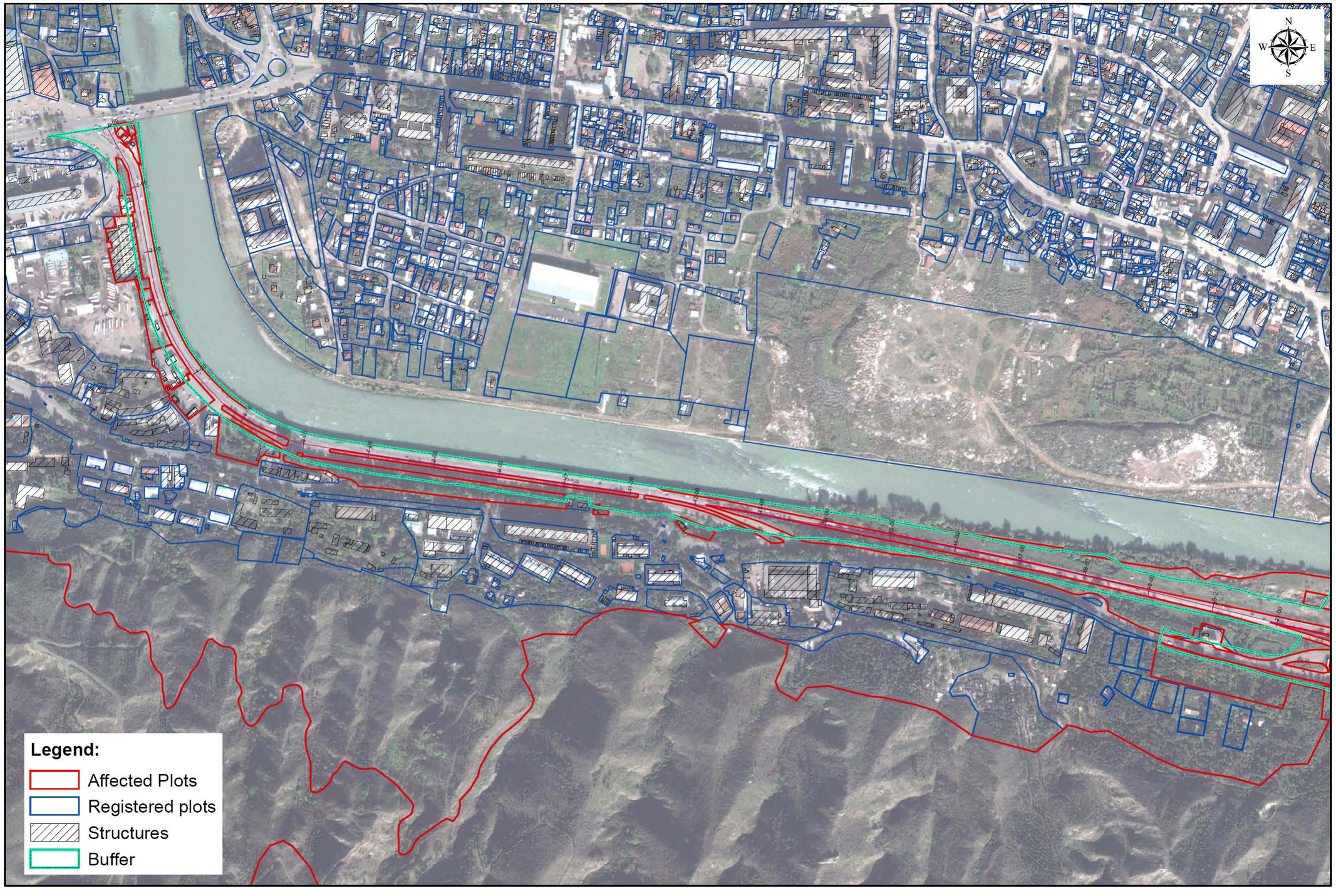
6. ANALYSIS OF ALTERNATIVES

163. No-project variant means the conservation of the poor situation along Tbilisi-Rustavi section of Red Bridge-Tbilisi connection road, in particular, insufficient road capacity and low traffic safety will be maintained what will accordingly hamper the full application of the international transit potential of the country. Thus, No-project variant was ignored right at the early stage of the project development.

164. The main alternatives of Rustavi-Tbilisi speedway project are associated with the selection of the route of the section along Ponichala settlement. The given sub-project (2nd section of the road) is being developed as an individual project and the relevant alternatives analysis will be presented under the IEE specially developed for this sub-project. However, the present IEE is developed for Tbilisi to Ponichala Section 1 as part of Rustavi-Tbilisi highway only. The existing road is being widened along the given section and no alternative routes are considered. However, due to the concerns expressed during the public consultations by different NGOs, we comment below on this issue in more details.

As it is seen from the aerial photos (fig. X and Fig. Y), along the section 1 existing road passes in a narrow corridor between the r. Mtkvari form left side and the steep slopes of Shavnabada hills. For the section km0.0 – 2.0 the road passes close to r.Mtkvari and there is no physical space for shifting the road to the left side. The road buffer is following the river bank alignment. Shifting of the road to the right side, first of all, has no sense from engineering standpoint: for km 0.0 – 0.7 the curve characteristics could be only worsened (turning angles sharpened) and from km 0.7 to 2.0 shifting to the right means cutting into the slopes, arrangement of benches etc. At the same time such shifting has no even potential benefit from environmental or social standpoint. Relocation of the road alignment to the right side will cause sharp increase of resettlement impacts for the section km 0.0 – 0.7 affecting many additional private land plots and large buildings. For the subsection km 0.7 – km2.0 shifting right-hand means cutting into slopes located between Rustavi ave. and Gorgasali street and encroaching Gorgasali street with subsequent impacts on traffic , adjacent buildings and greenery plantation belt.

From km 2.0 to 4.0 any relocation of the road buffer to the right side is limited by steep and densely vegetated slopes of Shavnabada ridge. Shift to the left is limited by r. Mtkvari (km 2.0 – 3.0) and river bank slopes in certain places require protection from flooding. Appropriate engineering structures (revetments and walls are envisaged by the project here – km 3.8). The left shift is also limited by private territory and buildings of the plant nursery company Krtsanisi Ltd. (km 3.1 – 3.4). Besides, any shift to the left (at the level of Krstanisi Ltd) will only worsen the curve alignment and shifting to the right needs cutting benches and arrangement of two level road, having no justification from the engineering standpoint and no environmental or social benefits. On the contrary, any benching of slopes increases slope instability and footprint of the project on the natural landscape.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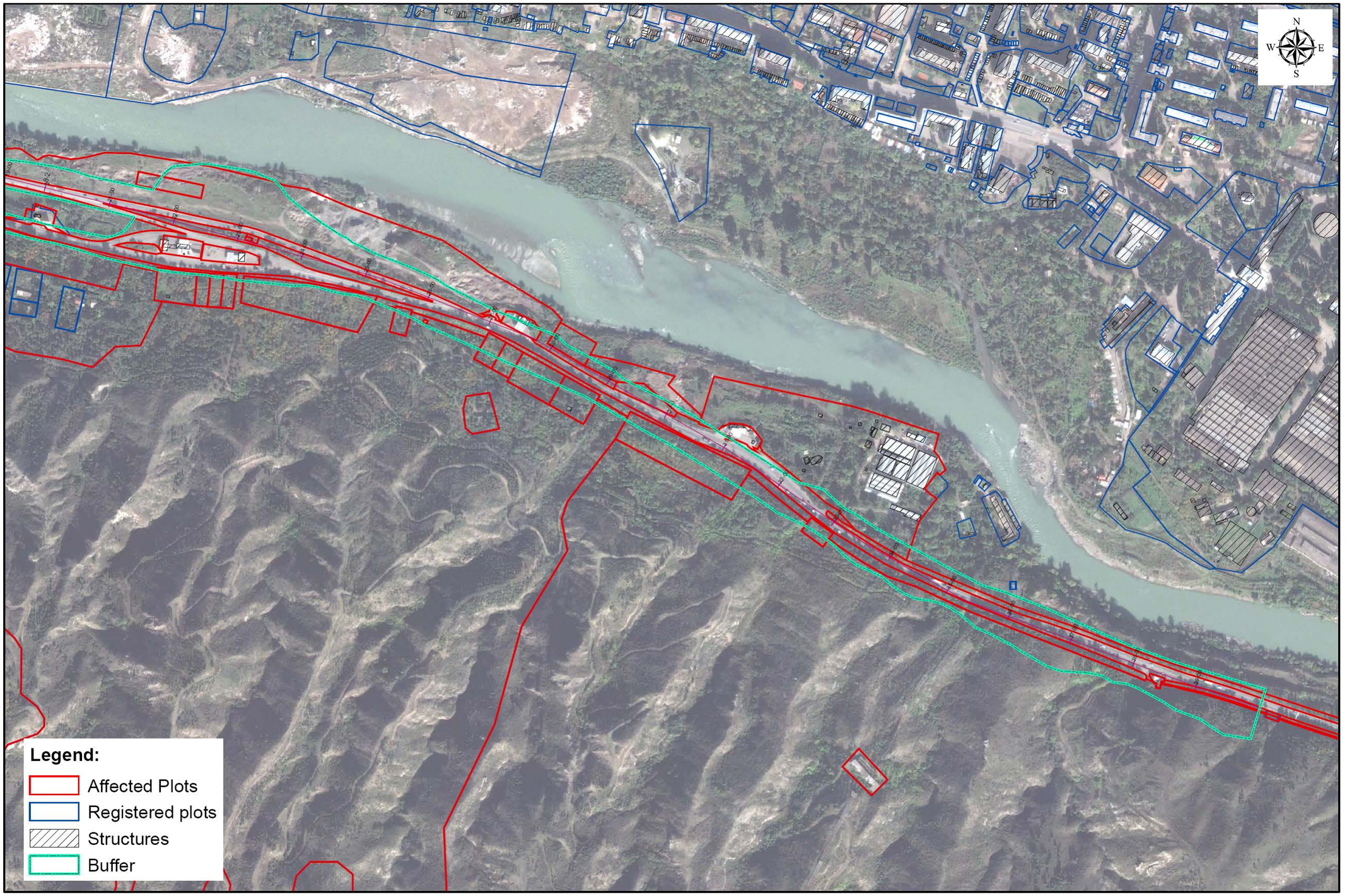
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165. The pavement variants were considered as alternatives. The lifetime of the rigid pavement is higher. However, following the technical and exploitation considerations, the choice was not the rigid bituminous concrete cover, but asphalt cover gas been selected, as the road is located within the Tbilisi City and often need of maintenance works on underground utilities, makes impossible rigid pavement of the road. In the environmental respect, the result of such a choice is the increased demand for asphalt within the limits of the project. At present, the project plans not the construction of a new bituminous concrete plant, but purchasing the ready asphalt from operating licensed producers. If the project implementing building company decides to use its own asphalt plant, it will have to draft its own IEE and obtain the environmental permit to operate the asphalt plant.

166. The project is not realized in a sensitive environment and no particular harmful impact on the natural environment is expected. The environmental impact level, provided the building norms and rules are observed, will be within the norm. Accordingly, there is no need for any additional principal alternatives for any environmental reasons.

7. ENVIRONMENTAL IMPACTS

7.1 Summary of Activities and Anticipated Impacts

167. The project was screened for environmental impacts and a summary of activities and anticipated impacts is provided below in relation to project phases. In the case of the design phase the analysis describes how these potential impacts have been and will continue to be incorporated in the project design process.

A Environmental Impacts – Design and Pre-construction Phase

Sl.No.	Potential Impact	Comments
1	Site specific considerations related to "project footprint" : Degradation of natural landscape (relief, soil cover, vegetation, ntural habitats) in the certain part of the right-of-way (land strips adjacent to the highway – acces roads, dumping sites, borrow pots). Sensitive ecosystems and sites of special importance Sites of archaeology and cultural significance, Existing human activities and land use – residential and farming land. Geohazard prone sites	Particular sensitivities identified during design: • Resettlement issues were most important for optimal planning of the Kutaisi southern route.
2	Damage of infrastructure elements and the need to redesign road and/or plan for relocation of services and avoid disruption of services i.e. Railway & existing roads, Power transmission lines, Gas pipelines, Irrigation channels	The highway crosses several important infrastructure systems. Design for grade separation of proposed and existing roads and railway. Design for gas pipelines to be relocated with any safety buffers being observed. Following infrastructure elements should be relocated before starting construction of the road: • Relocation of overhead power lines within the right of way of the construction site • Relocation of gas-main pipeline • Relocation of communication cable
3	Location of borrow pits, waste disposal sites, any asphalt mixing sites, aggregate and concrete making facilities, workers camps, fueling and storage places and equipment yards	Dust/air pollution, water pollution, landscape degradation impacts on aquatic life - will depend on careful choice of site location. At the detailed engineering stage EIA/IEE consultants have proposed certain sites described in chapter 2.12 However, the final choice will be made later by the construction contractor.
4	Soil Erosion – Design of temporary and permanent drainage systems, retaining walls, berms and embankments, design of anti-erosion engineering measures and reinstatement plans	Proper design important to minimize potential erosion and secondary impacts: landscape degradation and increased sedimentation of watercourses and potential slow deterioration of the highway pavement.
5	Interchanges and interconnecting roads and their planning and design	Interference with local transportation circulation and local access with increased traffic safety problems. Need to design traffic circulation plans in consultation with local authorities and Regional Roads Department.
6	Noise and traffic emission nuisance	Noise & emissions related to traffic is only a significant problem in densely populated areas & where residential properties adjoin the road. Taking traffic away from

		Kutaisi and Samtredia towns addresses this and there are positive impacts with the chosen bypass route removing through traffic and pollution from existing residential neighbourhoods.

B Environmental Impacts - Construction Phase

Sl. No	Potential Impacts During Construction Works	Yes/No Severity	Site Locations
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	Section from 0,5 km to 4,0 km
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 by construction contractor
3	Landslides, slumps, slips and other mass movements in road cuts triggered by the construction activities.	Minor risk	No existing landslides.
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.	Minor	Near embankments.
5	Increased suspended sediment in streams affected by erosion at construction sites and fresh road cuts, fills and waste dumps. Reduced water quality and increased sedimentation and impacts on water quality and fish breeding.	Yes Minor	r. Mtkvari km 0.0-1.5
6	Impact of construction activities on aquatic ecosystems of the rivers and streams crossed by the highway	Minor	r. Mtkvari km 0.0-0.5
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	All construction site locations and activities, some to be determined by contractor.
8	Poor sanitation and solid waste disposal in construction camps and work sites (sewerage, sanitation, waste management)	Yes Medium	Site to be determined by Contractors
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	Anywhere construction vehicles pass through settlements
11	Air pollution from any concrete batching plants.	Yes Medium	Supplier and contractor site locations
12	Noise pollution from vehicle operation during construction particularly in populated areas traversed by the highway, such as densely settled rural areas. Local noise.	Yes minor	Tbilisi km0.0-0.5
13	Poaching by construction workers	Yes Very minor	R Mtkvari
14	Creation of temporary breeding habitats for mosquito vectors of disease e.g. sunny, stagnant pools of water (temporary puddles).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	Yes Minor	Small puddles could be created along the whole alignment; larger pools could be created at the borrow sites and quarries;

	the pest holes (i.e. not registered Anthrax sites)		
15	Health hazards by noise, air emissions and dust raised and blown by vehicles during construction activities.	Yes Medium minor	Tbilisi 0.0-0.5 km
16	Impacts on Archaeological Sites. only undiscovered archeological relics could be an issue	Yes/	Whole alignment;
17	Hazardous driving conditions where construction interferes with pre- existing roads. Traffic disruption during construction activities	Yes Minor High	At main interchanges of temporary construction roads Along the whole road
18	• Impact on existing infrastructure: Relocation of overhead power lines within the right of way of the construction site: - Relocation of 10 kv power lines - 0.45 km; - Relocation of 220 kv power lines - 1.461 km; • Relocation of gas-main pipeline d-500 mm; • Relocation of gas-main pipeline d-300 mm; • Relocation of medium pressure gas pipeline d-110 mm; • Relocation of medium pressure gas pipeline d-90 mm; • Relocation of medium pressure gas pipeline d-80 mm; • Relocation of optical fibre cable by "Delta-komi" Ltd - 2,466 km; Relocation of optical fibre cable "Poptneti" Ltd - 4,5 km;	Medium or High	
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 but particularly Tbilisi 0.0-0.5 km

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		+		+	+		+	

C Environmental Impacts - Operations Phase

Sl. No	**Potential Impacts During Operations**	**Yes/No** **Severity**	**Site Locations**
1	Air Pollution from increased use of the highway in future	Yes Minor increasing	Whole alignment,Tbilisi 0.0-0.5 km

2	Noise Pollution from increased use of the highway in future.	Yes Minor increasing	Whole alignment,Tbilisi 0.0-0.5 km
3	Water quality deterioration with increased dust from highway surfaces to water courses	Yes minor	Whole alignment,Tbilisi 0.0-0.5 km, r.Mtkvari
4	Traffic safety problems on poor feeder roads at the western end of the Bypass. Until the next section of the road is built there will be a need for a temporary solution to the problem of connecting the highway to the Samtredia via very poor existing road infrastructure.	Yes	Increase the level of security.
5	Roadside litter.	Yes Medium	Whole alignment
6	Soil and water contamination by oil, grease and fuel alongside the highway	Yes Minor	Whole alignment
	Potential Operation Phase Emergency Related Impacts	**Yes/No** **Severity**	
7	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		+		+	+		+	

7.2. Specific environmental issues

168. We specified the concrete environmental impacts described in the given chapter to include the most typical and important impacts for the concrete road projects. The general summary of the project impacts is given in paragraph 7.1 and the general impacts of construction activities are described in chapter 7.3. Below, we accent the concrete issues, which are more specific for road projects and accordingly, some of them need not only qualitative, but quantitative analysis.

7.2.1. Impact related to the emissions in the atmospheric air

169. The impact related to the emissions in the atmospheric air and relevant mitigation measures are among the important issues typical to the road projects. The issue of the emissions related to the road exploitation is discussed in details in Annex 3. Construction-related dust and emissions and relevant mitigation measures are described in paragraph 8.1.1.4**.** Below, we give a brief summary of automobile emissions analysis in terms of current and forecasted traffic intensity.

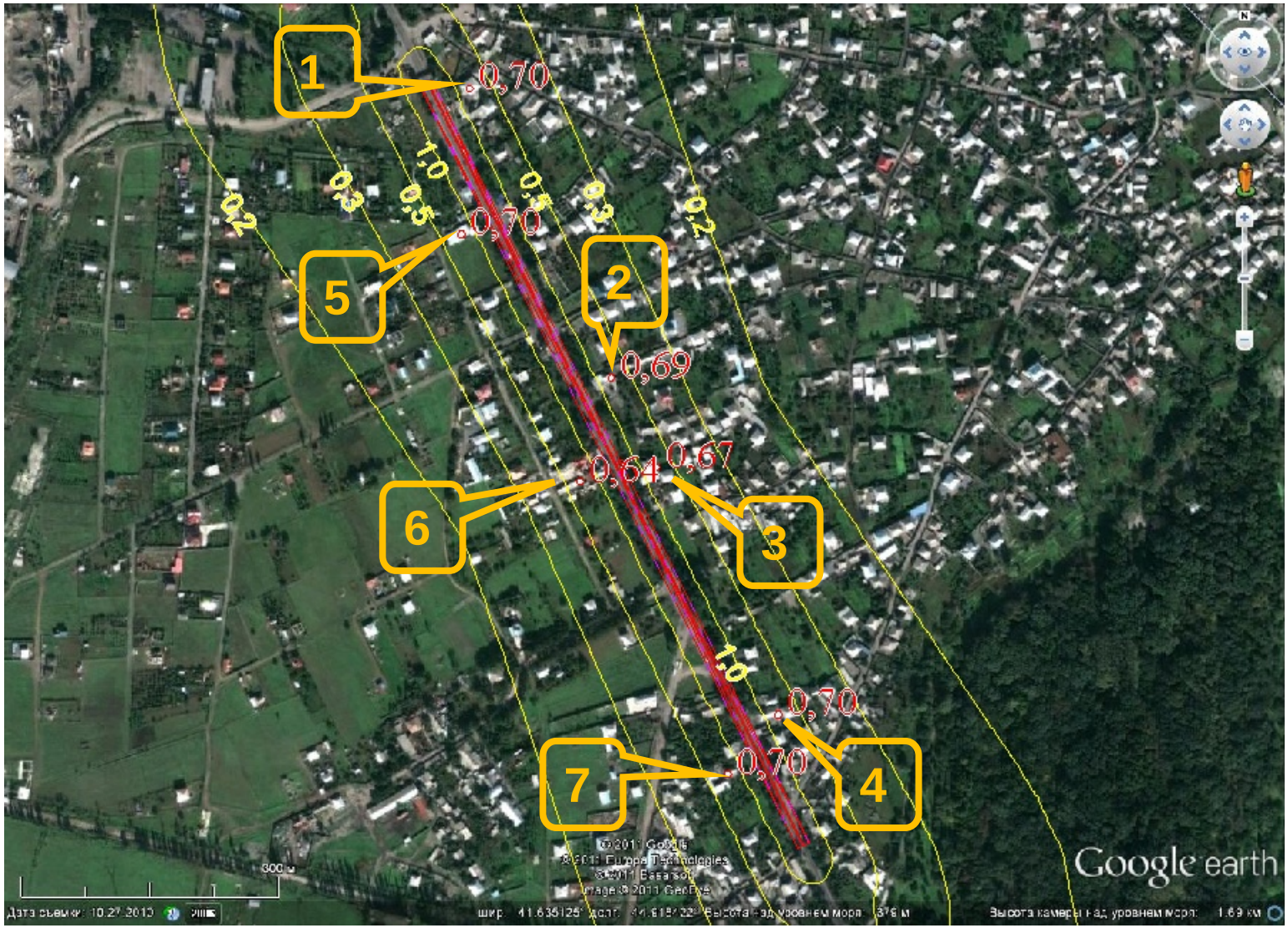
Ambient Air Pollution from the Traffic Emissions within Rehabilitation of Tbilisi-Rustavi Connecting Highway

170. The hourly intensity of traffic within Tbilisi-Rustavi highway rehabilitation according to observation data in 2011 is characterized with the below parameters: cars - 507 units; minibuses - 201 units; autobuses - 21 units and trucks - 18 units; dispersions calculated from this data [1] are given in the form of a table in Appendix #1.
According to 2016 estimates, intensity of traffic was assessed with the following parameters: cars - 724 units; minibuses - 286 units; autobuses - 30 units and trucks - 25 units; dispersions calculated from this data [1] are given in the form of a table in Appendix #2.

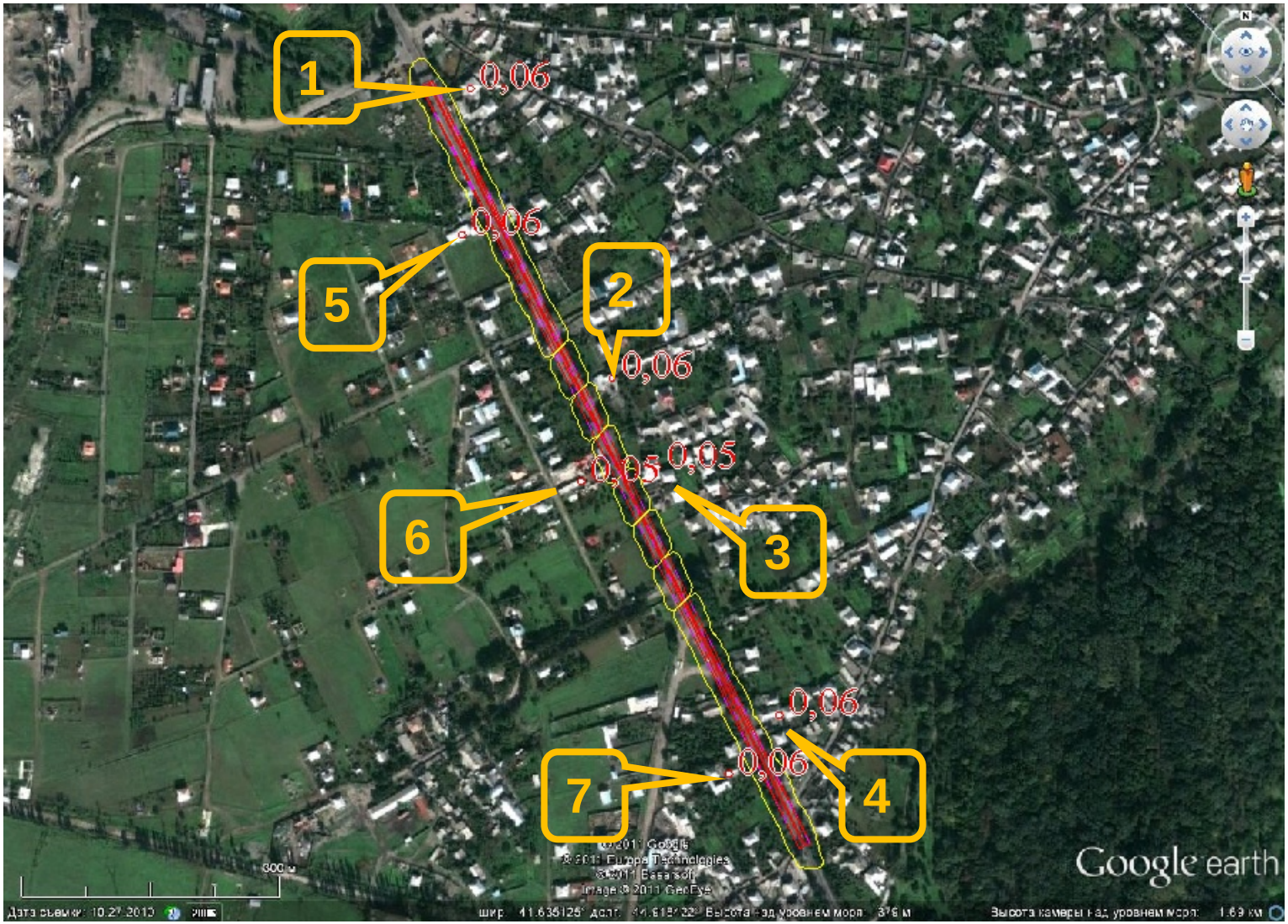
171. Air quality modeling was completed on the basis of calculated dispersion data [2] for pollutant substances within 1000 m section (calculation step – 25 m). The analysis of the results shows that standards are not exceeded in control points (nearest populated areas – 7 points) and the graphical and table data of these results are given below.

(Numbers imply maximum permissible concentration shares).

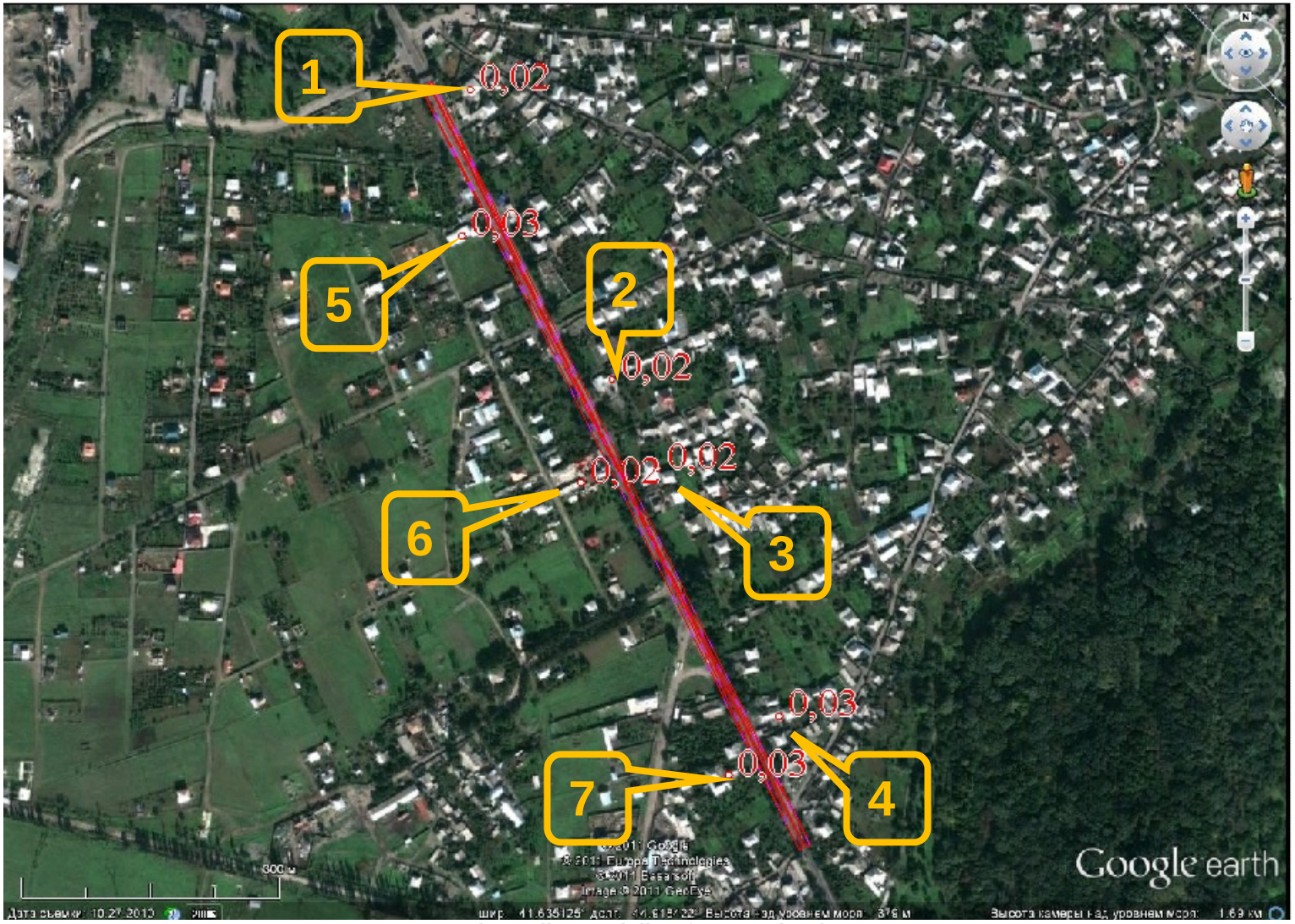
Year 2011



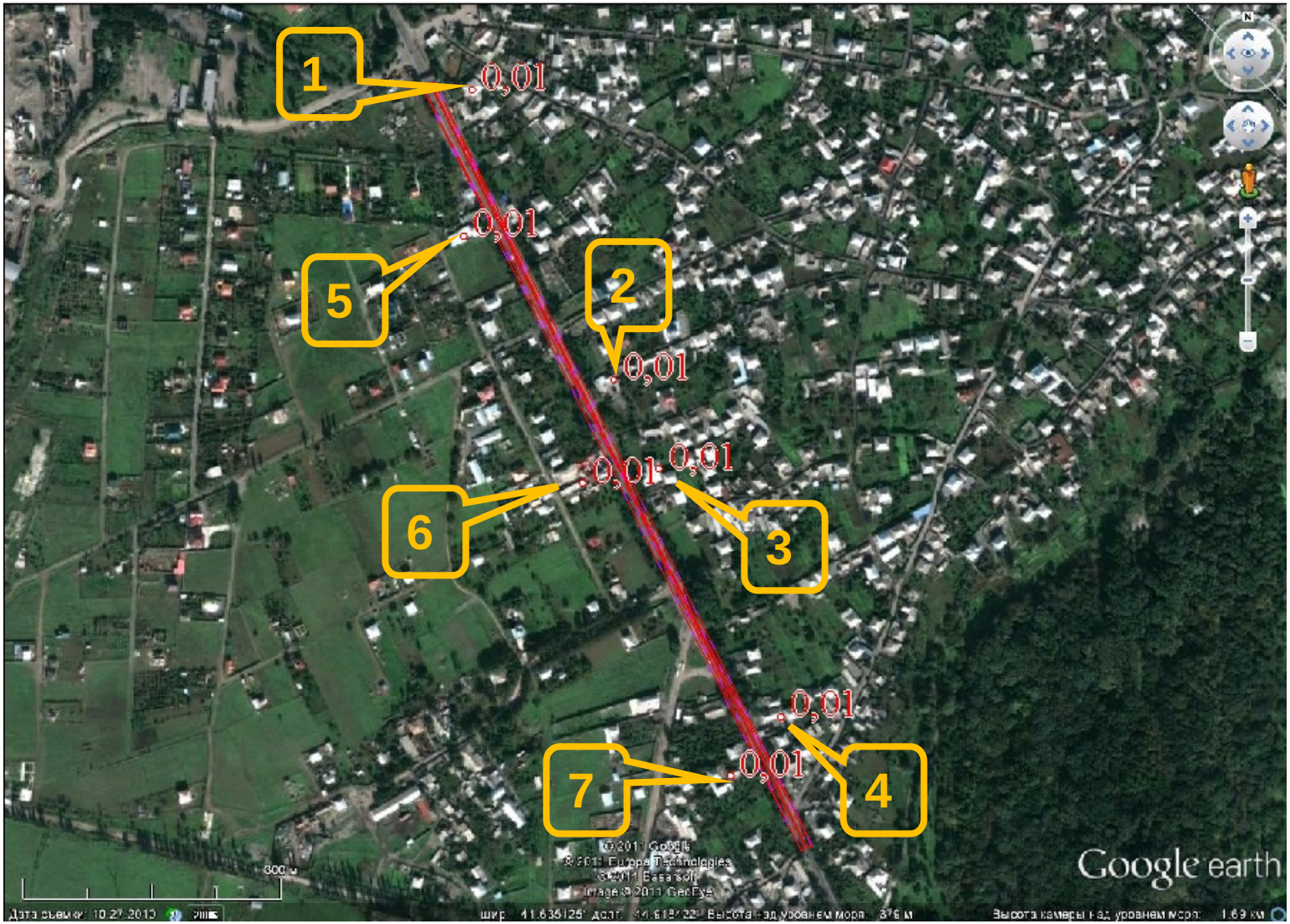
Air quality modeling for nitrogen dioxide (301)



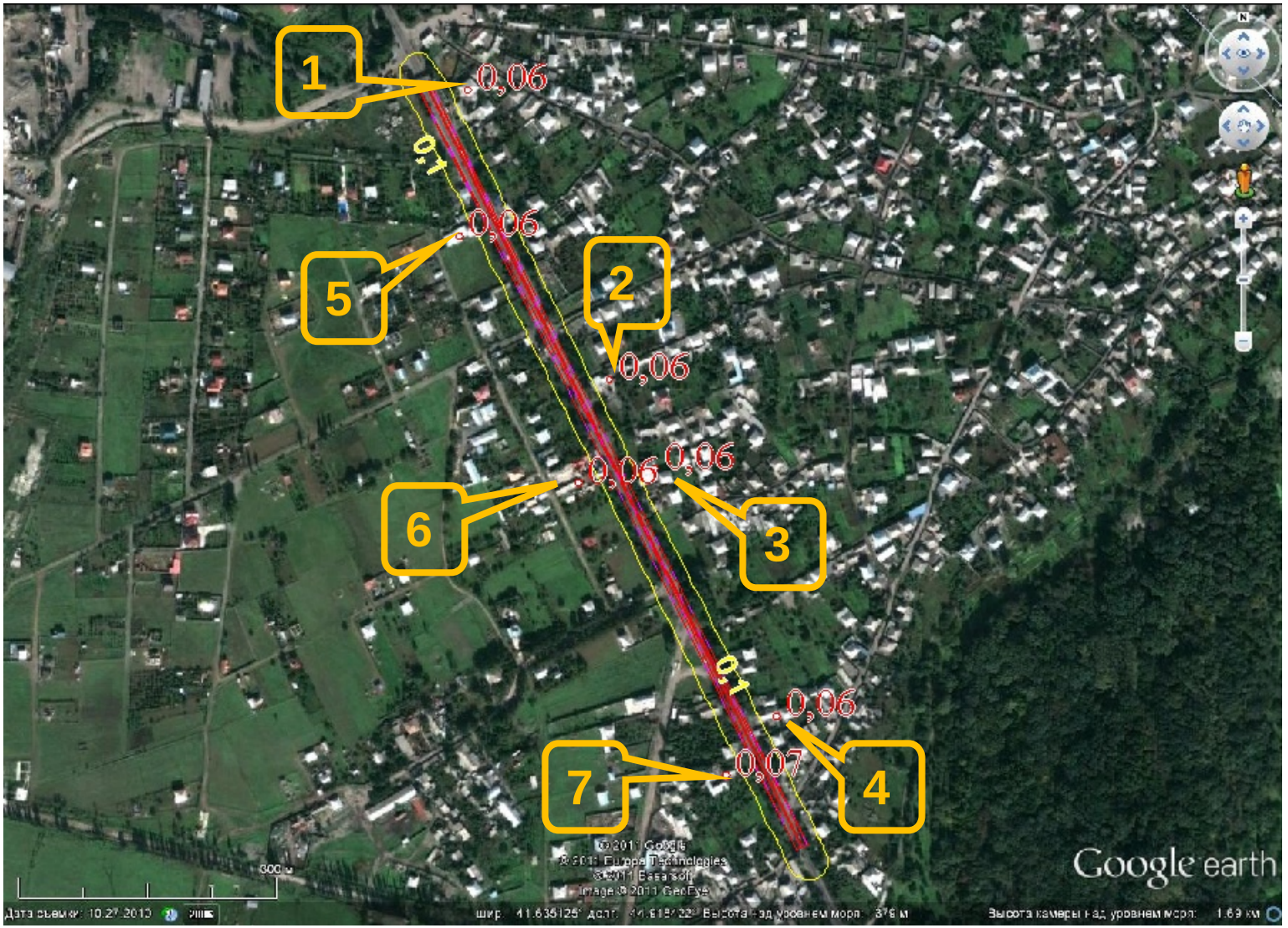
Air quality modeling for nitrogen oxide (304)



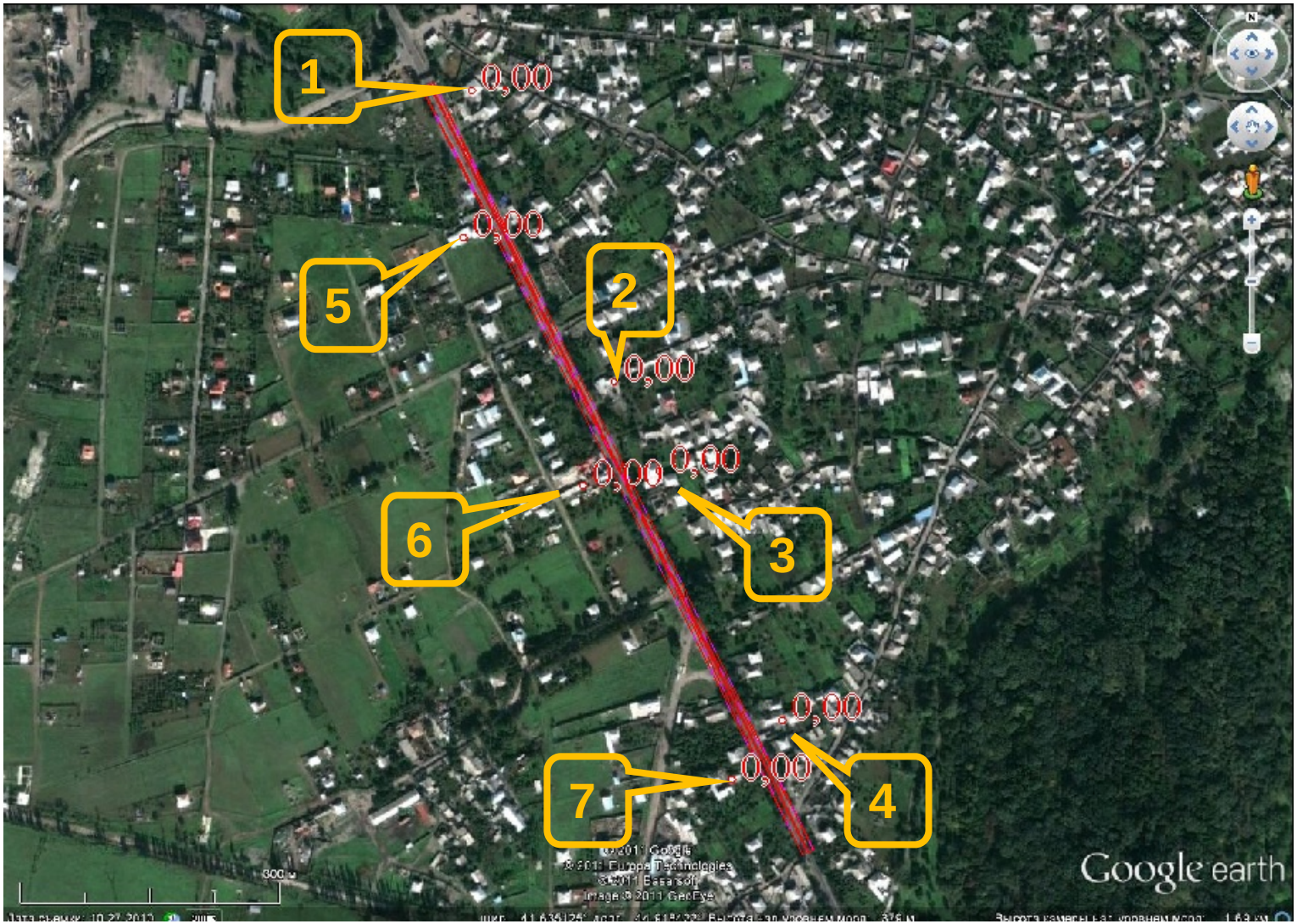
Air quality modeling for soot (328)



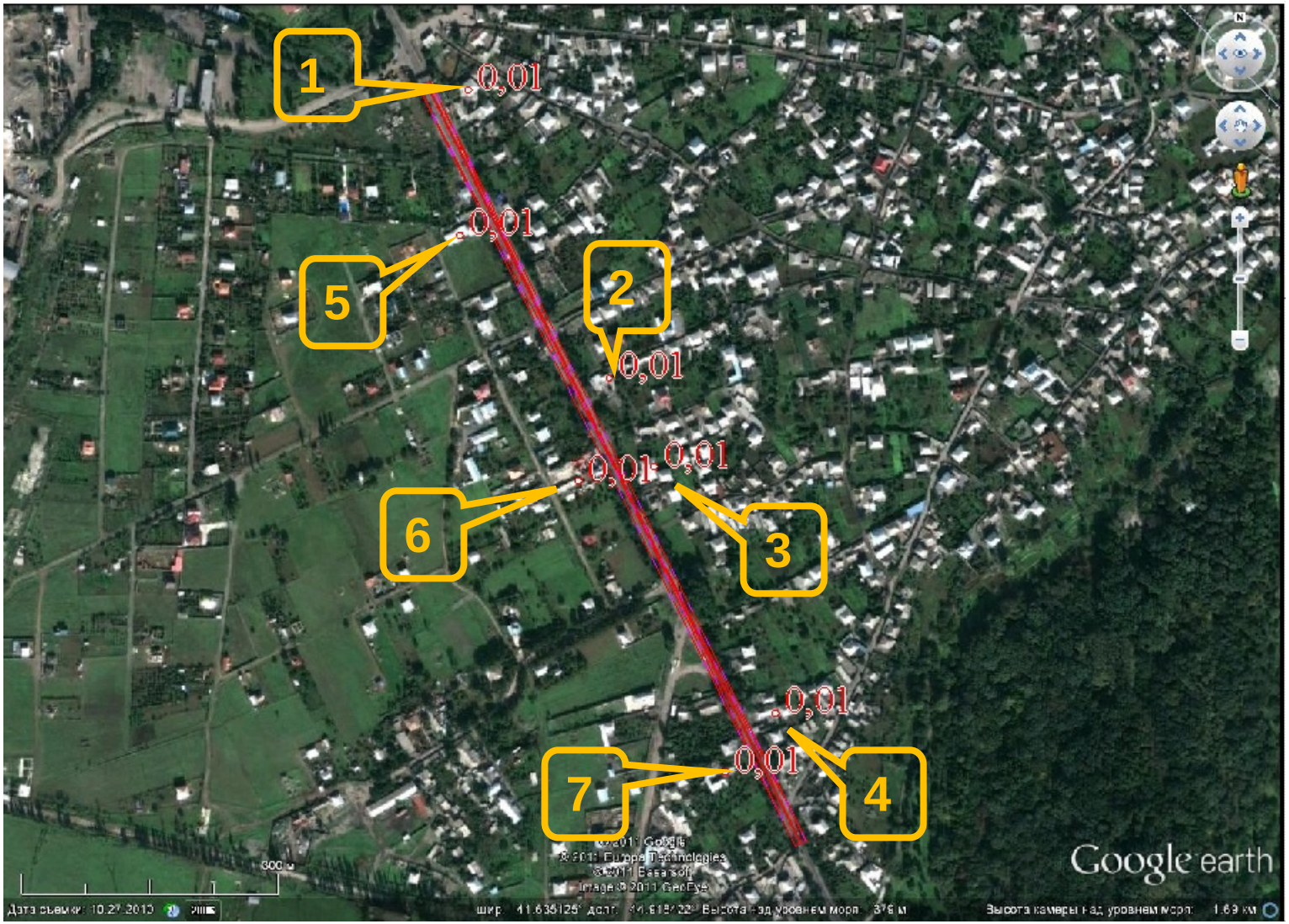
Air quality modeling for sulphur dioxide (330)



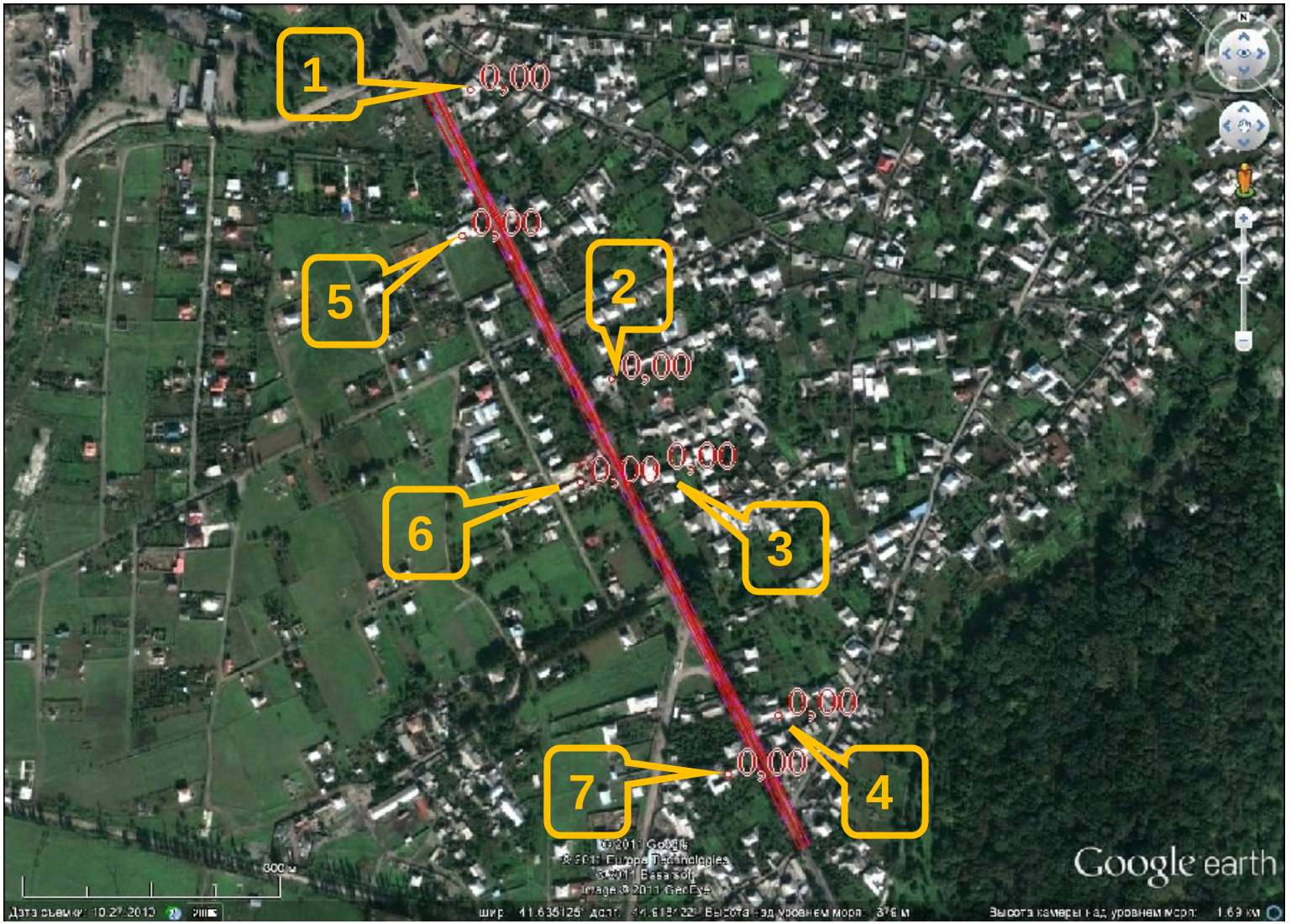
Air quality modeling for carbon oxide (337)



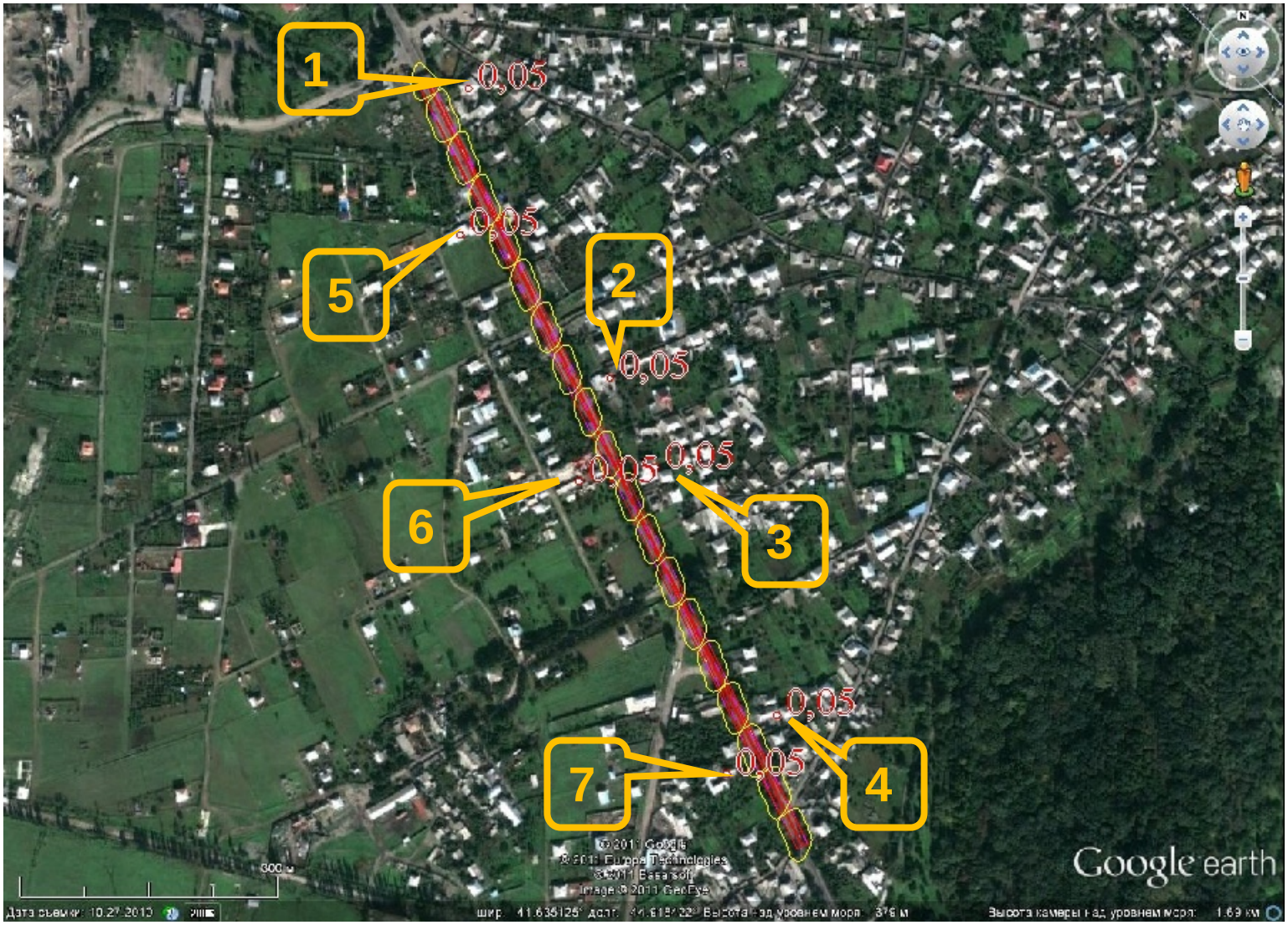
Air quality modeling for benzopyrene (703)



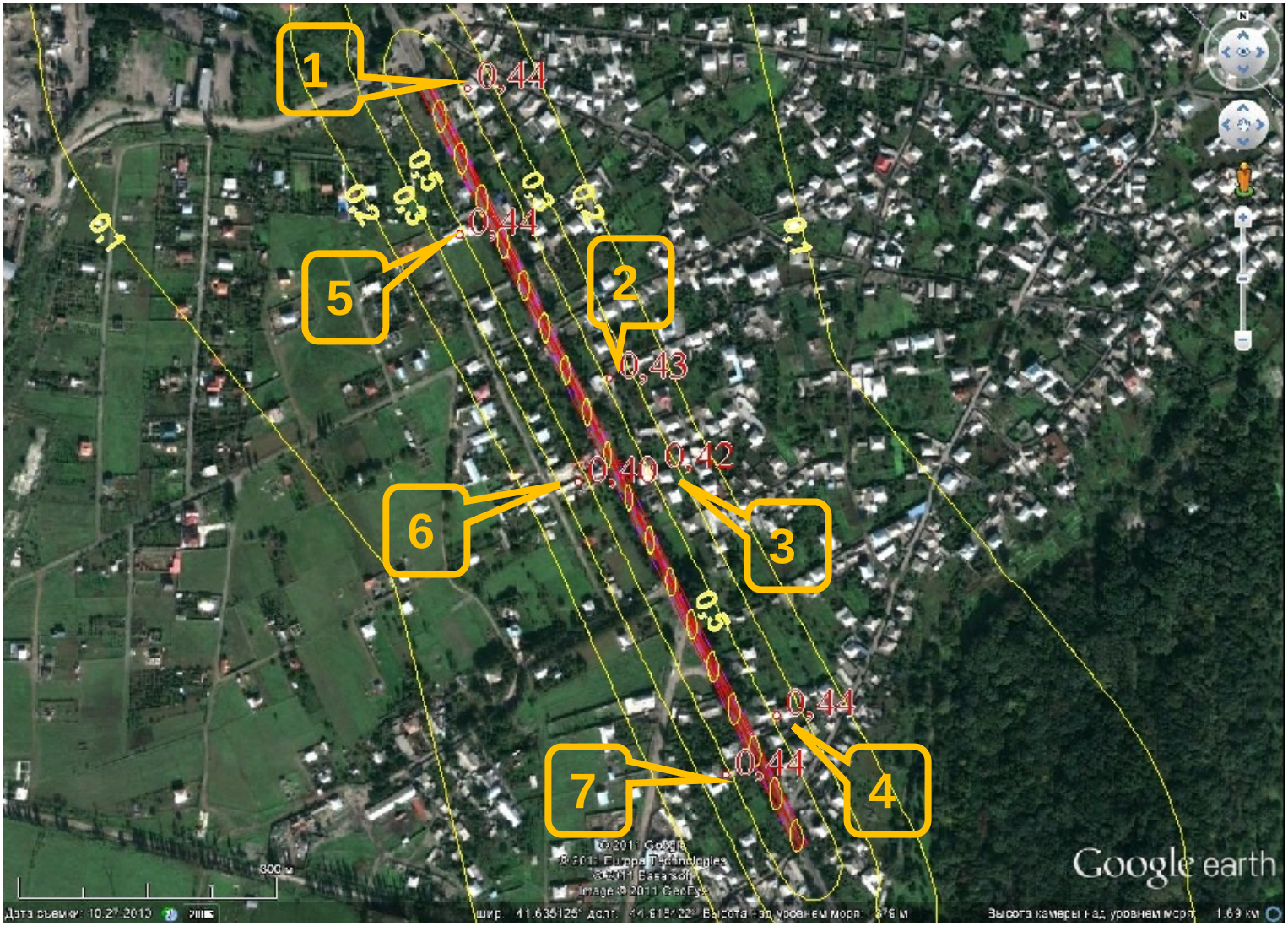
Air quality modeling for formaldehyde (1325)



Air quality modeling for petrol fraction (2704)

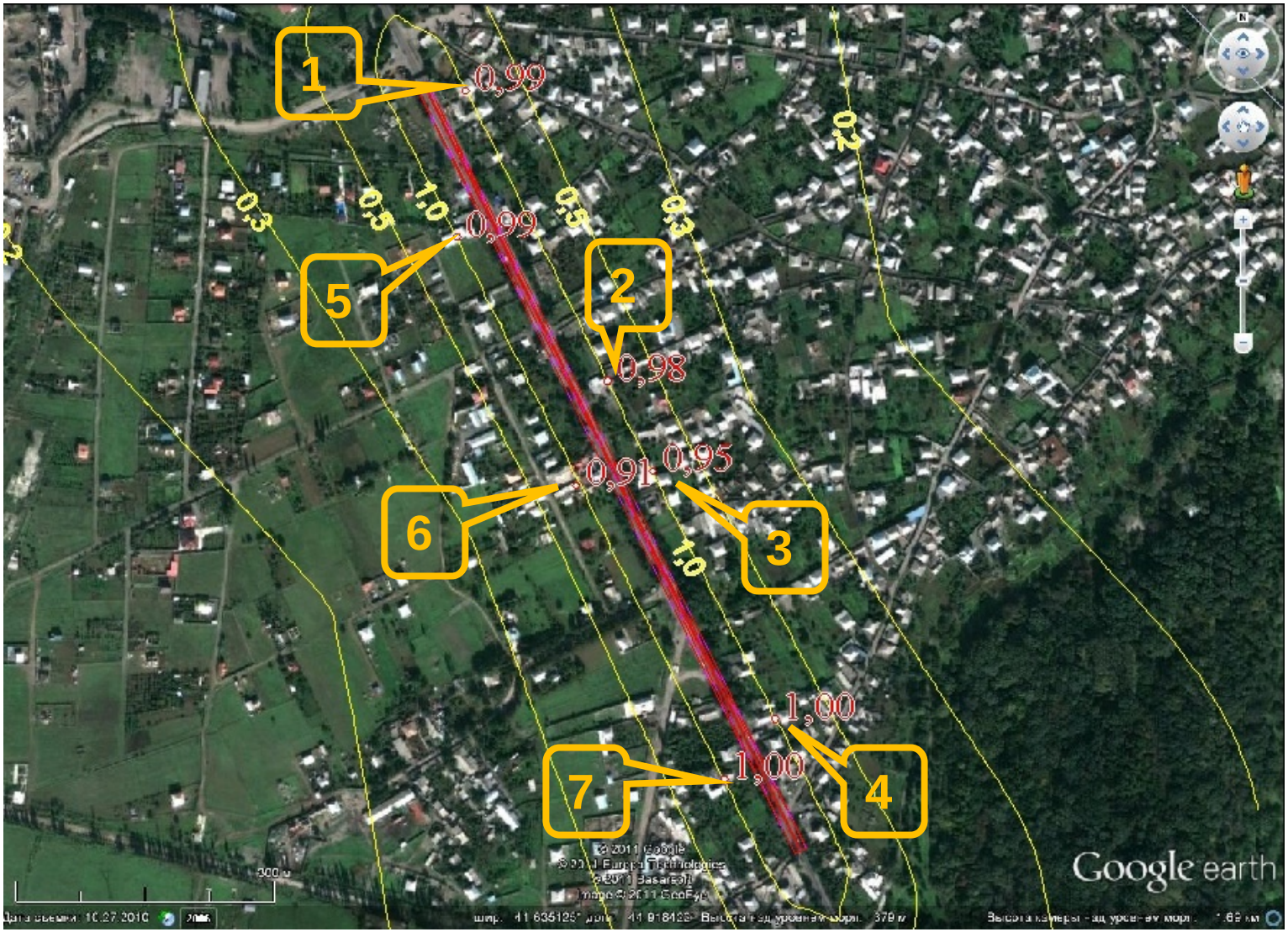


Air quality modeling for paraffin fraction (2732)



Air quality modeling for nitrogen dioxide (301) and sulphur dioxide (330) total impact (6053)

Year 2016



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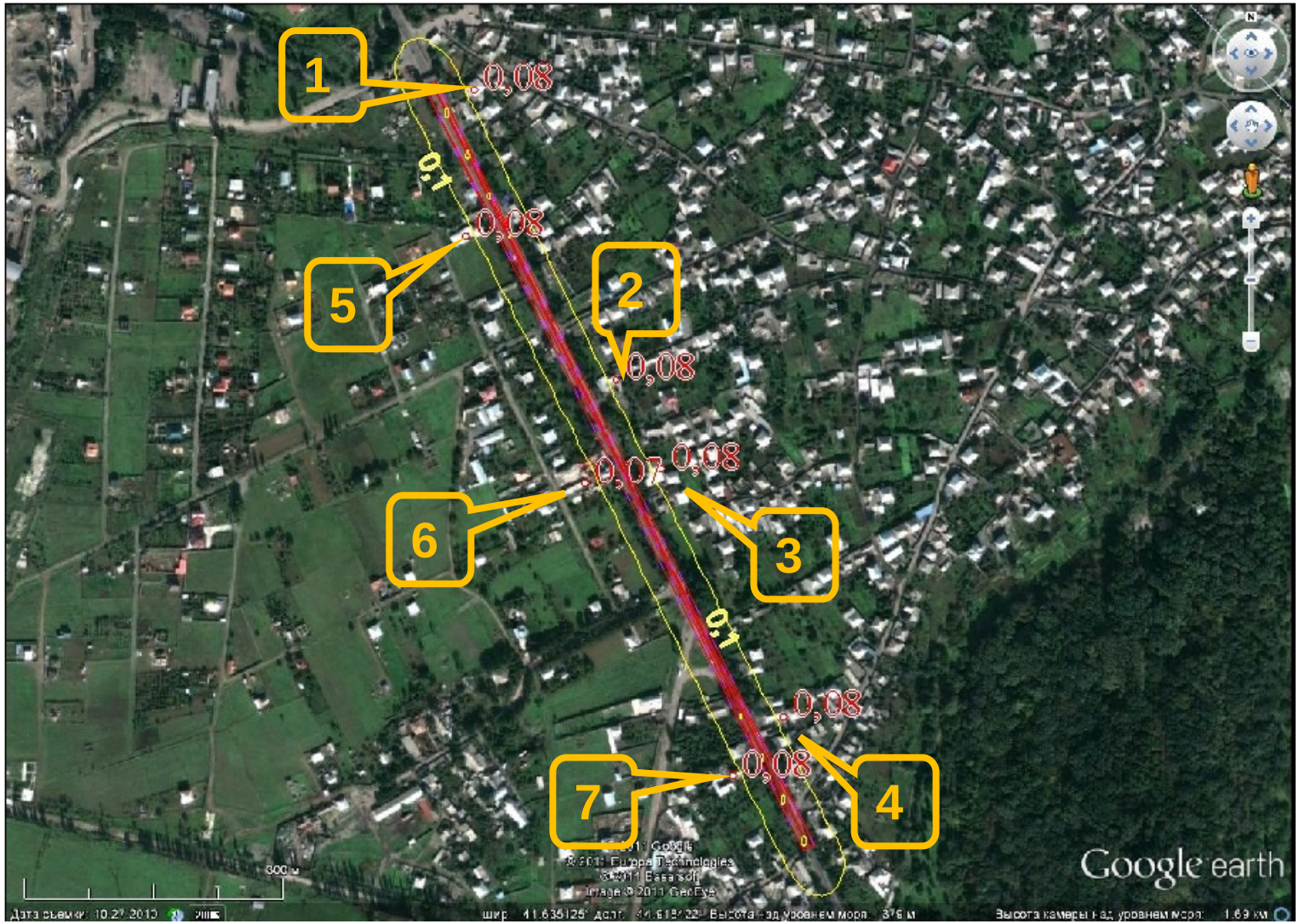

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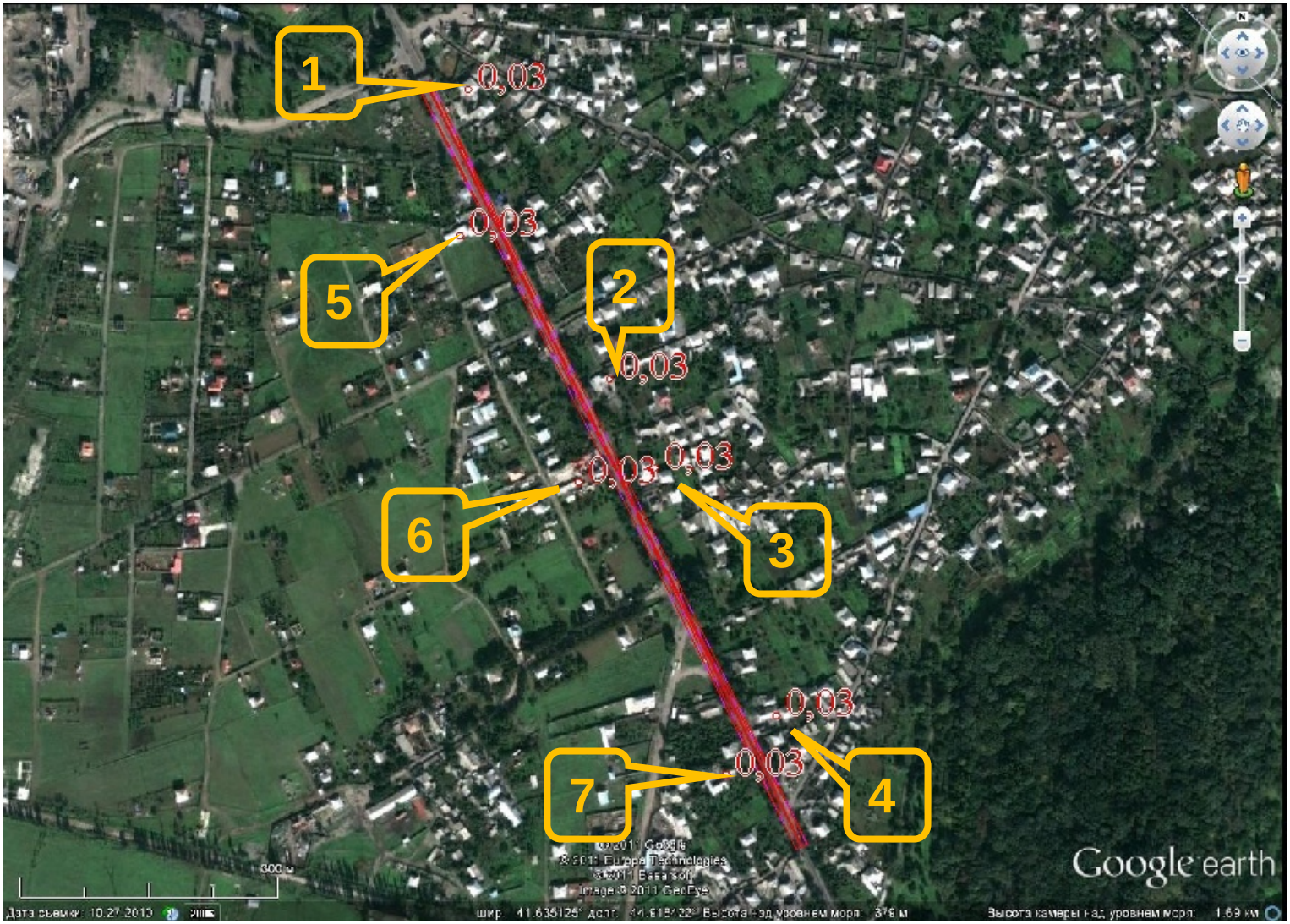
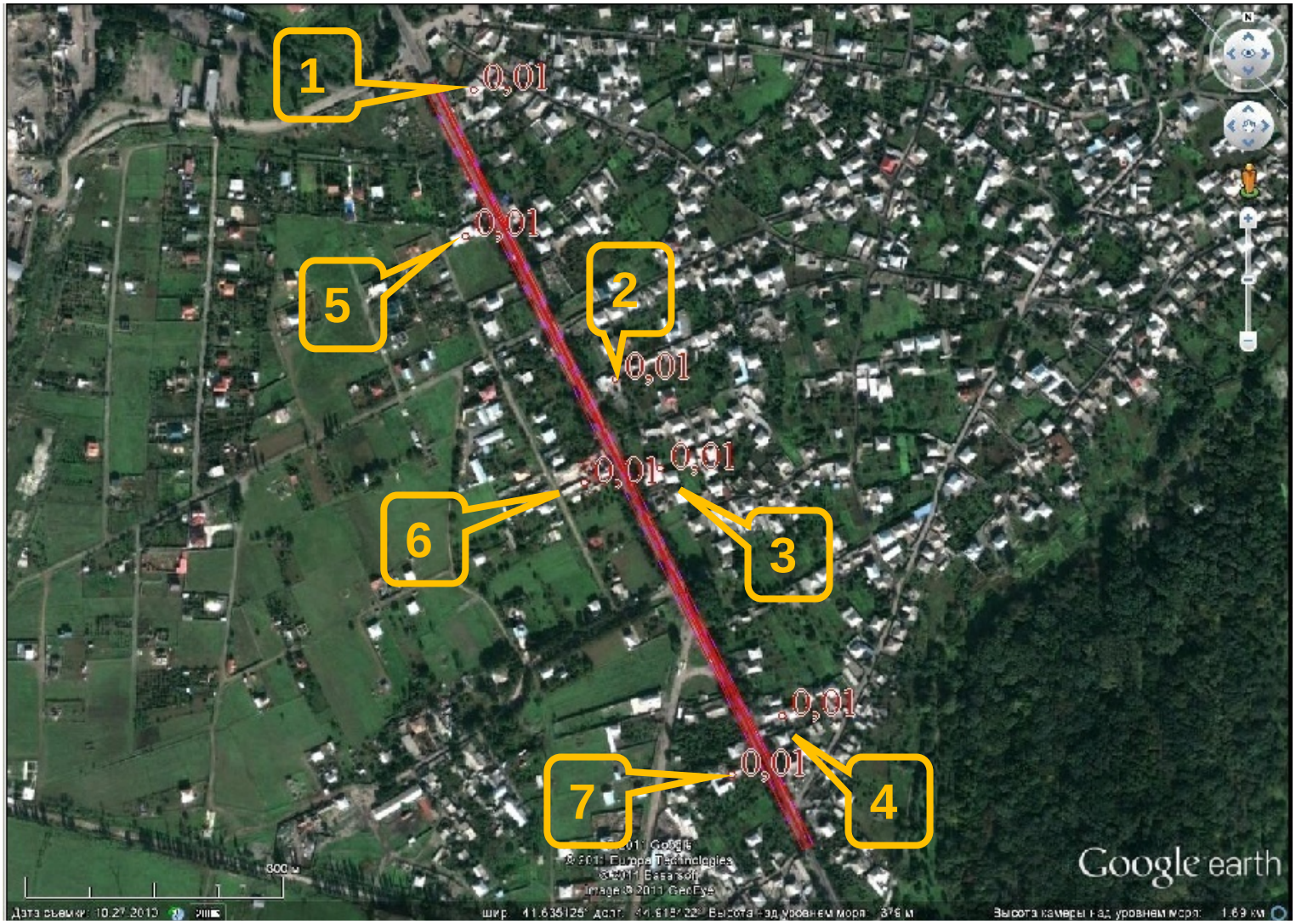


Air quality modeling for soot (328)



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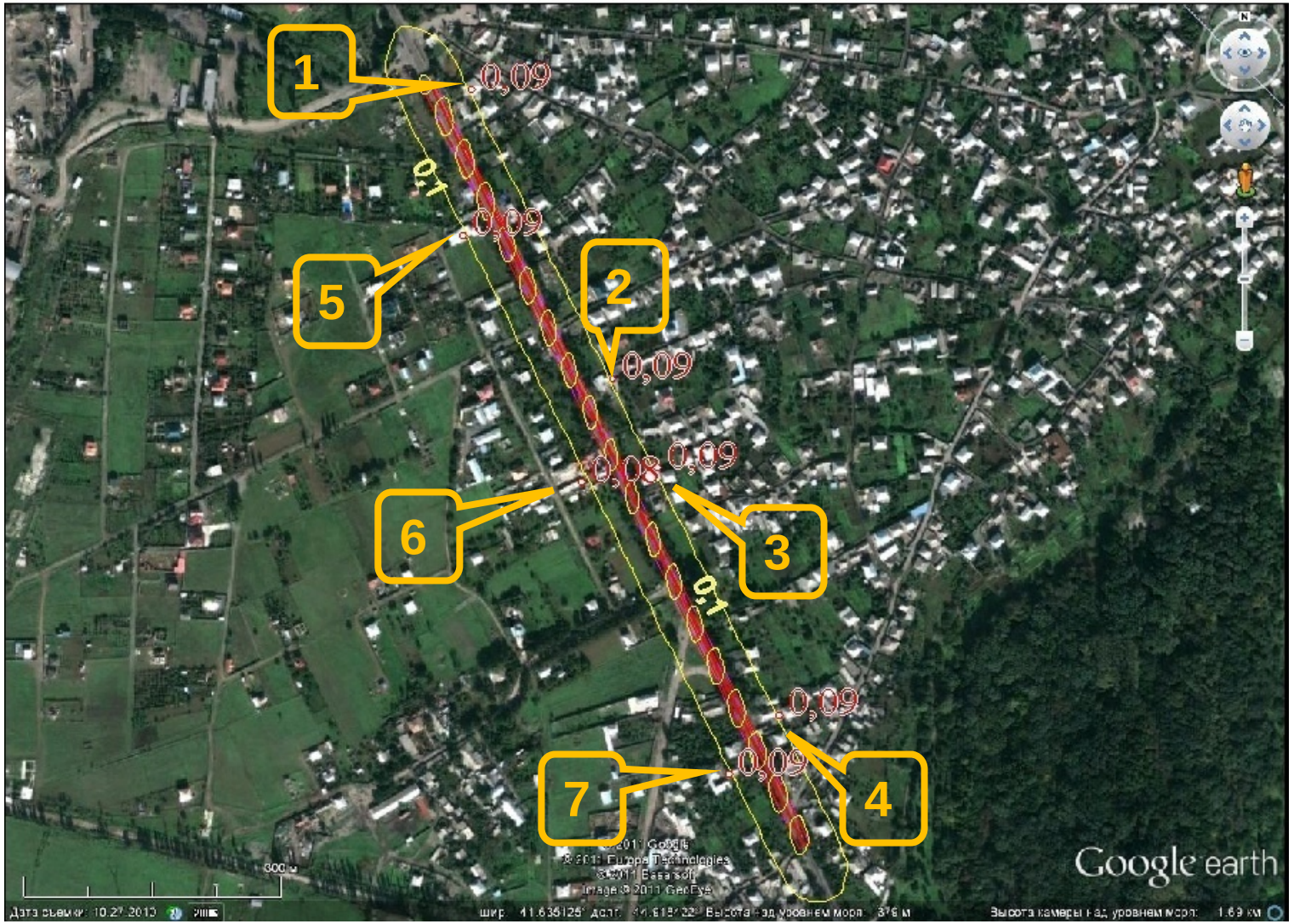

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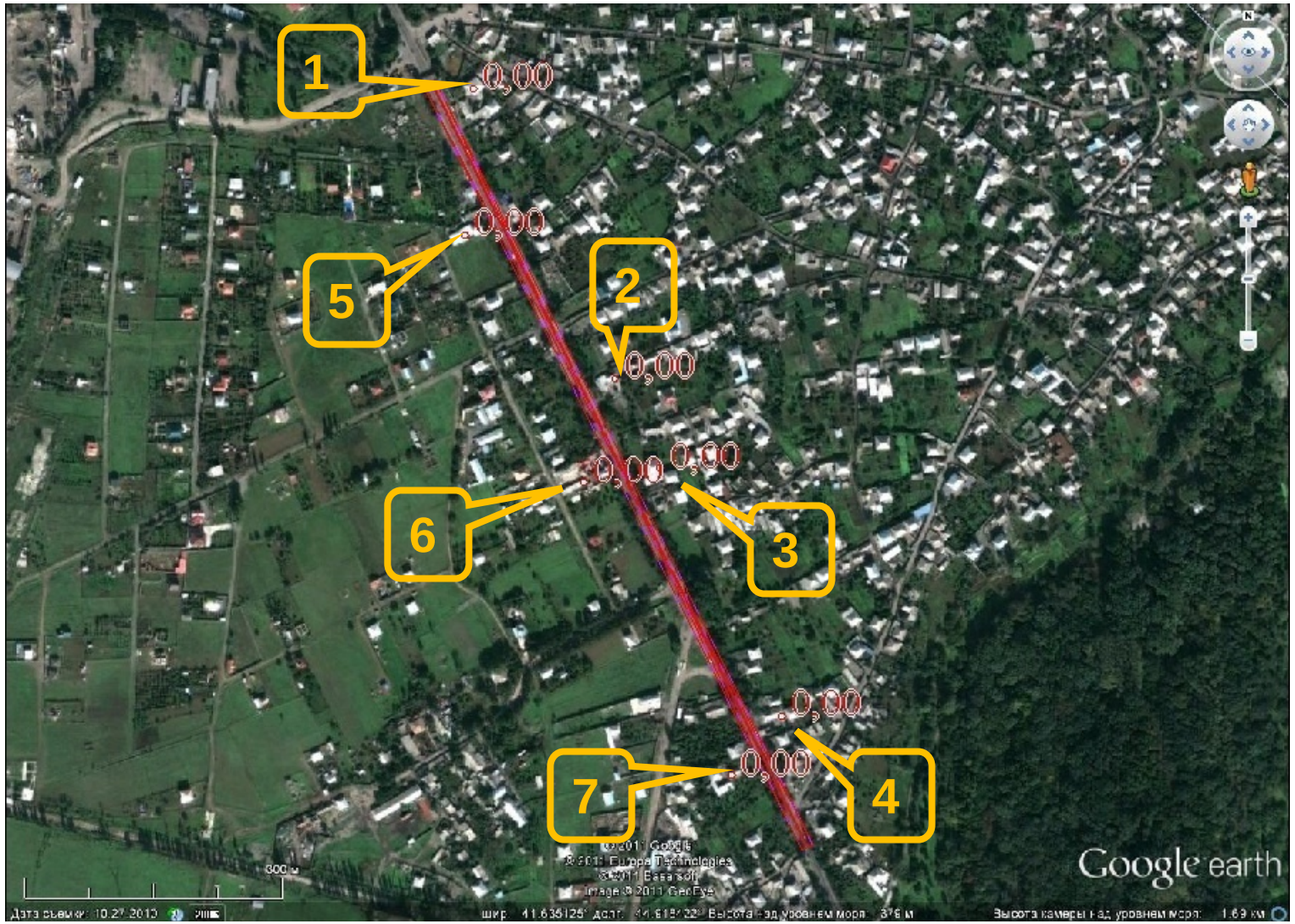
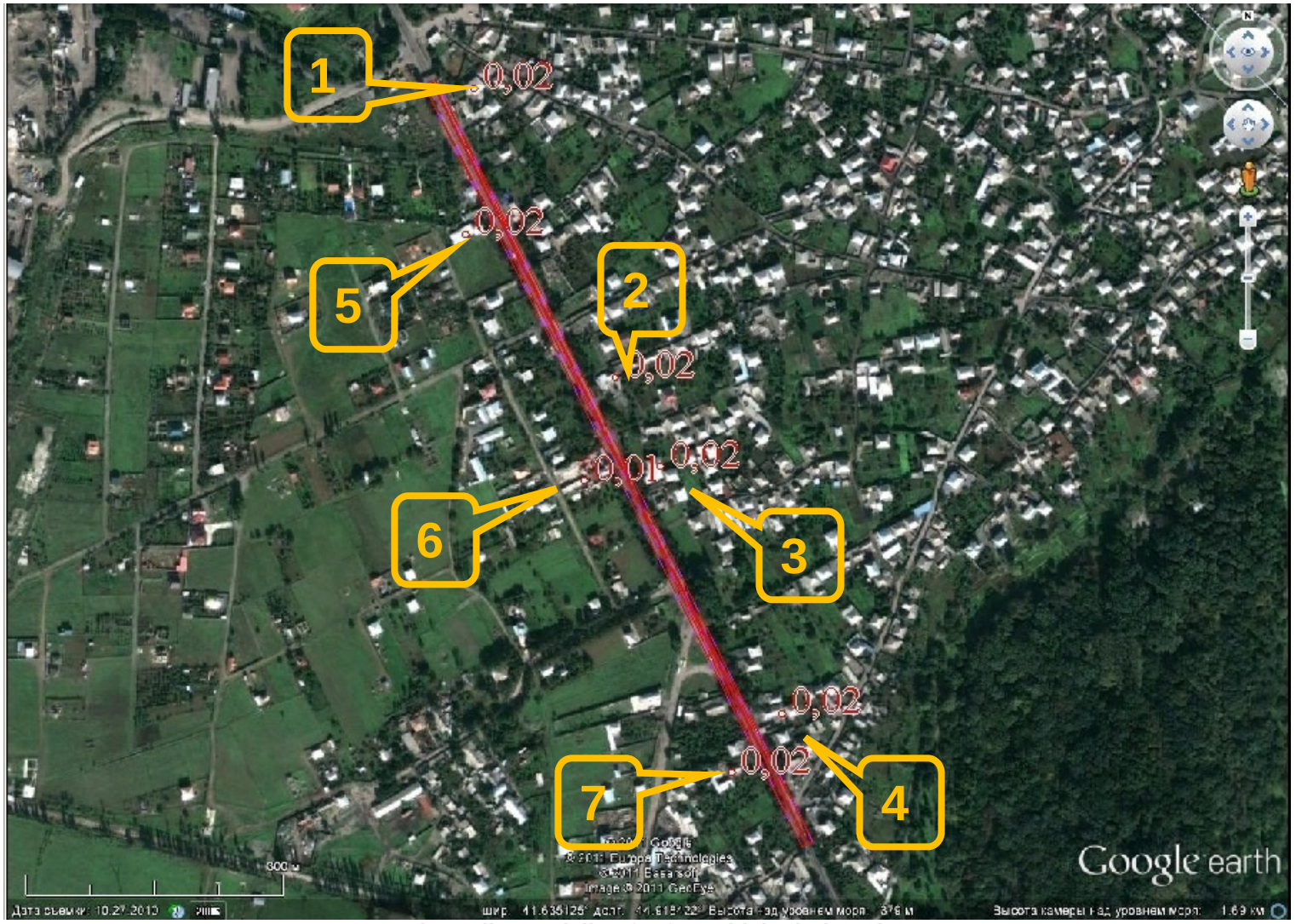
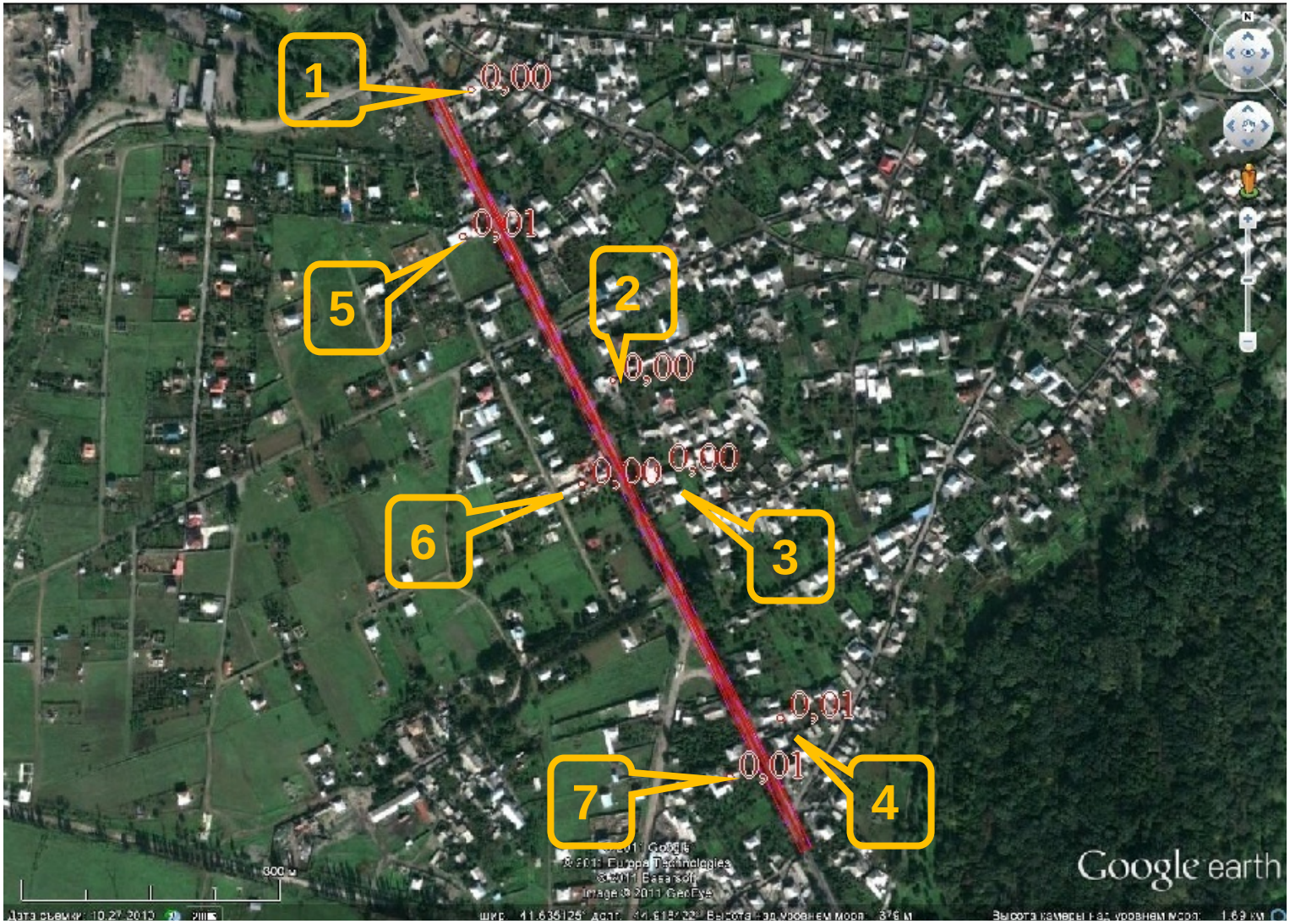


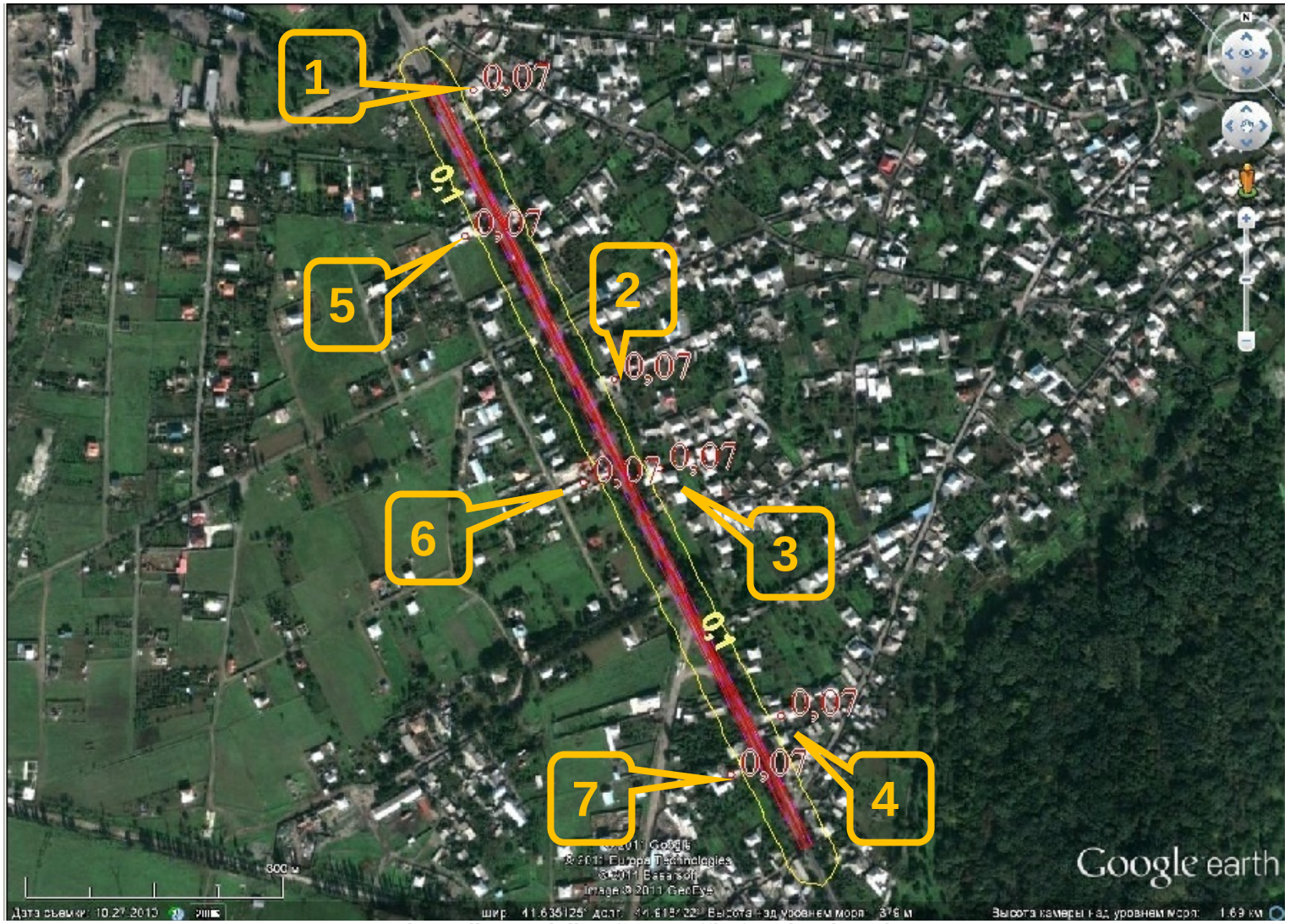
Air quality modeling for benzopyrene (703)



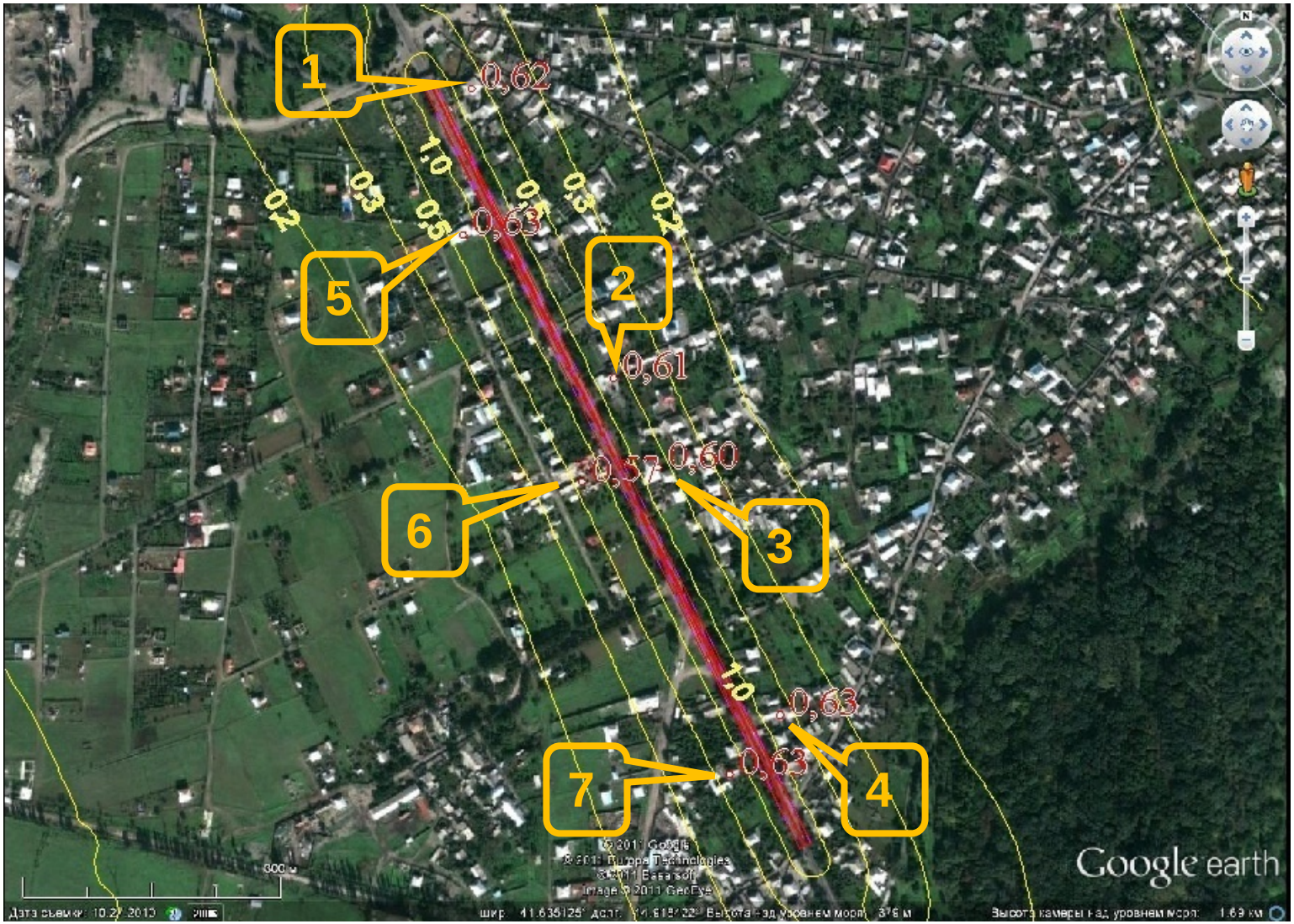
Air quality modeling for formaldehyde (1325)



Air quality modeling for petrol fraction (2704)



Air quality modeling for paraffin fraction (2732)



Air quality modeling for nitrogen dioxide (301) and sulphur dioxide (330) total impact (6053)

General Conclusion:

172. Values of ambient air pollution caused by the existing and perspective intensity of motor traffic within Tbilisi-Rustavi connecting highway rehabilitation will not exceed the standards.

Table data on concentration at control points in 2011-2016 are given in Annex # 3.

7.2.2 Noise Factor Related to Construction and Operation of the Road

Modeling of Noise Related to Construction Activities

173. Evaluation of construction related noise relies upon known information on the noise produced by various equipment and activities at individual stages of construction. For example noise levels produced at 50 ft (15.24m) as provided by the U.S. Department of Transportation, FHWA, CADOT, and SBAG 1993; and Country Sanitation Districts of Los Angeles County 1994 are about:

Table 7.1.a Noise Level Produced at 50 feet

Source of Noise	Equivalent noise level, dBA
1. Construction machinery and mechanisms	
backhoes	84 - 85
bulldozers	84 - 85
graders	91 - 92
compressors	80 - 88
jackhammers	85 - 98
pile drivers	96 - 107

According to other sources (U.S. Environmental Protection Agency, 1972,)

Table 7.1.b Noise Level Produced at 50 feet

Source of Noise	Equivalent noise level, dBA
2. Construction machinery and mechanisms	
Compacters (rollers)	72 - 75
Front loaders	72 - 83
Backhoes	72 - 92
Tractors	78 - 95
Scrapers, graders	80 - 95
Pavers	85 - 88
Trucks	83 - 93
Compressors	75 - 88
crane, movable	75 - 85
Jackhammers and rock drills	82 - 98
Vibrator	70 - 82
Saws	72 - 82

174. Noise generated by mobile sources naturally attenuates at a certain distance. Attenuation follows logarithmic pattern. In case of construction related noise, point source propagation model should be applied. Point-source propagation can be defined as follows: Sound $level_1$ –

Sound level$_2$ = 20 log r_2/r_1. This means that for every doubling of distance, the sound level decreases by 6dBA ("inverse square law").

Table 7.1.c Point Source Propagation Model

Distance from the Edge of the Road m	Predicted Noise Level Average Value - dBa	Predicted Noise Level Maximum Value - dBa
5	80	90
10	74	84
20	68	78
40	62	72
80	56	66
160	50	60
320	44	54

Summary

The present and anticipated noise levels along the road are insignificant. Actually, in 40-50 m from the highway the noise level is acceptable without any mitigation measures.

Operation Phase –Traffic Noise Modeling

The noise from the line source spreads out in case of continuous traffic flow. If the line noise source is combined with the point source, the sound waves spread out in a cylindrical or semi-cylindrical pattern. The noise spread forecast from the line source is as follows: Noise Level 1 – Noise Level 2 = =10 log r_2/r_1. The sound level of a line source reduces at a rate of 3 dBA for each doubling of distance. We should consider the traffic flow on a busy highway as a "line source" and take into account 3 dBA reduction for each doubling of distance.

The semi-quantitative assessment of the present and anticipated traffic noise impact is based on the noise measurements. The average and maximum data are presented in 4.1.3 Paragraph.

7.2 Table shows the noise levels specified by the law for various distances from the highway.

Table 7.2. Anticipated Noise Levels

Distance from the Road edge	Anticipated Noise (average) dBa	Anticipated Noise (maximum) dBa
5	64	78
10	61	75
20	58	71
40	55	68

175. The traffic noise will not spread farther than 5-10m from the road edge. The noise level is acceptable. Despite the anticipated increase of traffic volume, no worrying rise of the noise level is expected until 2030.

7. 3 Potential Impacts Related To the Construction Activities

7.3.1 Pollution and Waste

177. 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.

7.3.1.1 Construction Related Wastes

178. Various wastes will be produced throughout the construction process. The main waste producing areas are: construction sites and construction camps. Small amounts of waste are expected along the access and heavy equipment movement routes with ground and soil pollution.

Waste Classification

During the construction of the bypass the following types of waste will be produced:
1. Household;
2. Hazardous industrial;
3. Non-hazardous industrial;

Inert Waste

179. The road construction mainly produces inert construction waste, excavated soil, loose rock and debris – construction materials which have not been used and need to be disposed. The total amount of inert waste produced during the construction of the design road section is less compared with the other road sections.

- milled pavement - 10.790 m^3;
- Only some of excavated soil will be used fro fills. At least 201,250 m^3 of excavated and loose soil will be dumped in the disposal area.

The inert waste disposal areas will be selected by the contractor and agreed with the local authorities. The disposal areas suggested by the IEE team are discussed in 8.1.1.3 Paragraph below.

Household Waste

180. Both hazardous and non-hazardous household waste will be produced:

- Food waste (non-hazardous);
- Office waste (non-hazardous);
- Empty glass or plastic bottles (non-hazardous);
- Sewage (hazardous);
- Sweeping waste (proceeding from the object specifics, could be hazardous or non-hazardous);
- Bulb waste (hazardous);
- Medicial waste (hazardous).

Non-Hazardous Industrial Waste

- Packaging (wood, paper, carton, plastic);
- Expired or unusable metal parts;
- Damaged or expired tools;
- Personal safety means and clothes.

Hazardous Industrial Waste

- Polluted soil;
- Polluted rags and oil absorbing fabric;

- Polluted water;
- Polluted industrial equipment in disrepair;
- Paint vessels and brushes;
- Lubricant vessels;
- Empty vessels of packaging;
- Polluted personal safety equipment and clothing.

Table 7.4 Types and Estimated Quantities of Waste

Waste Type	Waste Category	Estimated Quantities (with unit of measurement)	Waste Management	Alternatives	Responsibility Issue(s)
Domestic waste	**non-hazardous**	**80-100 m^3 annually**	**to be transferred to the Contractor for disposal**	**Waste can be separated on site and some of it (paper, glass, plastic) can be transferred to the Contractor for recycling or reuse.**	**Contractor**
Office waste (sweepings, glass and plastic bottles, stationery)	**non-hazardous**	**10-15 m^3 annually**	**to be transferred to the Contractor for disposal**	**Waste can be separated on site and some of it (paper, glass, plastic) can be transferred to the Contractor for recycling or reuse.**	**Contractor**
Sewage	**hazardous**	**1500 m^3 annually**	**Sewage is discharged into the sewer network based on the contracts**		**Contractor**
Burned-out bulbs	hazardous	**50-70 pieces**	**to be transferred to the contractor for disposal**	**1. returned to the manufacturer 2. transferred to the licensed contractor for recycling**	**Contractor**
Printer cartridges	hazardous	**2-3 pieces annually**	**Recharged 3-4 times and then transferred to the contractor for disposal**	**1. returned to the manufacturer 2. transferred to the licensed contractor for recycling**	**Contractor**
Medical waste	hazardous	**0.1kg annually**	**to be transferred to the contractor for disposal**	**to be transferred to the contractor for incineration**	**Contractor**
Damaged or outdated tools	non-hazardous	**1-2m^3 annually**	**to be transferred to the contractor for disposal**		**Contractor**
Personal	non-	**1 m^3**	**to be transferred to the**		**Contarctor**

protection and clothes	hazardous		**contractor for disposal**		
oil soaked rags and absorbents	hazardous	**The quantities depend on the oil spill scale 1m^3 annually**	**2. to be collected in plastic or metal containers and temporarily stored**	**1. to be transferred to the contractor for incineration 2. to be transferred to the contractor for storage**	**Contractor**
Cut trees	non-hazardous		**to be transferred to the local authorities**	**to be transferred to kindergartens and schools**	**Contractor**

7.3.1.2 Soil Pollution

181. 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.

7.3.1.3 Surface Water and Groundwater Pollution

182. 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. River Iori is the major receptor sensitive to the increased sediment load.

7.3.1.4 Biological Recontamination

183. 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.

7.3.1.5 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

7.3.2 Impacts on Flora.

184. The design area is located in the urban and adjacent transformed landscape. There are no protected territories, wetlands, forests or other sensitive habitats and ecosystems. However, potential negative impact on vegetation should be taken into account.

185. The design implementation envisages cutting of about 1000 trees in the widened road sections. The vegetation mainly comprises a green belt along the highway. However, there are some species listed in the Red List of Georgia and some endangered species in the project area. Detailed botanical studies showed that two species listed in the Red List of Georgia, namely the walnut (*Juglans regia* L) and the Field Elm (*Ulmus minor* Mill). There are also rare, endangered and vulnerable species in the project area, including the silver berry *Elaeagnus angustifolia* (rare species), the Turkish Pine *Pinus eldarica* (endangered species), etc. The results of the botanical studies conducted prior to the construction need to be verified.

7.3.3 Impact on Fauna

186. The project is not expected to have significant impact on the Fauna. The only species to be affected by the construction is bats. The impact can be mitigated by checking old buildings and hollow trees prior to their demolishing or cutting. A simple acoustic method can be used to scare off bat colonies.

7.3.4 Protected Areas

The design road does not lie in the vicinity of the protected territories.

7.3.5 Landscape.

The project does not envisage any impact on the valuable natural landscape.

7.3.6 Water Resources.

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 (river Mtkvari; groundwater resources). Water intake for construction works and particularly for the camp operations could be made from surface water sources or from groundwater sources (wells). No Water Intake Permit is needed for surface water intake, however special form should be filled to demonstrate that the terms of surface water intake (including indication of intake volumes) are in compliance with the Technical Regulations (Technical Regulations approved by the Order No 745 of MoE, issued on 13.11.2008). Intake of the groundwater for camp operations does not require obtaining of License for Use of Groundwater (according to the Law on Licenses and Permits, 2008). Wastewater discharge in surface water objects needs development of special document – Maximum Admissible Discharge Limits, which should be agreed with MoE and which determines limits for discharging wastewater with given concentrations of pollutants. The agreed values (Limits) are determined for each particular facility in order to comply with the Sanitary Norms for surface water. Sanitary Norms for Surface Water is the generic regulation issued by the Ministry of Labor, Health and Social Protection, while the Discharge Limits are calculated for each polluter of the surface water objects.

The river Mtkvari is widely used for irrigation, power engineering and industrial water-supply purposes. The closest HPP plants are located upstream from project sites in Ortachala district of Tbilisi and in Zahesi (between Tbilisi and Mtskheta).The headworks arranged past the city of Rustavi supplies the irrigation and power engineering water to Gardabani irrigation system and Gardabani thermal power plant. r. Mtkvari is not used for navigation. Fishing in r. Mtkvari has no economic value but mostly a leisure meaning. Use of water by the project or increased sedimentation due to the slope erosion will not affect economic activities related to r. Mtkvari, however erosion and sedimentation control measures and pollution prevention is required to protect the river as a valuable environmental receptor and water resource.

7.3.7 Impacts on Archaeological Sites.

Land clearance works, grading and excavations are associated with the risks of damaging underground archaeological remnants. No aboveground monuments or known archaeological sites and visible signs of potential archaeological remnants have been identified during the baseline studies conducted by the IEE team. However, not listed sites could be as sensitive as already known archaeological sites. During construction of the roads 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 motor road will be upgraded and widened. It should be understood that only undiscovered archeological relics could be an issue and chance finds procedure proposed in chapter 8 is accepted as sufficient mitigation measure at the stage of planning.

7.3.8 Transport related impacts

Heavy trucks are required to deliver required amount of inert materials to the needed sites within the construction corridor. Selection of supplier is the prerogative of the construction contractor. However, the closest licensed quarries and borrow pits are located in the immediate vicinity to the highway and the highway is the main transportation route for delivering construction materials. No new access roads are required and the existing short access roads from quarries to the highway do not pass close to any of the settlements. 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

7.3.9 Traffic Disruption.

Intensive 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.

However, the main risk of the traffic disruption is related to the fact that the construction rlated to the widening of the road is to be carried out at the existing and functional road. Construction of ne lains amy affect traffic on existing road. Proper organization of construction activities is crucial to mitigate these risks. The Traffic Management Plan is represented in p. 8.1.1.13.

7.3.10 Quarry-related Impact

Fill volume - 65.610 m^3.
Cut volume - 238440 m^3
Filling materials to be transported from quarries and borrow pits for arrangement of the embankments - 28420 m^3.

Heavy trucks are required to deliver required amount of inert materials to the needed sites within the construction corridor. Selection of supplier is the prerogative of the construction contractor. However, the closest licensed quarries and borrow pits are located in the immediate vicinity to the highway and the highway is the main transportation route for delivering construction materials. No new access roads are required and the existing short access roads from quarries to the highway do not pass close to any of the settlements.

So far as licensed quarries and borrow pits are supposed to be used by construction contractor, the limits for exploration and environmental requirements are fixed in license and expected impacts are mitigated by appropriate operations of the license-holder. The main requirement of this IEE in that case is to use only licensed suppliers of construction materials.

7.3.11 Construction Camp-related Impacts

187. The experience of constructing other sections of E-60 shows that temporary works, e.g. a construction camp for accommodation of 200 workers (approx. 1.5 ha area), a yard for 100 vehicles and 150 units of heavy construction machinery like bulldozers, excavators, cranes, etc. (approx. 2 ha) and concrete plant (approx. 3 ha) need to be constructed.

The exact location will be selected by the Contractor. The potential impacts of the camp construction and operation are summarized below:

- potential damage to the humus topsoil;
- pollution caused by fuel storage and vehicle fuelling;
- waste and sewage management.

The design and operation procedures and conditions and optimum location options of the camp are detailed in 8.1.1.13 Paragraph of the IEE regarding the mitigation measures. Waste management plan for camps is given in Annex 6.

7.3.12 Construction Related Impacts at the Asphalt Plant and Gravel Crushing Facilities

188. The road will be a asphalt-concrete paved. It is responsibility of the construction contractor to chose: will they install new asphalt plant or use licensed asphalt suppliers. According to Georgian regulations, in case if the decision will be to install own mobile asphalt plant, the construction contractor will have to prepare appropriate EIA and obtain Environmental Impact Permit on plant operation.

Direct impacts of asphalt plants and gravel crushing sites include landscape degradation, emissions, dust, emissions, noise etc. Gravel and any other supply materials needed for asphalt production will be acquired through licensed operators.

Dust and emissions are the most significant impacts related to asphalt plant operations and material supply and storage.

Asphalt plants (liquefied bitumen materials etc.) could be a source of surface water and ground pollution, in case of improper management of materials.

Dust emission and noise is characteristic impact associated with the operation of crusher facilities.

8. MITIGATION & ENVIRONMENTAL MANAGEMENT PLAN

8.1 MITIGATION MEASURES

8.1.1 Mitigation of Construction Related Impacts

8.1.1.1 Prevention and Mitigation of Geohazardous Processes

189. The design is prepared considering 8 degree seismic zone and is relevant to existing seismic risks.

There are no landslide prone areas or other high risk geological processes developed within the RoW. Minor risks related to some rockfall have no impact on design and just requires permanent monitoring during operation of the road.

8.1.1.2 Pollution Prevention Measures:

190. 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.

191. 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(r.Mtkvari) , 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.

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

Significant impacts on groundwater are not envisaged as no blasting operations and deep cuts are planned. Ground water pollution risk related to fuel leakages is minimal and will be eliminated in case of immediate removal of polluted ground

8.1.1.3 Construction Waste Management

The anticipated types and amounts of waste are described in p. 7.3.1.1

Inert construction waste handling
192. Generally, it is recognized that the best option has always been the avoidance of waste generation resulting in minimizing the quantities and hazard. Then it is recognized that it is better to reuse, restore and recycle the waste rather than to process it, and the placement is the last resort.
The total amount of inert waste produced during the construction of the aforementioned road section is less compared with the other sections construction.

The quantities of the milled pavement are 10,790 m^3. The reuse of milled pavement is possible and advisable. The milled pavement is stored in the borrow pit and reused in pavement construction or road section repairs.

Only some of excavated soil will be used for fills. at least 201,250 m^3 of excavated soil and loose rock should be placed in soil deposit areas. It is worthy of note that the designed road is located in the vicinity of non-functional Iagluja disposal area, which is due to be closed. Closure and conservation of the landfill requires huge amounts of soil and other filling inert materials for covering the waste layers. We recommend transporting inert construction waste (spoil soil and rock boulders) to Iagluja landfill area and using it for its closure and conservation. Such approach has double environmental benefits: a) it solves the problem of disposal of spoil ground from construction sites and b) it reduces the volumes of the filling materials to be transported from the borrow pits and quarries for landfill conservation needs. The spoil will be temporarily stored on the territory of Iagluja landfill and further will be used as filling material for covering the closed landfill, according to the conservation design.

Hazardous Construction Wastes

193. According to local legislation (Order #36/N of the Minister of Labour, Health and Social Protection of 24.02.2003) small amounts of listed 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. Constructing Contractor shall collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment or disposal at the temporary storage sites and further at the locations approved by MoE or pass it to the licensed operator (e.g. Sanitari Ltd), having environmental permit on operation of the hazardous wastes.

8.1.1.4 Noise, dust and emissions

194. The settlements are not affected significantly by the construction related emissions. 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.

As a result of rough estimation of construction related noise, we can assume that the noise impact will not exceed radius of 80 m. Temporary increase of the noise level near the construction ground within the 80-100 m radius is acceptable impact. The residential houses in the villages are not so densely concentrated near the road.

Mitigation of this minor 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 deploy high noise devices, like crushers, outside the residential zone and exclude the night-time works. 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; Minimum 2 browsers will be required for that purpose. However, the constructing contractor should not be limited by this figure, and if required additional browsers should be engaged.
- 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.

8.1.1.5 Quarrying Sites and Borrow Pits

195. The fill shall be constructed from:

- Soil delivered from borrow pit- 145000m^3;

Rocky soil delivered from borrow pit – 50000m^3. On the other hand, it will also be necessary to transport a certain amount of materials from borrow pit for fill so that the fill is of the right fraction size. The map of potentially usable licensed borrow pits is given in Figure- 2.3, Clause 2-8. Selection of supplier is the prerogative of the construction contractor. However, the closest licensed quarries and borrow pits are located in the immediate vicinity to the highway and the highway is the main transportation route for delivering construction materials. No new access roads are required and the existing short access roads from quarries to the highway do not pass close to any of the settlements. So far as licensed quarries and borrow pits are supposed to be used by construction contractor, the limits for exploration and environmental requirements are fixed in license and expected impacts are mitigated by appropriate operations of the license-holder. The main requirement of this IEE in that case is to use only licensed suppliers of construction materials. However, it is not excluded, that the construction contractor will prefer to obtain licenses for operating its own borrow pits and quarries, For that case this IEE provided general requirements to be met during the exploration of quarries and borrow pits.

196. Generally quarry sites are the major sources of environmental impact due to dust and noise pollution, loss of biodiversity, and generation of spills. Operation of the quarries above the approved limits may cause change of floodplain hydrology and trigger erosion and landscape degradation. The operating procedure for borrow pits shall consider following principles: (i) maximize the amount of fill that can be effectively used from the pit, (ii) minimize erosion and sedimentation, (iii) preserve the water quality of the rivers, (iv) protect air quality during excavation, (v) prevent wildlife from falling into the pit, and (vi) reinstatement of the site after construction. Only approved borrow and quarry sites will be used by the contractors and produce copy of necessary government licenses to the client before procurement.

197. The mitigation plan to be followed by the Contractor at the borrow sites is: (i) only borrow areas approved by the environmental authority will be used for the project; (ii) pits management, (including restoration if it will follow the completion of certain works) shall be in full compliance with all applicable environmental standards and specifications; (iii) the excavation and restoration of borrow areas and their surroundings, in an environmentally sound manner to the satisfaction of the MoE and RD; (iv) borrow pit areas will be graded to ensure drainage and visual uniformity or to create permanent tanks/dams. Additional borrow pits, if necessary, will not be opened without the restoration of those areas no longer in use, and without the approval of MoE. Topsoil from the opening of borrow pits will be saved and reused to revegetate the pits to the satisfaction of the MoE.

198. General principles recommended for borrow pit and quarries management:

- Do not use borrow excavation until all suitable roadway excavation is used. Use select borrow and select topping as shown on the plans.
- It is accepted to used only licensed material suppliers
- Develop and restore Government located and provided borrow sources as approved by the Engineer.
- Do not excavate beyond the established limits.

- The borrow pit shall be landscaped after the excavation.

After the closure of the borrow pits, reinstatement and landscaping plan should be implemented by Construction Contractor.

199. Local roads will be damaged during transportation of borrow materials and by the construction equipment. In order to reduce impact on all borrow sites and local roads, contractors will water the local roads close to the settlements used by the borrow trucks and rehabilitate the local roads to their original conditions.

The measures aimed on mitigation of the dust and emission impacts, as well as potential river contamination due to improper fueling and vehicle operation, 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 the quarrying site during monitoring.

The MoE and Environmental Inspectorate are in charge to control compliance of the quarrying company's performance. The Road Department will control the licenses of Construction Contractors in case they are exploring some quarries and borrow pits.

8.1.1.6 Topsoil Protection

200. Contractors will be encouraged to minimize usage of productive agricultural land and convert them to their original state after completion of civil works. Embankments should be monitored during construction for signs of erosion; long-term material stockpiles will be covered to prevent wind erosion.

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:

- Segregation of the topsoil from the subsoil stockpiles
- 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 100 m from river/streams, subject to site specific topography.

201. 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: (i) anaerobic conditions - turning the stockpile or creating ventilation holes through the stockpile; and (ii) erosion - temporary protective silt fencing will be erected;

202. Topsoil removed from the construction sites will be used for reinstatement of the topsoil on the embankments or in the adjacent construction corridor affected by the project activities. 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 farthest 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.

Subsoil Storage The storage of subsoil in stockpiles, no more than 3m high with side slopes at a maximum angle of 60^0, 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.

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.

8.1.1.7 Final Reinstatement and Long-term Anti-erosion Measures

203. 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 bush clearance and no woodcutting are 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".

8.1.1.8 Landscape Reinstatement and Protection of Flora

204. The most part of the RoW belongs to strongly transformed urban landscape and has no ecological value. The project does not affect forestry fund land.

In order to protect the sensitive habitats and endangered flora species, followning actions are needed:

- Preentry survey in these sensitive zones prior to construction start up, in order to quantitavely assess the red data species presented within the zone and all trees to be felled.
- Exact demarcation of those trees that are subject for felling (to exclude cutting of other trees)
- Detailed taxation of the trees to be felled needed to comply with the procedure of Excluding the Project Land parcels from the Forestry Land Fund.

205. All these actions should be incorporated into the Construction Contract as part of the Environmental Management Plan.

206. The construction Contractor and RDMRDI, based on the preentry survey data, should apply all efforts to minimize the impacts on the red list species and accordingly refine the route. Inventory of each single specimen of the red data tree species remaining under the impact after the route refining should be conducted. The extraction of the red data tree species from the natural environment should be conducted according to the requirements of the Georgian Law on Red List and Red Book.

Tree felling should be conducted in accordance with the procedures requiring change of category of lands attributed to the Forestry Fund. In case of building an object or infrastructure with a special state designation, the plant species included on the Red List can be removed from the nature only if the Ministry of Environment makes a decision on the removal of the Red-listed plant species from the nature. The request for obtaining such a decision by the Ministry of Environment can be made by the ministry envisaged by the Law of Georgia "On the Structure, Authority and Rules of Operation of the Government of Georgia".
Trees can be cut down by observing the following rules under the law:

Law of Georgia "On special protection of green plantations and state forest fund within the boundaries of Tbilisi and its environs" regulates the procedure to protect the forest fund and forest fund grounds within the boundaries of Tbilisi and its environs and determines the rule to compensate the damage inflicted by damaging, destroy or digging out the green plantations within the boundaries of Tbilisi and its environs.

1. Privatization of the forest fund and forest fund grounds within the boundaries of Tbilisi and its environs or their use in any other manner, as well as changing a category of the green plantations is prohibited except in cases envisaged by the present law.
2. The use of the state forest fund within the boundaries of Tbilisi and its environs is admissible only for allocation purposes as well as when conferring the state forest fund the category of a special designation, and the deduction of the areas out of the state forest fund within the boundaries of Tbilisi and its environs is admissible under the rule established by the legislation of Georgia.
3. Conferring the category of a special designation to the state forest fund within the boundaries of Tbilisi and its environs and its allotting for special forest exploitation purposes is admissible only for the purposes envisaged by the legislation of Georgia (except ore mining), with the relevant decision made by LEPL Agency of the Natural Resources, which is a part of the Ministry of Power Engineering and Natural Resources of Georgia.

207. The prohibited activities with the state forest fund and state forest fund grounds within the boundaries of Tbilisi and its environs are as follows:

a) Construction, except for the allocation purposes or construction in the specially designated areas;
b) Tree cutting to gain the material timber, except dry, withering and rotten trees;
c) Plantation business;
d) Issuing an exploitation permit for hunting industry.

1. Within the administration boundaries of Tbilisi (except the protected areas), a recreational zone with a special regulation can be established by the decree of the President of Georgia.
2. The decree envisaged by the first clause of this article is issued by the President of Georgia based on the application by Tbilisi Mayor, which is agreed with the Ministry of Environment of Georgia.
3. Within the administration boundaries of Tbilisi (except the protected areas), an area can be given a status of a special recreational zone with a special regulation only to realize the projects, whose main aim it is to protect the green areas and/or planting the areas.

The standards to use the areas with the status of a special recreational zone with a special regulation, the necessary requirements for improving and building the given areas, the plant species to be grown on the areas as well as the boundaries and area of the areas are determined by the decree of the President of Georgia.

8.1.1.9 Protection of Fauna

208. The listed protected animals in Georgia which shall not be hunted, killed or captured (including CITES species). In addition, the IUCN Red List for Georgia contains lists of species of

a number of categories of rare and threatened species nationally and globally. These resources should be protected for maintaining effective biodiversity in the region.

8.1.1.10 Protection of the cultural heritage

209. Despite the fact that the project footprint is mostly limited to the existing road and 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 (although unlikely). To avoid this risk, 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 ("Chance Finds Procedure") 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.

Chance Finds Procedure:

Construction Contractor engages 1 especially dedicated archaeologist (archaeological supervisor) for conducting daily supervision activities during the earthwork operations. Good practice is to agree the candidature of person assigned for that task with the Ministry of Culture and Monument Protection.

The Ministry of Culture and Monument Protection may also assign a person or company for periodical supervision of construction works, although this is practiced only in exclusive cases of sensitive projects.

Archaeological supervisor conducts daily monitoring at all construction sites, where the earthworks (land clearance; grading; excavations etc.) are planned according to the schedule. Besides that, archaeological supervisor instructs the workers to report him immediately in case of any chance finding of potential archaeological relics.

In case of finding any artefacts of potential archaeological value, following steps are taken:

1. Construction workers are obliged to stop works and immediately report to the Archaeological Supervisor.

2. Archaeological supervisor reports to the Chief Engineer at site and requests to stop activites at the site of finding. Archaeological supervisor executes first checking of the finding and the site where finding was made

3. In case the finding has no potential archaeological value, the Archaeological Supervisor reports to the Chief Engineer and the works are restarted. Appropriate record regarding the case is made in record book.

4. In case if the finding is estimated as potential archaeological relic, the Archaeological Supervisor reports to Chief Engineer of the Construction Contractor and to MDF Environmental Specialist (and supervising company / Engineer) requesting to stop construction activities and to inform the Ministry of Culture and Monument Protection about the incident.

5. Chief Engineer of the Construction Contractor also reports to MDF informing about the stopped oerations and requesting immediate engagement of the Ministry of Culture and Monument Protection.

6. Ministry of Culture and Monument Protection will assign expert or group of experts and conduct necessary arcaeological works at the site to identify the problem.

7. In simpler cases, after removal of the movable artifacts, fixing materials and conducting other required works, the experts of the Ministry of Culture and Monument Protection will issue decision on recommencement of stopped construction works.

8. In exclusive cases of valuable and spatially spread findings, the Ministry of Culture and Monument Protection may issue request to relocate the RoW shifting it on a safe distance from the archaeological site.

8.1.1.11 Protection of the Infrastructural Elements

210. During the mobilization and preconstruction stage required activities are planned to remove the existing transmission lines, water supply pipelines and communication cables to the safe sites. All of these infrastructural systems should be uninterruptedly functional during and after completion of construction activities. Permanent monitoring is required to avoid damage of the infrastructure systems, which are not removed. All the damaged systems should be reinstated. The complete list of the utilities and infrastructure to be relocated or affected specificly is provided in table 9.1 paragraph 2.7.

Relocation, replacement and rerouting of all utilities located on the Project:

- The contractor is responsible for working closely with any utility company having their infrastructure located within the public right-of-way.
- Before any construction is begun the Contractor shall notify the utility companies of the proposed work area and request that they mark the location of any types of equipment in the area.
- The Contractor shall establish the position of existing services such as pipelines, sewers, surface water drains, cables for electricity and telephones, overhead lines and water mains, before starting any excavation or other work likely to damage them.
- The Contractor shall be responsible for arranging in liaison with the appropriate Authority, the moving of or alterations to services such as pipelines, power and telephone lines, water mains, sewers and surface water drains which are affected by the Works. The arrangements for such moving or alteration shall be subject to the agreement of the Engineer and the appropriate Authority.
- The Contractor is responsible for any and all damage caused to any utility during construction and shall repair them with his equipment or, if the utility company desires, they shall be allowed a free use of his equipment and personnel as required in order to complete repair works.

- Should the utility company chose to repair the damaged utility themselves costs incurred shall be the responsibility of the Contractor.
- If any utility equipment is encountered in the proposed work area the Contractor shall submit to the Engineer for approval his proposal to relocate the utility outside the construction limits in writing. This proposal shall include, but not be limited to the proposed duration of the works, plans and details of a new utility route, materials to be used, together with any required certification that the material meets the utility company's specification and details of protection methods to be used for any utility materials to be left in place. After the utility has been rerouted the interested utility company shall be notified to inspect the work prior to commencing the backfill operation.

8.1.1.12 Health and Safety

211. It is required to observe safety measures, industrial sanitation and fire precaution measures and instructions whilst performing the works, as well as to train the staff. The Contractor is required to instruct the staff on safety measures prior to the commencement of works.

Road vehicles shall have small turning radius, equipped with sound signals and light signals which should be in good operating conditions. Parking place shall be fenced with barriers and equipped with red signals of emergency stop during the day and with red signal floodlight at night.

Roadmen shall be provided with special uniforms and special footwear. It is required to observe overall safety measures such as fencing of work site, various safety activities. The Contractor should ensure special shelter for protecting workers from unfavorable weather conditions.

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

The Contractor is responsible to perform the works in accordance with labor protection and safety requirements as well as industrial sanitation requirements.

8.1.1.13 Traffic Management Plan

TRAFFIC MANAGEMENT DURING CONSTRUCTION

66. Road construction will not disrupt normal traffic operations and travelling through a construction zone for the main road. The contractor has to prepare detail traffic management plan mainly for construction of the interchanges where the local traffic is concerned.

67. The frequency of crashes in work zones is disproportionately higher than at other locations. Therefore the primary consideration in work zone traffic control is safety. If driver can easily understand the traffic control and have adequate time to make decisions, they will operate their vehicle in a safe manner.

68. Maintaining the full carrying capacity is usually not possible during construction periods. As construction progresses, travel lanes are either narrowed, closed or rerouted.
Due to the excessive traffic volumes on the project road sections at the design interchanges, lane closures might not be considered to maintain traffic completely out of the construction area. Lane closures on 2-lane road will generally require shifting traffic to the shoulder or provide traffic for both lanes on a 1-lane roadway.

69. For the higher trafficked road sections shifting traffic to the shoulder should be considered, whereas for the other project road sections the use of alternating traffic on 1-lane roadways may be acceptable.

70. Traffic shifting is one of the least disruptive work zone strategies since the same number of lanes are retained and narrow lanes, while reducing speed, have minimal effect on capacity. Utilization of the shoulder as temporary traffic lane in order to maintain the same number of lanes requires that the shoulder pavement is able to adequately support anticipated traffic loads. Re-gravelling and sealing of the existing shoulder is required to sustain the traffic load during construction and permit the safe movement of traffic at a reasonable speed. Adequate signing must be provided to guide drivers to the temporary shoulder lane.

The typical layout of traffic shifting to the shoulder is presented in the figure below.

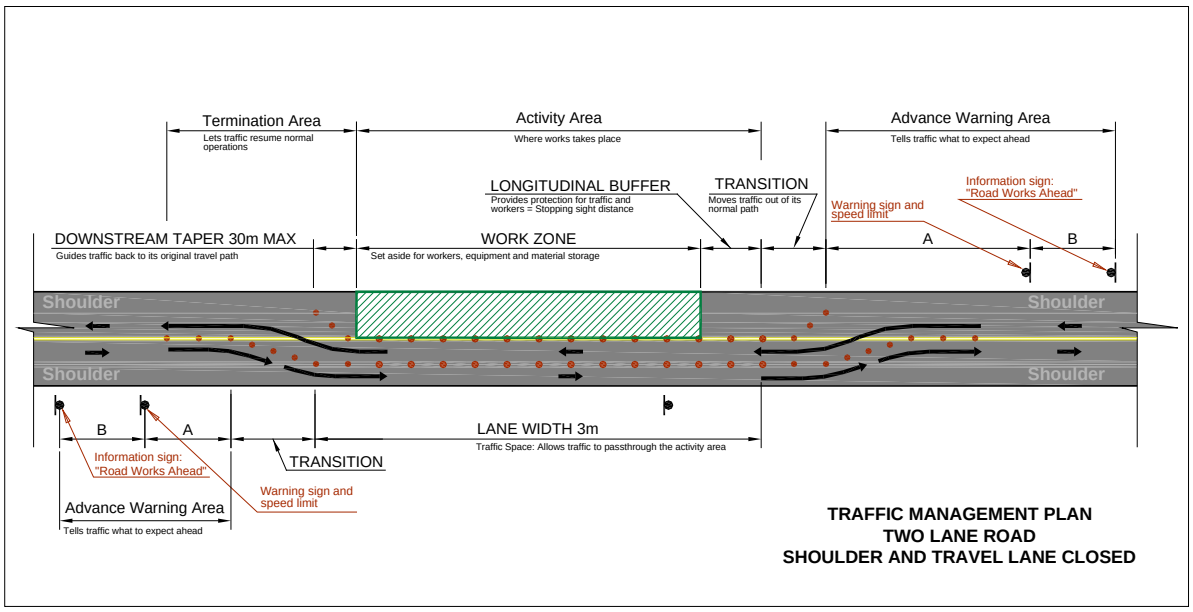


Fig. 2.11 Traffic Management During Construction

71. During construction access to driveways could temporary blocked by the construction zone, thereby affecting access and parking for the adjacent business and residences. Alternative access should be provided where feasible, with guide signs to inform the public.
The Contractor shall give written notification to all landowners, tenants, business operators, and residents along the right-of-way of the construction schedule, and shall explain the exact location and duration of each construction activity. Potential obstruction to their access shall be identified and alternative access provisions shall be made, if feasible.

Public information

72. Accurate and timely reporting of project information is a valuable element in the overall strategy for managing a work zone. The use of resources such as newspapers, radio, and television, can greatly improve the public's perception and acceptance of necessary delays and inconveniences. Key benefits of a public information program associated with construction activities are:

- Advance notice might encourage users to seek an alternative route around the project
- Advanced notice might encourage users to travel at off-peak times, or when construction sites are dormant
- Motorist acceptance might reduce speeding and other aggressive driving behavior in work zones

The proposed traffic management scheme solves the traffic disruption problems within each of the subproject (section 1 and section 3). However, the simultaneous execution of civil works on Tbilis-Phonichala and Phonichala-Rustavi subsections may create additional traffic problems. To minimize these risks we propose to split construction schedules in a way that intensive works on critical sites are carried out at one section at the same time.

8.1.1.14 Complex of Ancillary Facilities (Asphalt Plant, Camp, Vehicle Fleet)

212. In order to efficiently organize the works, it is necessary to build the auxiliary buildings and premises to be designed and built by the contractor. The current project design does not include these facilities. Design and location of these facilities is within the competence of the Construction Contractor. Accordingly, the present IEE is not covering project-specific mitigation measures in that respect, but provides only generic recommendations on legal procedures and mitigation measures, as well as standards applicable for the project.
The site proposed for camp location is only recommended for the Construction Contractor. This site is located at a distance more than 1km from the r. Mtkvari and from residential area in Rustavi. No residential houses, agricultural lands or business facilities are located and no forests, wetlands or any ecologically sensitive sites. At the same time it is adjacent to the project road and thus no access roads are required. In that way noise, emission, dust and other impacts, on residential areas, as well as contamination of surface water bodies and ecologically sensitive sites is excluded.

The decision regarding the asphalt plant will be taken by the Construction Contractor. He may chose to use existing suppliers of the asphalt materials operating in the region. In this case the requirement to be met is that only licensed suppliers having all required permits are used. The other option is that Contractor decides to install his own mobile asphalt plant. In this later case, the Construction Contractor is obliged to prepare appropriate EIA and obtain Environmental Impact Permit on asphalt plant operations.

In line with the legislation of Georgia, the other facilities (construction camps. vehicle fleet etc.) are not subject to the environmental permit. However, the Construction Contractor has to comply with certain standards and regulations. Designing and the selection of territory must be undertaken under the following normative documents effective in Georgia:

- Resolution No. 57 of the Government of Georgia of March 24, 2009 “About the rule of issuance of a building permit and terms of permit”.
- Decree No. 1-1/1254 of the Minister of Economic Development of Georgia of July 8, 2009 “Relating the approval of the principal provisions to regulate the use and accommodation of the territories with settlements”.
- Decree No. 1-1/251 of February 18, 2010 of the Minister of Economics and Sustainable Development of Georgia “On the use of the norms, rules and other of documents of technical regulation in the field of technical supervision and construction on the territory of Georgia effective before 1992”.
- SNiP2.07.01.–89 Urban planning
- SNiP2.08.02.–89 Public buildings and premises
- SNiP2.09.03.–85 Premises of the industrial enterprises
- SNiP2.09.04.–87 Administrative and domestic buildings.
- Decree No. 745 of the Minister of Environment Protection and Natural Resources of Georgia of November 13, 2008 “On the technical environmental regulation”

The complex of auxiliary buildings includes a living camp, fleet and concrete plant.

The Worker’s Camp

213. The camp has an office, living, domestic and catering units.
When building the living camp, drinking and domestic water-supply should be considered. A pipe or pit well can be made on the selected territory and the camp can be supplied with fresh underground water. In line with the effective legislation, an underground water intake license is necessary for this purpose. A reserve reservoir will be arranged on the territory supplying the camp units with water by gravity.

214. The waste waters will be collected in the sewage system on the camp territory and discharged via a common collector from the camp area.

The waste waters will be polluted with organic substances and therefore will need biological treatment. A technically relatively simple premise, a septic is to be provided to treat the waste waters. A septic is a premise, where the mechanical and biological treatment of waste waters and sludge mineralization take place at the same time. After the septic, the waste water will be disinfected and discharged into the surface water facility or environment (dry gorges etc.). The proposed site for camps is located far from the r. Mtkvari and discharge could be arranged in dry gorge. However, the Construction Consultant will agree discharge mode with MoE and develop, if requested by Moe, the normative document "Admissible Maximum Discharges into the Surface Water Bodies".

A waste container for domestic waste will be placed on the camp territory. The waste will be removed from the camp site under the agreement concluded with local services.
The requirements of the following normative documents must be considered when arranging the unit:

- Georgian Law "On water";
- Georgian Law "On ore deposits"
- Georgian Law "On permits and licensing"
- Decree No. 745 of the Minister of Environment Protection and Natural Resources of Georgia of November 13, 2008 "On the technical environmental regulation"
- Construction Regulation Standards Building Code (MTS 07.01-09) - "Water supply and sewerage outer networks and premises"
- Construction Regulation Standards Building Code 2.1.4. 000 – 00 "Drinking water and water-supply of settled areas"
- Construction Regulation Standards Building Code 2.04.01–85 "Internal water pipeline and sewerage norms"
- Construction Regulation Standards Building Code 3.0.01–85 "Internal sanitary-technical systems"
- Construction Norm 496–77 "Temporal instruction to design the surface waste water treatment plants".

Vehicle Fleet Depot

215. The fleet includes a car park and repair boxes for construction techniques.
The tanks to collect the broken-down car parts will be placed on the territory of the repair boxes, in particular the metal boxes for oily parts, reservoirs for amortized tires and other polyethylene or rubber parts; the given remains will be removed from the territory under the agreement with local services. Plastic reservoirs will be placed for used oils and other oil product residues, and the contractor will be made responsible for their removal from the territory and rendering them harmless. In order to avoid the expected risk of pollution of the soil or water reservoirs with oil products, the territory of the fleet will be flattened and a storm water collection system will be provided.

216. There is a risk of the storm waters pollution with suspended materials and oil products and therefore, the oil products retaining unit for the collected storm waters will be provided.
The amount of storm waters is calculated by the following formula:

$$Q=10 \times F \times H \times K$$

where Q is the volume of storm water, m^3/day (m^3/year)
F is the area of the territory, ha
H is the amount of precipitations, mm and is taken from the existing literary sources
K is the coefficient, which depends on the type of the cover.
According to the volume of storm waters, the treatment plant calculations will be made.

When building the unit, the requirements of the following normative documents must be taken into account:

- Georgian Law "On water"

- Building Norm 496-77 “Temporal instruction to design the surface waste water treatment plants”
- SNiP 2.11.04.–85 – “Underground reservoirs for oil, oil products and liquid air”
- Decree No. 1-1/2935 of the Minister of Economic Development of Georgia of December 8, 2008 “On gas filling stations and approving the rules of safety of gas filling complexes”.
- Decree No. 745 of the Minister of Environment Protection and Natural Resources of Georgia of November 13, 2008 “On the technical environmental regulation”

Selection of territories

217. In order to ensure the efficient work organization, the sites for the camps are to be selected carefully.

The selection of the location and size of a camp is the contractor’s prerogative and responsibility, but the interaction between the construction staff and the environmental authorities and local population must be considered.

Figure- 8.6 Proposed Camp Site

Waste Management Plan for Construction Camp is given in Annex 6.

218. The brief summary is provided below.

The following categories of waste are expected during object exploitation:

- Household waste;
- Office waste (paper, cartridges, bulbs, etc.);
- Packaging (wood, paper, etc.);
- Oil contaminated clothes, filters, absorption pillows;
- Oil contaminated soil;
- Polymer waste;
- Medical waste.

219. The amount of household waste produced during plant functioning is connected with the staff number. According to the preliminary data, up to 200 people shall be employed. Following the accepted norm, 0.70 m^3 of household waste is produced per employee annually. Proceeding from the above, the amount of household waste per year will be: 0.70 X 200 = 140 m^3. The installation of closed containers is planned for household waste at the object. The removal of this waste and disposal at the grounds will be conducted on the basis of the contract with the municipal cleaning service.

Oil contaminated mass as well as other hazardous waste shall be temporarily allocated within the plant in accordance with environmental and hygienic requirements and proceeding from the collection passed to the organization with appropriate environmental impact permit for further processing/disposal/treatment.

Wooden packaging material shall be passed to the local population for further re-use.

The management of waste produced at the object (classification, inventory, segregation, collection, storage, passing and transportation) and monitoring shall be conducted in accordance with the principles, procedures and rules described in Annex 7.

8.1.1.15 Resume

220. Commitment of Construction Contractor to adhere the environmental management requirements described in the present IEE should be incorporated into the contract (e.g. the present IEE or only EMP could be attached as annex and essential part of the contract).

The Constructing Contractor is obliged to assign environmental specialist for managing environmental issues and produce Contractor's Implementation Plan (based on the present EMP) with further description of details (schedule, involved personnel, required resources etc.).

The offset tree planting project (if required and as requested by MoE) should be elaborated by constructing contractor and relevant costs should be reflected in the overall construction budget. Offset tree planting 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.

Only legally registered suppliers having all required permits and licenses will be used.

221. This is relevant to the borrow pit operators, as well as to the other material 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 concrete mixing plants to produce concrete for their operations. In that case special EIA/IEE and obtaining of the Environmental Impact Permit is not required, however the contractor should be in compliance with the Technical Regulations.

8.1.2 Mitigation of Long-term and Operation Related Impacts

222. The mitigation measures to be implemented at operational stage are mentioned here. 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. RDMRDI 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. RDMRDI 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 RDMRDI 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. RDMRDI 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 and enforcement

Institutional Framework for EMP Implementation

223. Construction contractor is obligated to follow EMP and good construction practice. In order to meet this obligation, a contractor shall have at least one environmental specialist on the team, who is able to fully understand recommendations of EMP and professionally apply prescribed mitigation measures to the contractor’s daily operations.

Technical supervisor[13] of works commissioned by MDFis responsible to establish strong field presence in the Project area and keep a close eye on the course of works. Along with ensuring consistency with the design and ensuring quality of works, the supervisor is mandated to track implementation of EMP by the contractor, reveal any deviations from the prescribed actions, as well as identify any unexpected environmental issues should they emerge at any stage of works.

MDF provides a general oversight on the environmental compliance of works through ensuring quality performance of the technical supervisor and of the contractor. MDF also liaises with the Asian Development Bank, ensures availability of all environmental information, and facilitates environmental supervision of the Project by the ADB.

Reporting on EMP Implementation

224. Contractor, through the environmental specialist on the team, shall prepare monthly status reports on the EMP implementation. Such reports must carry information on the main types of activities carried out within the reporting period, status of any clearances/permits/licenses which are required for carrying out such activities, mitigation measures applied, and any environmental issues emerged in relations with suppliers, local authorities, affected communities, etc. Contractor's monthly status reports shall be submitted to the technical supervisor and MDF.

225. Technical supervisor prepares monthly reports on the status of EMP implementation and environmental performance of the contractor. These reports shall be based on the contractor's reports and carry analysis of their contents. Technical supervisor shall assess how accurate is the factual information provided in the contractor's reports, fill any gaps identified in them, and evaluate adequacy of mitigation measures applied by contractor. Technical supervisor must highlight any cases of incompliance with EMPs, inform on any acute issues brought up by contractor or revealed by supervisor himself, and propose corrective actions.

226. MDF must ensure that monthly reports from the contractor and from the technical supervisor are made available for the environmental specialists of the MDF promptly upon their arrival in MDF administration. The MDF, through its environmental specialists, shall report each semester (1 report per 6 months) to the ADB on the status of environmental compliance of construction works. Such reporting shall contain information on all violations identified and the actions taken for fixing of such cases. MDF shall inform the ADB on any major environmental issues at any time, independently from the schedule of regular reporting.

Remedies for EMP Violation

227. MDF, as a client of construction works, will be responsible for enforcing compliance of contractor with the terms of the contract, including adherence to the EMP. For minor infringements, an incident which causes temporary but reversible damage, the contractor will be given 48 hours to remedy the problem and to restore the environment. If restoration is done satisfactorily during this period, no further actions will be taken. If it is not done during this period, MDF will arrange for another contractor to do the restoration, and deduct the cost from the offending contractor's next payment. For major infringements, causing a long-term or irreversible damage, there will be a financial penalty up to 1% of the contract value in addition to the cost for restoration activities.

Institutional Capacity of MDF

[13] Technical supervisor is part of the consulting service for construction management to be hired by MDF (CMC)

228. MDF structure includes an environmental specialist, who is responsible for the control over the review of the environmental documents and accomplishment of the environmental procedures. Besides, MDF has a monitoring group with the function of implementation monitoring. The present institutional capacity of MDF is to be further extended to ensure the environmental compliance within the limits of the Project. Despite the fact that the work engineering supervisor will be charged with the daily control over the performance quality, the MDF has to have proper staff to supervise the performance of the technical supervisor and make decisions to solve the problems brought up before MDF by the supervisor. For this purpose, it is necessary to organize the trainings for the MDF environmental specialist and monitoring group to master ADB safety procedures, and hire one more specialist to be responsible for the resettlement issues.

8.3 Costs of Implementation

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

Additional archaeological studies may be required for obtaining Construction Permit. Possible need for financing these studies should be considered and negotiated with the Ministry of Culture and Monument Protection..

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

In case if the red-data tree species are damaged, compensatory planting of the species should be facilitated with the proportion of 1:10, so 10 trees should be planted instead of 1 cut tree.

The permanent expenses during construction are associated with the need to hire environmental and H&S specialists (In CMC budget, under the overall supervision contract) . Related costs are approximately 60,000 Gel annually.

Trainings for MDF Enviromental Specialist – 7000 GEL.

8.4 Environmental Management Plan

Mitigation Measures to be Implemented During the Construction Phase

Impacts	Sites	Mitigation Measures/Costs	Timeframe	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. Activities: land clearance, topsoil stripping and excavations	Whole alignment of road to be widened	Pre-entry survey for preventing damage to fauna will be conducted prior to start up of land clearance (inspection of bat living sites; inspection of nests in RoW) Sticks will be installed in pits and trenches for escaping small mammals. Proper top-soil storage practice, as described below, will be applied and stored topsoil will be used for reinstatement and landscaping; Compensatory planting of the red data tree species (oak etc.) should be facilitated with the proportion of 1:10; Replanting of other trees as minimum with ratio 1:1	prior to start up of land clearance Excavation period From land clearance – till reinstatement Develop planting plan before construction start up. implement before completion	Constructing Contractor	MDF CMC Inspectorate 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 yard**s.	Camp site; Quarry sites; (e.g. mtkvari floodplain). Waste dumps, construction camps and equipment yards.	Pre-entry survey will be conducted for preventing damage to flora and fauna; In case of unavoidable impact on rare or protected species of flora, replanting program will be planned and executed; Sticks will be installed in pits and trenches for escaping small mammals Proper top-soil storage practice, as described below, will be applied and stored topsoil will be	prior to start up of land clearance Excavation period From land clearance – till reinstatement After completion of civil works	Constructing company.	MDF CMC Inspectorate of MoE

		used for reinstatement and landscaping; Landscaping plan will be developed and implemented;			
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.	Along the whole section of the road	Permanent and temporary anti-erosion measures will be implemented according to the Detailed Design (temporary drainage, biomatting or geo -textile cover, berms etc.) For mitigation of sedimentation impact following measures will be implemented: - 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 For mitigation of induced erosion following measures will be implemented: - Appropriate sized rain-storm-water channels will be constructed. - Drain outlets designed so as to avoid cascade effect. - Provision for cross drainage structures will be made. Water receiving surfaces to be lined with stones, concrete.	Construction period	Constructing Contractor	MDF CMC Inspectorate of MoE
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	Subsections close to the r. Mtkvari r. Mtkvari km 0.0-1.5	**Mitigation strategy**: prevention through implementing temporary 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	Construction period	Constructing Contractor	MDF CMC Inspectorate of MoE
Topsoil losses due to improper storage and handling	Whole alignment: the sections of road;	The Contractor shall - Strip the top soil to a depth of 15 cm and store in stock piles of height not exceeding 2m and with a slope of 1:2	Construction period: starting from topsoil stripping and ending with	Constructing Contractor	MDF CMC

Earthworks will impact the fertile top soils that are enriched with nutrients required for plant growth or agricultural development		- Spread the topsoil to maintain the physico-chemical and biological activity of the soil. The stored top soil will be utilized for covering all disturbed area and along the proposed plantation sites - 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;	reinstatement;		Inspectorate of MoE
Soil and surface water contamination by oil, lubricants, fuel and paint in the RoW, bridge sites and equipment yards caused by construction activities and operation of construction equipment; Materials used in construction have a potential to be a source of contamination. Improper storage and handling of fuels, lubricants, chemicals and hazardous goods/materials on-site, and potential spills from these goods may harm the environment or health of construction workers.	Soil - the whole alignment; **Rivers – Mtkvari** **Km 0 - 1** ,	The Contractor shall - Prepare spill control procedures and submit the plan for RD approval. - Train the relevant construction personnel in handling of fuels and spill control procedures. - Store dangerous goods in bunded areas on a top of a sealed plastic sheet minimum 100 m away from watercourses. Do not store any hazardous waste in the in the restricted areas, which include • within 100m from the banks of r Mtkvari or other streams • within 500m from any residential areas, cultural or archaeological sites • - 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	Construction period	Constructing Contractor	MDF CMC Inspectorate of MoE

		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.			
Construction waste generation alongside the RoW : - excess soil and rock, demolished structures, packaging materials etc.) - Concrete and metal constructions	Construction sites	Agree with Jagluja landfill management and municipalities and transport the spoil (excessive rock and soil) to the landfill and use it to as cover material for closing the landfill. This is proposed actin. In more general terms: Assess and, if required, develop spoil and rock disposal plan Use spoil and excess rocks for construction of embankments and dike with riprap revetment. Provide for disposal facilities agreed with local municipalities; 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 municipal services. The main purpose is not to damage valuable landscapes or soil deposits and other ecological sensitivities. Demolished metal constructions should be disposed as a scrap. The personnel involved in the handling of hazardous and non-hazardous waste will	Mobilization stage Construction period Construction period Mobilization phase and Construction period	Constructing Contractor Constructing Contractor	MDF CMC Inspectorate of MoE

		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.			
Emission from Construction Vehicles & Equipments causing air pollution	the whole alignment	- Emission levels of all construction vehicles & equipment will conform to Georgian emission standards. - Any crushing & concrete plants will be away from populated areas. - Adherence to engine maintenance schedules and standards & repair - All vehicles and plants shall be maintained so that their 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 are minimized. - 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).	Construction period	Constructing Contractor	MDF CMC
Dust generation from construction sites, material stockpiles and access roads. Dust is a nuisance in the environment causing health impacts for workers and local	The whole alignment	- All precautions to be taken to reduce dust level emissions from batching plants & portable crushers with spraying of water and containment measures. - During dry conditions material delivery vehicles and haul vehicles carrying sand and fill material will be covered with	Construction period	Constructing Contractor	MDF CMC

population;		tarpaulin. The construction site and any local roads will be watered as appropriate. - Protective equipment to be provided to workers as necessary e.g. at quarries, stone crushers. - Use of defined haul routes and reductions in vehicle speed where required with appropriate traffic management planning - Sheeting of construction materials and storage piles; and			
Noise pollution from vehicle operation during construction in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas. Local noise.	The whole alignment	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. Prohibit night works near the settlements	Construction period	Constructing Contractor	MDF CMC
Infrastructure. The main infrastructure element that could be affected are: 1. power lines 2. Gas mainline and local supply pipelines 3. Optical fiber cable		**Protection of infrastructure.** Implement the individual relocation/reconstruction plan and design as agreed with the owners of infrastructure within the frames of Detailed Design. Replace the affected infrastructure elements • Relocation of overhead power lines within the right of way of the construction site: • Relocation of gas pipeline Permanent monitoring during construction. Full reinstatement in case of damage.	Preparatory works before the construction start up	Constructing Contractor	MDF CMC
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,	whole alignment	Remove all created pools till spring-time. Reinstate relief and landscape.	Construction period	Constructing Contractor	MDF CMC

quarries, etc. suited to mosquito breeding and other disease vectors.					
Health hazards by noise, air emissions and dust raised and blown by vehicles during construction activities.	near settlements	Dust control by application of watering. Use as minimum as 2 browsers; Noise control, installation of mufflers on equipment, daytime works; See points 11 - 13	Construction period	Constructing Contractor	MDF CMC
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.	Before start up of construction; Construction period	Archaeologist from MoCM Constructing Contractor	MDF CMC Archaeologist from MoCM
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.	Construction period	Constructing Contractor	MDF CMC
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	Construction period	Constructing Contractor	MDF CMC
Final Reinstatement and Long-term Anti-erosion Measures	Whole alignment	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 bush clearance is required for the highway upgrading, preservation of top-soil is sufficient for reinstating the natural grass vegetation cover as well		Constructing Contractor	MDF CMC
Tree cutting and Offset tree planting program.	Sensitive zones	Offset tree planting program should be agreed with the MoE and Tbilisi Municipality. We propose to apply tree planting ratio 1:10 for felled red data tree species and ratio 1:2 for other (non-red data) tree species.	Develop before construction start up. Implement before completion	Constructing Contractor	MDF CMC

		Apply procedures for extracting Red List Species From Natural Environment and procedures for exclusion of the land plots from the Forestry Fund, where appropriate			
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.	The whole alignment	- 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.		Constructing Contractor	MDF CMC
Quarrying Sites Taking of Borrow and Quarry Materials for construction of embankments for road, bridge approaches with potential for loss and degradation of land; Potential impact of the increased quarrying activities on ichthyofauna, groundwater and landscape	presumably, r.Mtkvari floodplain	IEE proposes to use licensed querries located in the vicinity to the project road (see chapter 2) In more general terms: Quarry and borrow pit materials will be obtained from existing operating sites with proper licenses & environmental clearances. Control of validity of licenses. (The license is given with description of exploration limits and reinstatement commitments). In case of need for opening new borrow areas, all required licenses will be obtained from the Ministry of Energy and Natural Resources; Measures will be taken to conserve top soil. At	Construction period	Constructing Contractor	MDF CMC Inspectorate of MoE

Operation Phase

		close of use the area to be reclaimed according to licensing conditions. Control of vehicle operations at quarry sites. Avoid traverse of watercourse. Exclude leakage of oil or fuel. Check the condition of vehicles.			
Concrete plants.	Plant site	Contract only licensed supplier having all required environmental permits. In case if the Constructing Contractor takes decision to install and operate its own plant, specific EIA/IEE should be prepared and Environmental Impact Permit obtained	Construction period	Constructing Contractor	MDF CMC
Construction Camp, equipment yard and Vehicle Fleet Site The potential impacts related to the construction and operation of the camp could be summarized as follows: - Clearance of vegetation cover during camp construction - Potential damage of topsoil - Contamination related to fuel storage and fuelling operations - Sewerage related contamination - Waste related contamination	camp site	- Proper waste management (see annex 6 Waste Management Procedures for Camps) - Apply regulations relevant to the camp sites and referred in p. 8.1.1.13 - Arrange accommodation of personnel in villages. In case if large camp will be constructed for the workers accommodation, organize sewerage according standards. - Pollution prevention measures: proper organization of fueling, waste management; - Proper storage of topsoil - Reinstatement of topsoil and vegetation cover;	Construction period	Constructing Contractor	MDF CMC Inspectorate of MoE

Impacts	Sites	Mitigation Measures	Timeframe	Responsibility for Implementation	Responsibility for Monitoring and Enforcement
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	Construction stage; Maintenance after completion of construction	Constructing contractor RDMRDI in long-term perspective	RDMRDI Inspectorate of MoE
Landscape disfiguration by embankments and deep cuts, fills and quarries. Marred landscape (scars from rod cuts, induced landslides and slumps etc.).	New cut sites.	- Maintenance and and/or restoration of roadside vegetation - Use an architectural design to 'blend with the landscape. - Replant disfigured surfaces.	Construction stage; Maintenance after completion of construction	Constructing contractor RDMRDI in long-term perspective	RDMRDI Inspectorate of MoE

Increased suspended sediment in streams affected by erosion at 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 the river Mtkvari	**Mitigation strategy:** long-term – remediation; Reinstatement of relief and landscape; Long-term monitoring; Installation of long-term drainage systems and anti-erosion structures. Reinstatement of vegetation cover. Establishment of vegetative cover on erodible surfaces as soon as possible		Constructing contractor RDMRDI in long-term perspective	RDMRDI Inspectorate of MoE
Soil and water contamination by oil, grease, fuel and paint alongside the highway	whole alignment	Install oil traps at large bridges (Gubistskali, Cherekha, Ochopa); Facilitate installation of standard refueling stations and repair shops along the highway	after completion of construction	RDMRDI in long-term perspective	RDMRDI
Air pollution from mobile asphalt plants during maintenance works.	whole alignment	Install and operate air pollution control equipment.	During Maintenance Works	RDMRDI supervising works and Maintenance Contractor	RDMRDI
Air pollution from vehicle operation, in populated	whole alignment Most critical starting	- Monitoring of air quality and traffic related emissions (including inspection of vehicle emissions)		MoE Constructing contractor	MoE

areas traversed by the highway, notably metropolitan areas or densely settled rural areas. Local dust.	point near Gulua bridge and end point close to Phonichala;	- 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		RDMRDI in long-term perspective	
Noise pollution from vehicle operation, in populated areas traversed by the highway, notably metropolitan areas or densely settled rural areas.	whole alignment Most critical starting point near Gulua bridge and end point close to Phonichala;	- High solid walls – wooden or stone/brick - 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.		Maintenance contractor RDMRDI in long-term perspective	MoE
Roadside litter.	whole alignment	- Provide for disposal facilities. - Encourage anti-littering laws and regulations.		Local Government authorities and RDMRDI provide facilities and Regional services of MoE tracks compliance with standards	RDMRDI Inspectorate of MoE
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 checkpoints (not locally on the current project but in general, to control the whole highway	Operation period	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	RDMRDI
Health hazards by dust raised and	whole alignment	Impact is minimal on asphalt paved highway. Dust control by application of	Operation period	RDMRDI	RDMRDI

blown by vehicles.		water.			
Obstruction of access roads	Crossig of local roads	Proper Design of interchanges have mitigated this potential impact. See in RAP	Design stage	Constructing Contractor	RDMRDI

8.5 Environmental Monitoring Plan (Matrix)

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	Before an agreement for the supply of materials is formalized	Assure compliance with HSE requirements	N/a	MDF Supervising Agency (CMC)
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 and access road	Supervision	Unannounced inspections during work hours	Assure compliance with HSE requirements. Ensure safety, and minimize traffic disruption.	Minimal Included in supervision contracts	MDF CMC
Top-soil stripping stage. Final reinstatement.	Top-soil storage. Reinstatement. Erosion control. Landscape destruction; Visual impacts;	Construction site	Supervision	Periodic (Unannounced inspections during work hours); From top-soil stripping – to completion of the works.	Assure compliance with, construction standards, environmental norms and EMP provisions;	Minimal Included in supervision contracts	MDF CMC
Construction work	Noise levels; Equipment;	Construction site	Inspection; compliance monitoring (engine maintenance, usage of mufflers, night time work limitations and other provisions of EMP.) noise measuring device	Periodic (average once per month); Only in case of complaints	Assure compliance with HSE requirements. Good condition of standard construction machinery and limiting the works near settlements to the site-related works is the only way for efficient noise control	Minimal Included in supervision contracts	MDF CMC MoE

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**
Construction work	Vibration	Construction site	Supervision	Unannounced inspections; following complaints	Assure compliance with HSE requirements.	Minimal Included in supervision contracts	Constructing Contractor CMC
Construction work	Dust and Air pollution (solid particles, suspended solids, flying heavy metal particles)	At or near construction site	Visually	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 RDMRDI CMC
Whole construction period.	Traffic safety/ Vehicle/ pedestrian access Visibility/ appropriate signs	Construction site	Observation	Once per week in the evening	Assure compliance	Minimal Included in supervision contracts	Constructing Contractor; MDF CMC
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	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; MDF; CMC
Whole construction period.	Waste Management	All construction sites; Camps;	Observation	Once per week	Assure pollution abatement; Assure compliance with, construction standards, environmental norms and EMP provisions	Minimal Included in supervision contracts	Constructing Contractor; MDF CMC
Whole	Equipment maintenance and	Refueling and	Observation	During material	Assure pollution	Minimal	Constructing

construction period.	fuelling Water and soil quality (suspended solids, oils, fuel, etc)	equipment maintenance facilities; Run off from site; material storage areas		delivery and periodically during construction (average 1/week), especially during precipitation (rain/ snow/ etc).	abatement	Included in supervision contracts	Contractor; MDF CMC
Whole construction period.	Impacts on archaeological sites and remnants	All earthwork sites	Observation	Permanent/daily	Assure cultural heritage protection	Minimal	CAS represent. Constructing Contractor; CMC
Whole construction period.	biological recontamination during earthworks near pest-holes of soil infections (e.g. anthrax);	All earthwork sites	Observation	Permanent/daily	Assure health protection	Minimal Included in supervision contracts	Construction Field officer; MDF CMC Veterinary Department of the NSFSVPP
Whole construction period.	Protection of infrastructure elements	Crossings of power lines, pipelines;	Observation	During construction activities at the sites of concern	Assure infrastructure protection	Minimal Included in supervision contracts	Constructing Contractor MDF CMC
During Construction period	offset tree planting Program	Sites adjacent to the SZ 1 and 3	Observation	During Construction period	Assure offset of damage to flora and landscape	Minimal Included in supervision contracts	Constructing Contractor; MDF CMC MoE
During Construction period	Reinstatement of work sites	work sites, road alignment, used quarries, camp sites	Observation	During Construction period, after completion of works at concrete site	Reinstatement of work sites not taken by RoW		Constructing Contractor; MDF CMC

During Construction period	Disposal of construction wastes	work sites, road alignment, used quarries, camp sites	Observation	During Construction period, after completion of works at concrete site	Ensure pollution prevention and landscape protection;		Constructing Contractor; MDF CMC
Whole construction period.	Personal Protective equipment. HSE issues Organization of traffic by-pass	Construction site	Inspection	Unannounced inspections during works	Assure compliance with HSE requirements	Minimal Included in supervision contracts	Constructing Contractor; MDF CMC

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	Quarterly	Assure erosion protection, reinstatement and mitigation of visual impacts;	N/a	RDMRDI personal responsible for engineering and environmental monitoring ;
Whole operation period	Increased suspended sediment in streams affected by erosion	Near rivers;	Observation	Quarterly	Assure water protection;	Minimal	RDMRDI 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	Monthly	Waste management and pollution abatement;	Minimal	RDMRDI 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		Quarterly/Annually	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	Emergency preparedness; Rescue and salvage operations; Pollution abatement;	Minimal	MoE; MoI RDMRDI

9. PUBLIC CONSULTATION PROCESS

9.1 REQUIREMENTS FOR PUBLIC DISCLOSURE AND CONSULTATIONS

A. Legislation and regulations of Georgia

230. In April 2000 Georgia ratified Aarhus convention. This UNECE convention grants public rights regarding access to information, public participation and access to justice, in governmental decision-making processes on matters concerning the local, national and transboundary environment. It focuses on interactions between the public and public authorities.

231. The law of Georgia on Environmental Impact Permits (2008) states the procedures for consultation in the EIA/IEE process and defines timeline for public review and consulting, namely:

1. The project executor will conduct public review on the impact on environment before submission of the project to the governmental agency responsible for permission issuance (where activities require construction permission, public review must be conducted before beginning the second step of the permission procedures).
2. The project executor will publish the information on the planned activity after 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) the 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 one 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.
6. Public review will be conducted at the region administrative center, where the activity is planned.

232. According to the article 7 of the law, 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, as required. If the comments and proposals of stakeholders are not accepted the letter of explanation should be sent to the concerned persons. 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.

B ADB-requirement in relation with Public Consultations

233. **(1) Basic Principles -** ADB 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 ADB at an early stage and to ensure its accountability and transparency in the environmental review process, ADB makes available, important information on environmental reviews. This is done in ways appropriate to the nature of the project, and while the environmental review is in progress. ADB may also, when necessary, seek the opinions of concerned organizations and stakeholders.

In addition to the aforementioned principles, if requested by third parties, ADB will provide them with information regarding environmental and social considerations within its capacity to do so. ADB 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.

234. **(2) Timing of Disclosure and Content of Disclosed Information**
Prior to making decisions on funding and depending on the nature of the project, ADB discloses information in principle as indicated below. ADB endeavors to disclose information in a manner that allows enough time before decisions are made on funding i.e.

- Upon completion of the screening of a project, ADB 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, ADB publishes the status of major documents on environmental and social considerations by the borrowers and related parties, such as IEE or EIA reports, Executive Summary on the ADB website, and promptly makes available the EIA reports etc.

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

235. ADB 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 ADB and the borrower may be disclosed only with either the agreement of the borrowers and related parties or in accordance with legal requirements.

9.1.2 Status of Public Participation

236. The first draft IEE has been submitted to MDF who has in turn Disclosed the report according to the requirements of Law on Environmental Impact Permits (2008). MDF as the executor of the project has arranged the public participation as per the Georgian procedures defined above.

The Public Consultation Meeting has been conducted in MDF office on March 1, 2012 (50 days later after the disclosure of the draft document and announcement regarding the planned meeting).

Series of separate meetings with affected stakeholders have been conducted in relation with the Land Acquisition and Resettlement Plan. The minutes of all these meetings are provided in Annex 7.

Protocol of public review of the EIA Report of construction of Tbilisi-Ponichala and Ponichala-Rustavi sections of Tbilisi-Rustavi speedway

Tbilisi **March 1, 2012**

On March 1, 2012, the public review of the EIA Report of construction of Tbilisi-Ponichala and Ponichala-Rustavi sections of Tbilisi-Rustavi speedway took place at the office of Georgian Municipal Development Fund.
The meeting was attended by the:

Representatives of the Georgian Municipal Development Fund:

- Nikoloz Soselia, a specialist of the environmental protection analysis and resettlement department;
- David Baindurashvili, a specialist of the environmental protection analysis and resettlement department;

a representative of the environmental protection consultation fund “World Experience for Georgia”

- Irakli Kaviladze;

a representative of the Spatial Planning and Building Policy Department of the Ministry of Economics and Sustainable Development of Georgia:

- Amiran Katsadze;

as well as NGOs and consulting companies:

- Tamar Gugushvili - Aarhus Centre in Georgia;
- Irine Svanidze - Association “Green Alternative”
- Gia Gvilava - International Transparency Georgia
- Gia Aladashvili - ‘Information Centre of Social Reforms”
- Zurab Gvelesiani - International Transparency Georgia
- David Khidesheli - MAMISONI LTD.
- Valeri Gelashvili - ENGURI 2006 LTD.
- R. Sharashenidze - VBR LTD.
- Ilgar Abdulaev - AKKORD.

and citizens:

- Tamar Bakhurauli;
- Manon Bokuchava and
- Shakro Mirotadze.

The meeting was opened by the specialist of the environmental protection analysis and resettlement department Nikoloz Soselia, who informed the attendees of the aim of the meeting and presented Mr. Irakli Kaviladze, a representative of the environmental protection consultation fund “World Experience for Georgia” to the public, who informed the public about the EIA and relevant report within the limits of the Project. He noted that when drafting the EIA report, the background status of the physical and social environment of the design section of Tbilisi-Rustavi road was studied. In particular, they studied the atmospheric air quality (pollution with harmful substances, natural radiation background, noise propagation), surface water quality, biodiversity, cultural heritage, social aspects, etc.

By considering the works to be accomplished, the types of expected possible impact, degree of impact and needed mitigation measures were specified. The plans of environmental management and monitoring of the planned actions are drafted.
At last, the reporter communicated about the conclusions developed in the EIA process, in particular:

- The Project has a significant positive social-economic impact evidenced by the guaranteed increased traffic flows (local and transit) at the expense of the road with due carrying capacity;
- The general negative effect of the Project is associated with the impact on private lands and associated property and businesses, loss of property or income along the road for the physical and legal entities. Resettlement and compensations will be accomplished in line with the World Bank rules and Georgian legislation. This question will be discussed in the Resettlement Action Plan in detail, which will be published after the relevant document is drafted. During the document drafting, the consultations with the impacted people will be organized individually and in groups.
- The implementation of the Project is not related to any particular environmental impact and is mostly related to the common factors of construction works, like dust, emissions, noise, etc. what can be mitigated by observing the building rules and taking the measures under the management plan.
- The Project is accomplished on strongly transformed urban landscapes with no protected areas, habitats of ecological value or eco-systems in the impact area. Despite this, a certain amount of trees will be felled (mostly the along-road green space plants). The possibility of damage to individual trees of any red-listed or endangered species (e.g. chestnut trees, Plot's Elm, Aldar pine) is not excluded. After the corridor demarcation by the building contractor, the proper cadastre studies in the corridor, marking the trees to be felled, avoiding the protected species as to the extent possible and accomplishing the procedures envisaged by the Law of Removing the Red-Listed Species from the Natural Environment are necessary. A concrete plan of compensatory planting must be developed and agreed with Tbilisi and Rustavi Municipalities and Ministry of Environmental Protection.

After the presentation of the EIA report, the participants of the public review were given the possibility to express their own opinions and notes. A question about the reasons for the resettlement problem not considered under the EIA report and the population subject to resettlement not informed about the public review was put.
In this respect, I. Kaviladze explained to the author of the question that in connection to the resettlement issues a study is underway and a resettlement action plan is being developed, which will thoroughly cover all questions of resettlement. As soon as the said plan is ready, it will be subject to the public review in line with the requirements of the Asian Bank of Development.

The information about the questions and proposal during the public review is given in the annex.

Information about the questions and proposal during the public review of the EIA Report of construction of Tbilisi-Ponichala and Ponichala-Rustavi sections of Tbilisi-Rustavi speedway			
No.	**Authors of questions, notes and proposals**	**Question**	**Answer**
Notes and proposal during the public review			
1	T. Gugushvili (Aarhus Centre) and I. Svanidze (Green Alternative)	The EIA report was not acceptible for them	The EIA report was not acceptable for them, as it did not cover the resettlement issues. As they explained, EIA should cover the analysis of environmental, social and all expected impacts. The EIA is drafted in the format consistent with the legislation of Georgia (Provision of the Environmental Protection Agency of October 4, 2011) and ADB requirements for Category B projects (Initial Environmental Examination). The resettlement issues are discussed in chapter 5.3 of the document to the extent due for the documents of the given format. In particular, chapter 5.3 (pp. 84-89) considers the abstract of the main data known at the developing stage of EIA report, description of number of the affected legal and physical entities, kind of impact, type of business objects and brief description of the ADB resettlement principles. In addition, the explanation about a separate resettlement action plan being developed to be published and publicly reviewed was made. During the document drafting, the consultations with the impacted people will be organized individually and in groups. At present, the resettlement action plan is being completed and it will be published at the end of March of 2012, and its public review will be presumably held at the beginning of April. As for the EIA/IEE document, its final version shall include the accurate information delivered by the team drafting the resettlement plan as soon as at the current stage.
2	T. Gugushvili (Aarhus Centre) and I. Svanidze (Green Alternative)	Where the information about the public review was published?	Explanation: the information about the planned review was published in the newspaper “The 24 hour” and on Aarhus Centre and MDF web-sites.
3	I. Svanidze (Green Alternative)	The presented EIAs do not consider the alternatives of each section or expected environmental impact assessment, and there is no due calculation or validation.	The modern EIA principles mean considering the meaningful alternatives and not nominal execution of procedures. The EIA contains the explanation about the Project of Tbilisi-Rustavi being divided into 3 sub-sections. At present, an intense study of the alternatives of 2nd section of the road is underway, covering the complex analysis of the existing road corridor and other possible

			routes (including environmental and resettlement aspects). The analysis of alternative routes is paid much attention to in the feasibility study of the mentioned section and EIA. As for section 1 (Tbilisi-Ponichala) and section 3 (Ponichala-Rustavi), the Project envisages the modernization and extension of the existing road and not the construction of new sections, and different routes were not meaningful alternatives for the presented Project. The maps shown in the EIA, clearly show that Tbilisi-Ponichala sections follows a narrow corridor between the river Mtkvari (on its left) and steep mountain slope of Shavnavaba ridge (on its right), where there is no either need, or possibility of any alternative route, as in general, the impact on the environmental and social environment is within the norms or even less than along other sections of the speedway. There is no topographicall limitation for the section Ponichala-Rustavi, but any rerouting is associated with penetrating the settled areas thus increasing the impact of resettlement. This is so clearly seen on the maps that needs no special quantitative evaluation. As a rule, the extension of the existing road is a priori associated with less impact on the natural and social environment, and the alternatives are sought in the exceptional case when there are significant limitations (technical or social/environmental). Such an exception is the 2nd section of the road (Ponichala section), where the existing road is limited by densely populated areas from its both sides. Despite the above-mentioned and clarity of the issue, the revised IEE of Ponichala-Rustavi section includes expended chapter related to Analysis of Alternatives with additional graphic and quantitative information making the unpromising nature of the search for alternative routes even clearer.
4	I. Svanidze (Green Alternative)	The report says that people not having their plots legalized are not eligible for compensation. This is against the ADB requirements. The report also says that each family will receive 200 GEL for transportation. Which criteria were used to fix this amount?	The report does not contain any information implying that those not having their plots legalized are not eligible for compensation, but on the contrary, paragraph 5.3 clearly says that: • All affected people, notwithstanding their legal rights to property, will receive the different aid to reserve their pre-project means of subsistence and living standards. • Those using the land illegally, will not receive the compensation for the loss of land, but they will be compensated for the loss of any other property owned by them on the given land. They will also receive the alowances

			to maintain or improve their living standards. In addition, we would like to explain that in line with the ADB requirements, those occupying the land illegally (with no registered property right of the land or any other legal basis to recognize the land property right with its further registration), will not receive the compensation for land, but will receive the compensation for the loss of harvest, buildings and premises, trees or source of income. **The version of the Project presented for the public review (para. 5.3, p. 87. Compensation Legibility) says that:** 'The families subject to physical resettlement will receive monetary aid of 200 Gel per family for transportation (to hire vehicle to transport the family belongings) and monetary aid to restore their income source for 3 months, as the aid rendered to establish oneself at a new location). This amount is the subsistence minimum for 3 months amounting to 1.112 Gel per family." The said citation was taken from the "Land Acquisition and Resettlement Framework" (2008) agreed and approved with the ADB by MDF. After disclosure of the first draft of IEE in January 2012 and prior to the start up of preparation of the LARP, the mentioned frame documents were updated. The revised document formulates the said clause as follows: "The families subject to physical resettlement will receive additional aid to cover their cost of transportation (311 Gel) and 3 months' subsistence minimum (3x311 Gel) to help alleviate the transitional period." The final, corrected version of EIA will accordingly contain this clause. At the same time, we would like to once again underline that this clause talks about the additional aid only, while the compensation itself covers the compensation of the lost property (land, buildings and premises, trees) and one-year harvest of annual plants at the full replacement cost. At last, the cited fragment is taken from the part of paragraph 5.3 of IEE considering the eligibility principles approved for the Project and not about real impacts. The list of real impacts does not include the description of the physical resettlement of the affected families from their place of residence. No such case takes place

			under the Project. The final EIA variants are attached by the brochures during the consultations with the population as an annex, which gives a detailed description of resettlement principles agreed with the ADB.
5		A question about the waste was put: Where and how will the waste generated during the work be placed? The EIA states that the waste will be placed at the municipal landfills, while in the current situation it is impossible to meet this requirement, as the existing landfill is already overfilled. In addition, the place and manner of placement of the hazardous waste must be indicated.	The EIA says that there is a decision to close up Iagluji landfill and its conservation project will be developed. The conservation needs the covering of the closed landfill with inert fill material. The IEE recommends using the inert material generated during the construction of Tbilisi-Rustavi road for this purpose. This has two kinds of environmental benefits: on the one hand, the need for transporting the inert material from borrow pits to cover the landfill will be reduced and on the other hand, the problem of placement of the construction inert materials will be simply settled. As for the other waste, including domestic, hazardous, etc., according to EIA, such waste shall be placed by licensed companies under the agreement.
6		Was there any study undertaken to specify the need for this road? If yes, what is its effect?	Yes, the study was accomplished at the early stage of the project development and early stages of the project preparation.
7		Why this meeting is not attended by the representatives of the organization working on the resettlement issues?	The meeting is attended by the representatives authorized to give answers about the resettlement issues (Mr. D. Baindurashvili (MDF) and Mr. Avto Okromchedlishvili (independent auditor)). At the same time, we would like to underline that the consultations about the resettlement issues with the affected people takes place in another format (individually and in focus groups), while the review of the resettlement action plan documents will be organized at a separate meeting at the end of March/at the beginning of April.

10. GRIEVANCE REDRESS MECHANISM

237. During implementation of the Project, there might be several issues related to environmental hazards and disputes on entitlement processes will occur due to the Project activities. For example, intensive schedule of construction activities; inappropriate timing of construction vehicle flow; waste; noise and air pollution from construction activities; ecological disturbances; cultural conflicts between migrant workers, are some of the environmental issues that are likely to arise from the Project activities. A Grievance Redress mechanism will be set up for the Project to deal with both the environmental and social issues of the Project.

238. MDF has overall responsibility for project implementation and environmental compliance. The administrative bodies responsible for environmental protection are MoE and Tbilicy City and regional (Rustavi, Gardabani) municipal offices (gamgeoba). The affected population and stakeholders may send their grievances, related to the project-induced environmental impacts and nuisance to the Project Implementation Unit (PIU), represented by MDF, or directly to the administrative bodies responsible for environmental protection. CMC is used by MDF for verification of the cases described in received grievances and for routine communication with the affected local population. MDF will record all received grievances in a grievance book and supplement the initial information with the description of all corrective measures, further communication with the affected persons and final conclusion after completion of the grievance resolution cycle.

239. MoE, Rustavi Mayor/s Office and Gardabani Gamgeoba are obliged to respond to the grievances that have been received from population or other interested parties in accordance with the requirements of the Administrative Code of Georgia. MDF as the PIU will facilitate the response by implementing a project-specific GR procedure. During the public consultation process, MDF will inform stakeholders and the public that the MDF is responsible for environmental compliance and grievance redress. MDF will provide at the public consultation meetings and disclose on the MDF web-site the contact details of the persons responsible for grievance collection and response. Upon receiving a grievance (in written or oral communication) MDF will execute following actions:

(i) Send its representatives to check the claims and monitor the situation;

(ii) Involve MoE and local municipalities when and where appropriate;

(iii) Receive experts' conclusion (from MDF personnel, independent experts and/or MoE/City Hall experts);

(iv) Submit to the constructing company and operator an instruction regarding corrective measures;

(v) During 10 days after receiving the grievance, inform the affected person or persons about the expert's decision and applied corrective measures;

(vi) If the complainant is dissatisfied with the decision, they may present further information in support of their case. After considering the appeal and the supporting new information, the subsequent decision of the MDF/MoE and participating municipality is considered final.

At the conclusion of this process, if the affected stakeholder or person is not satisfied by the response of MDF or administrative bodies, the grievance may then be directed to the court.

In parallel the community is encouraged to submit their grievances directly to the ADB resident office in Tbilisi in order to enable ADB control the grievance resolution process from the early stages.
The affected persons are advised to provide their grievances in a format given below:

Complaints and Grievance Submission Form

Region#	
Title of the Project	
Name, Last name	
Contact Information **Please indicate the preferable means of communication (Mail, Telephone, E-mail)**	☐ **Mail: Please indicate the postal address:** _____ _____ _____ _____ ☐ **Telephone:** _____ ☐ **E-mail:**_____
The language desirable for the communication	☐ **Georgian** ☐ **English** ☐ **Russian**
Describe the grievance/claim:	What is the complaint about? What is the claim?

Date of Negotiation:	Resolution of Negotiation:

What is the basis of your claim?
Proposed Addresses for Submission of Grievance Forms
1. Ministry of Environment of Georgia 6 Gulua str. 0114 Tbilisi, Georgia Fax: 2727237/ Phone: 2727200 2. Municipal Development Fund of Georgia Address: 150 David Agmashenebeli ave. 0112 Tbilisi, Georgia (99532) 2437001; 2437002; 2437003; 2437004 Fax: (99532)2437077 E-mail: mdf@mdf.org.ge Contac person: Nino Patarashvili (environmental and social specialist); e-mail: npatarashvili@mdf.org.ge; Phone: 3. Asian Development Bank/ Resident Office in Georgia 39A Chavchavadze Ave. 0162 Tbilisi, Georgia Tel: +995 322 250619 to 21 Fax: +995 322 250622. Contact Person: Tea Papuashvili e-mail: tpapuashvili@adb.org Phone: 2250619

11. CONCLUSIONS AND RECOMMENDATIONS

240. The present IEE reveals that there will be minor negative and tangible positive impacts due to the construction activities and normal operations of the road section. Recommendations are made to mitigate expected negative environmental impacts. The IEE and included EMP cover all environmental aspects of the Project road. The resettlement aspects are addressed separately in LARP.

241. The major positive impact of the Project will be safe driving conditions for transit motor transport flows and local residents and higher carrying capacity of the road. After the further sections of the road are designed and constructed, the capital of Georgia will be linked to Azerbaijan and its capital Baku through the modern road meeting the international standards. This road will be used to comfortably transport the cargo and passengers to Tbilisi and Black Sea ports. The design road is also very much important for the social-economic development of the population of Kvemo Kartli region, particularly for the population and industries in the city of Rustavi and Gardabani region. Many of 120000 residents of Rustavi work or study in Tbilisi.

242. In short term perspective, the project will also have some benefit for local population, providing job opportunities (about 100 new jobs could be available for local residents). The negative impact related to the construction nuisance (dust, emissions, noise) is temporary, insignificant and manageable by application good construction practices.

243. The detailed Resettlement Action Plan is under the preparation. At this stage, it is summarized, that this project will affect as minimum 26 households. Its impact is related to permanent take of 36 private commercial land plots with total area of 33,481sq.m. None of the affected land plots is agricultural. No crops are cultivated on the affected commercial land plots. Acquisition of only 4 land plots is associated with losses of 57 trees. The main impact is related to the loss of land, structures and businesses. In total 20 structures will be destroyed, including 8 operational and non-operational gas filling stations, 2 Car Maintenance Workshops, 1 shop, 1 non-operational café, 1 liquefied gas plant, and 4 complexes of ancillary buildings. 9 legal entities will suffer in terms of business impacts (either temporary interruption or mostly permanent loss of business facilities). According to the ADB SPS 2009 this sub-project is thus classified as of category A and needs the preparation of a Land Acquisition and Resettlement Plan (LARP). The Land Acquisition and Resettlement Plan (LARP) will provide detailed census of affected households, inventory of loses, description of social status and identification of vulnerable groups. Compensation and rehabilitation plan will be elaborated upon completion of valuation of the lost assets. All the affected households will be provided with the adequate compensation according to the Georgian legislation and ADB SPS 2009 requirements. Vulnerable and severely affected households will be provided with the additional allowances.

Construction related potential impacts:

- 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.

244. These impacts should be mitigated by anti-erosion measures: temporary drainage systems, berms, sediment catchment basins etc

245. No sensitive ecological habitats are represented in the project area. However, 1000 amount of trees will be felled. Additional ecological studies are required prior to start up of the construction operations, immediately after the demarcation of the construction corridor.
246. The cadastral description of trees to be felled should be conducted within the

demarcated corridor, all efforts should be made to avoid any individual tree of red dat specie, the trees to be cut down should be marked. As minimum the same amount of trees should be planted under the landscaping and greenery plantation program.

247. The waste and hazardous material handling, dust and emission control, traffic management, health and safety procedures and other common construction related activities should be managed according to good international construction practices.

248. All the work sites (except permanently occupied by the road and supporting facilities) should be reinstated to its initial conditions (relief, topsoil, vegetation cover).

249. The contractor will prepare a spoil and waste disposal plan in consultation with MoE and local municipalities and submit to MDF for approval. Filling materials will be provided from licensed Quarries and borrow pits.

250. Compliance to the environmental management plan during various phases will minimize the negative impacts of the Project to acceptable levels. To ensure that these plans and mitigation measures are implemented and negative impacts avoided, the EMP will be included in the contract documents of the Project with a separate line item on environmental management in the bills-of-quantities.

251. Environmental Consultants of Construction Supervision Consultants are responsible for monitoring of implementation of EMP and ensure compliance. Environmental Division of MDF is also responsible for supervision of construction works and compliance to EMP in coordination with supervision consultants and hiring of external/independent monitoring consultants.

252. The Project will have overall beneficial impact as well as some minor negative impacts that will be carefully monitored and adequately mitigated. Therefore, the completion of this IEE fully meets the MoE and ADB requirements and submitted to MoE to obtain Environmental Impact Permit.