DCN: 2012-GEO-004

USAID
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Environmental Assessment Approval Sheet

Reference IEE: 2010-GEO-004
Country: GEORGIA
Project Name: Power and Gas Infrastructure Project
Type of document(s):

- ☐ Scoping Statement (SS) for Positive Determination (PD)
- ☐ Pollution Prevention Assessment (PPA)
- ☐ PERSUAP (Pesticide Evaluation Report and Safe Use Action Plan)
- ☒ Environmental Assessment (EA)
- ☐ Programmatic or Project Environmental Assessment (PEA)

Document Prepared by: Tetra Tech, Inc.
Document Preparation Date: January 2012
Location(s) Covered by this document: Georgia

Type of Structure/Services:
☒ High Voltage Electricity Transmission Line and two (2) electricity substations

Introduction:
This document records Mission clearance and Bureau Environmental Officer (BEO) approval of the attached Environmental Assessment for the High Voltage Electricity Transmission Line and two electricity substations of USAID/Caucasus's Power and Gas Infrastructure Project for Georgia (PGI).

Background:
USAID's environmental regulation (22 C.F.R part 216 or Reg. 216) establishes the conditions and procedures for environmental review of new projects, programs, or activities authorized by USAID. It includes a process for the review of environmental and social impacts to ensure that projects funded by USAID are environmentally sound, designed to operate in compliance with applicable regulatory requirements, and not likely to cause a significant environmental, health or safety hazard.

The Initial Environmental Examination (IEE) for PGI was approved by the Europe and Eurasia BEO on March 1, 2010 (DCN: 2010-GEO-0004). Pursuant to Reg. 216 and the IEE's Positive Determination for Transmission Line Construction, an Environmental Assessment (EA) is required for that assistance. An EA ensures that environmental consequences and their significance are known and clearly identified prior to the approval of the final design and start of construction [section 216.3 (a) (4)].

Action:
We request your approval of the attached Environmental Assessment for High Voltage Electricity Transmission Line and two electricity substations component.

Clearance:
Mission Director: _____ Date: 1/19/12
Stephen M. Haykin

Project COTR: _____ Date: 01/09/2012
Sukru Bogut

Mission Environmental Officer: _____ Date: 09 Jan 2012
Mariam Ubilava

Concurrence:
Bureau Environmental Officer: _____ Date: 10 Jan 2012
William Gibson

Approved: _____ Disapproved: _____

BEO conditionality of approval:mitigate erosion and undercutting of foundations by moving their location, whenever feasible, out of the path of the likely river meanders.

DCN: 2012-GEO-004

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ENVIRONMENTAL ASSESSMENT

Reconstruction of the Senaki I and II Transmission Lines and Rehabilitation of the Associated Bays at the Menji and Tskaltubo Substations

DCN: 2010-GEO-004

January 5, 2012

This publication was produced for review by the United States Agency for International Development. It was prepared by Tetra Tech.

ENVIRONMENTAL ASSESSMENT

Reconstruction of the Senaki I and II Transmission Lines and Rehabilitation of the Associated Bays at the Menji and Tskaltubo Substations

DCN: 2010-GEO-004

USAID Power and Gas Infrastructure Project (PGIP)
Contract Number EDH-I-00-08-00027-00, Task No. 1

January 5, 2012

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DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

ACKNOWLEDGEMENTS

We acknowledge and thank the following persons for their contribution to this report.

Name	Proposed Position	Qualifications	Years Experience

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ABBREVIATIONS AND ACRONYMS

The following abbreviations and acronyms are used in this document.

BEO	Bureau Environmental Officer
BOD	Biological oxygen demand
CFR	Code of Federal Regulations
C	Centigrade, Celsius
cm	centimeters
CP	Construction Permit
CR	Critical
DCN	Document Control Number
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EIP	Environmental Impact Permit
EMF	Electro Magnetic Field
EMMP	Environmental Management and Monitoring Plan
EN	Endangered
ESS	Environmental Scoping Statement
EU	European Union
FAO	Food and Agricultural Organization
FIZ	Free Industrial Zone
GIS	Geographic Information System
GoG	Government of Georgia
GRL	Georgia Red List
GSE	Georgian State Electrosystem
H	Hours
ha	Hectares
HGA	Host Government Agreement
ICES	International Committee on Electromagnetic Safety
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEE	Initial Environmental Examination
IUCN	International Union for the Conservation of Nature
IVMP	Integrated Vegetation Management Plan
kV	Kilo Volt
LC	Least Concern
mm	Millimeters
m	Meter
km	Kilometer
MoE	Ministry of Environment
MoENR	Ministry of Energy and Natural Resources
MoESD	Ministry of Economic and Social Development
NIEHS	National Institute of Environmental Health Sciences
PGIP	Power and Gas Infrastructure Project
PPE	Personal Protective Equipment

PR	Public relations
RAP	Resettlement Action Plan
ROW	Right of Way
STD	Sexually Transmitted Disease
TL	Transmission Line
US	United States
USAID	The United States Agency for International Development
USG	United States Government
VU	Vulnerable
WB	World Bank
WHO	World Health Organization
WMHP	Waste Management and Handling Plan

1 EXECUTIVE SUMMARY

1.1 Program Description

Although much progress has been made, Georgia's infrastructure has not fully recovered from the devastation caused by the ravages of civil war in 1993, lack of regular maintenance and scant investment in physical infrastructure. New vulnerabilities have surfaced after the 2008 conflict with Russia, especially with regard to energy production and transit. The task of stabilizing and rebuilding Georgia is immense and requires the support of the donor community, as notably highlighted in the post-conflict World Bank Joint Needs Assessment.

In recognition of the urgent need for reconstruction / rehabilitation of the Transmission Line Senaki1 and 2 in addition to two substations, in 2010, the Government of Georgia asked the United States Government, to provide financial support for the rehabilitation. Shortly thereafter, a host country agreement (HGA) was signed in February 2010 between the Government of Georgia and US Government, under which funds were allocated to finance the rehabilitation/construction works.

The activities under Georgia Power Gas Infrastructure Project (PGIP) will support USAID's objective of promoting energy security through greater access to electricity and natural gas supplies for households in west Georgia, promotion of the development of the Poti Free Industrial Zone (FIZ) on the Black Sea coast, and securing power exports through related infrastructure improvements.

The purpose of the PGIP (or 'Project') is to provide resident professional engineering and other technical services to support power and gas transmission improvements being undertaken by the United States Agency for International Development (USAID) on behalf of the Government of Georgia ('GOG').

Activities performed under the PGIP will complement and reinforce project management and the engineering expertise of USAID/Caucasus. USAID will be undertaking work from 2010 to 2013 in the energy sector in collaboration with the Georgia State Electrosystem (GSE) to upgrade, replace, and install critical selected power transmission infrastructure. This company is a state-owned entity that dispatches electricity throughout the country.

Under PGIP, Tetra Tech was hired by USAID for the purpose of providing project infrastructure oversight. Tetra Tech will provide resident professional engineering and technical contractor services in support of the gas and electricity infrastructure project. Tetra Tech will oversee all aspects of the design and construction of electricity transmission line.

Tetra Tech, on behalf of USAID, is responsible for the development of the USG Environmental Assessment (EA) and for managing the consultancy until the output is delivered to USAID. It is anticipated that USAID will then review the results of the design in conjunction with the environmental study, and if the conclusions are favorable, USAID will transfer this documentation to Georgian Government for rehabilitation/reconstruction of the Transmission Line (TL) and Tskaltubo and Menji Substations.

Figure 1. General Location of the Tskaltubo - Senaki Transmission Line System

The existing Senaki electricity transmission line was constructed in 1991 and was under operation; however, during the Civil War in 1991 – 1993 the transmission was completely raided and destroyed. Therefore in this area there is no transmission system in place and comprehensive reconstruction is needed in order to (i) bring the infrastructure back to an acceptable level of technical integrity, (ii) secure the safe and reliable supply of electricity to west Georgia and the Poti Free Industrial Zone (FIZ), and (iii) improve GSE's capacity to sustain and further develop the operational and financial performance of the system.

1.2 Project Context

The Tskaltubo – Senaki transmission line has a total of 58 kilometers of length and the Tskaltubo and Menji substations represent critical components of the Georgian electricity system which requires urgent rehabilitation. This is the only source of electricity transmission to the west Georgia city of Poti and to the FIZ.

Rehabilitation/reconstruction of the 58km Tskaltubo - Senaki transmission line section is important for:

- The population of west Georgia;
- Black Sea coastline resorts and recreational areas (e.g. Batumi, Kobuleti and the newly declared Zugdidi - Anaklia Free Touristic Zone);
- Poti FIZ, which requires a reliable source of power for development purposes; and
- To ensure the safe and reliable transmission of the electricity and to increase the energy security level of Georgia.

The project bears strategic importance and is aimed at raising the energy and political security of the country.

This document identifies environmental and social impacts during the construction and operation phases of the transmission line with corresponding mitigation and monitoring plans. The existing transmission line corridor and alternative corridor were assessed by the Baseline Team (Gergili, Basiani, POWER, and Tetra Tech) and the most feasible final routing of the transmission line was identified by the Baseline Team based.

1.3 Summary of 22 CFR 216 Requirements, Summary of IEE, Environmental Threshold Determination, Scoping Process

As a pre-condition for USAID support, USAID requires project participants to comply with USAID Environmental Procedures, 22 CFR 216 (http://www.usaid.gov/our_work/environment/compliance/reg216.pdf).

The Initial Environmental Examination (IEE) for the Gas Transmission Line Infrastructure Project was drafted and approved by the Europe and Eurasia Bureau Environmental Officer (BEO) on March 1, 2010, DCN: 2010-GEO-004. Pursuant to 22 CFR 216 and the regulations governing Positive Determinations, an EA was required to ensure that environmental consequences and their significances are known and clearly identified prior to the approval of final design and start of construction.

Scoping is a preliminary task within the EA process. The scoping statement provides a mechanism for consulting with affected populations and to agree to the content and methodology of the subsequent EA at an early stage in the process.

The definition of the scope is dependent upon the current state of knowledge regarding the design of the project and how it is proposed to be implemented. The EA is part of the design process and significant changes in the design will require EA amendments.

Consequently, the objectives of the scoping process undertaken for the transmission line and the substations were to:

- Determine the scope and significance of issues to be analyzed in the EA, including direct and indirect effects of the project on the environment;
- Involve relevant authorities, interested parties and other affected groups in the determination of the scope of the EA;
- Identify and eliminate from detailed study the issues that are not significant or have been covered by earlier environmental reviews or approved design considerations and to narrow the discussion of these issues to a brief presentation of why they will not have a significant effect on the environment;
- Describe: (a) the timing for the preparation of the environmental analyses, including phasing (if/where appropriate); (b) the variations/alternatives required in the format of the EA; (c) the tentative planning and decision-making schedule; and (d) a description of how the analysis will be conducted and the disciplines that will participate in the analysis (i.e. content of further study).

The Scoping Statement was prepared by Tetra Tech to determine the extent of and the approach to an EA, in accordance with 22 CFR 216.3 (a)(4) and was submitted to the USAID BEO for approval on May 30, 2011. It was approved by the BEO on July 22, 2011.

Pursuant to 22 CFR 216, the Positive Determination and the Scoping Statement approval, this EA has been prepared to ensure that environmental consequences and their significance are known and clearly identified prior to the approval of final design and start of construction.

The Georgian environmental legislation does not consider preparation of the Scoping Statement as a part of EIA (Environmental Impact Assessment) process, and thus do not contain specific requirements for the preparation of a scoping statement. However, this document reflects local legal requirements for the process of preparing the EIA. The detailed overview of Georgian environmental legislation is presented in this report.

1.4 Major Conclusions

There should be no or minimal environmental impact with the construction of this electricity transmission system provided that an environmental mitigation program is followed by the contractor. A sustained environmental impact that has been identified is the interaction between birds and the transmission lines; however there are already transmission lines throughout the Samegrelo – Svaneti Region. The short term temporary impact will be on habitats around river crossings and a restoration program is intended to reinstate these habitats.

1.5 Areas of Controversy (if any)

As of the date of this report no controversy has been identified.

1.6 Issues to Be Resolved

1.6.1 Clearances for Tree Cutting

The new transmission line is to be built along the right of way (ROW) of the previously existing transmission line. Trees within the existing ROW, which would have grown in the past twenty years, will be cut. Bushes and shrubs will be trimmed to nominal height.

Tree cutting during pre-construction or for construction that is not located in the ROW will need Ministry of Energy and Natural Resources (MoENR) review and approval. Specifically, tree cutting is required along the entire buffer zone of the line. For this purpose:

- If the tree is located within privately-owned land plots, cutting will be made in agreement with the owner with compensation;
- If the land where the tree is located is state-owned, a special procedure for the use of forest/cutting is applied and the relevant permit should be obtained from the Ministry of Energy and Natural Resources.

1.6.2 Land Registration and Compensation

By agreement, the Georgia State Electrosystem (GSE) is responsible for land registration and compensation for this project. Land registration and compensation issues will be resolved by GSE before the start of the construction activities.

The ROW for the previously existing transmission line was under the responsibility of the predecessor of GSE, but since 1988, when the lines were cannibalized, the ROW has been encroached upon by various users. With the new post-Soviet Georgian government, the land is being registered at the cadastral offices. The rights of both the land users and GSE are being protected.

There are approximately 226 parcels of land along the ROW. Seventy–six (76) of the parcels are already registered either under state or private ownership. The registered state-owned parcels include 33 state-owned land plots in the Forest Resource Register. GSE is working with the remaining one hundred and fifty (150) localizable private land owners for them to register the land in the name of the land user and become the land owner.

Work is underway to identify the types of land parcels (for example, garden crops / farming, fringe land / grazing, orchards, unused range land / bushes and shrubs, undeveloped forest, and park forests). Thus, this information is not yet available. GSE will update USAID and Tetra-Tech on the status of this work on a regular basis.

The practice is that the utility buys and owns the land round the tower foundations, but the utility only obtains by agreements servitude (easement) for the land in the ROW between the towers. GSE has already purchased the land around the tower foundations. Most of the agreements for the servitude (land in the ROW apart from the tower foundations) have been concluded with the land owners. Negotiations are underway with the remaining land owners for the ROW under the linesapart from the tower foundations).

According to the Civil Code of Georgia, no preliminary negotiations for compensation of damages are allowed. Thus, if any of the land owners incur any unforeseen damages during the construction activities, the compensation for such damages becomes subject to joint assessment, evaluation and negotiation. As usual, the obligation for the compensation of such damages is imposed on the construction contractor who shall be clearly specified under the construction contract.

For unregistered land plots, GSE will negotiate with the unregistered land users once the land is registered in the name of the land user and the user becomes the land owner.

The Georgian *Law on the Rule of Expropriation of Private Land for Public Necessity* of July 23, 1999 applies to compensation for infrastructure projects (e.g. electric transmission lines, oil and gas transmission lines, car and truck roads, railroads, etc.). There are no amendments to the law as of October 15, 2010. There are no known challenges to this law in the courts of Georgia. This law was used for the following recent projects:

1. Baku – Tbilisi – Ceyhan oil pipelines, finished 2007

2. Baku – Tbilisi – Ceyhan gas pipelines, finished 2007
3. The new 110 kV transmission line in the Region of Mestia, currently under construction and to be finished December 2011
4. New car and truck road from Tbilisi to Akhalkalaki, finished in 2010
5. A rehabilitated railroad from Tbilisi to Akhalkalaki and a new railroad line to the Turkish border, currently under construction and expected to be finished in 2012
6. GSE's new 500 kV transmission line from Zestaphoni to Akhalshikhe and onto Guardabani, currently under construction and to be completed in 2012
7. GSE's new 400 kV transmission line from Akhalshikhe to the Turkish border, currently under construction and to be completed in 2012
8. Rehabilitation of the North – South gas pipeline; finished in 2010.

Georgian law does not require public hearings for construction permits. However, during the environmental hearings of September 20, 2011, GSE addressed questions raised by the participants about land issues.

The key points of GSE's compensation methodology are summarized as follows.

a) Agreements between GSE and the registered land owner are finalized before construction begins.
b) The amounts of compensation are determined by duly authorized experts (auditors) or are based on the market prices of the land established by local government authorities in accordance with the Law of Georgia on the Rule of Expropriation of Private Land for Public Necessity. For illustration, we report representative prices for the Menji - Poti transmission line construction project of GEL 4 per square meter for servitude, GEL 8 per square meter for residential land, and GEL 4 per square meter for arable land.
c) Damages during construction are assessed after the fact by representatives from GSE, the land owner and the local municipality. The amount of damages incurred by the affected party during construction is assessed by an independent expert appointed by the Legal Entity of Public Law (LEPL), a division of the National Bureau of Judicial Expertise.
d) GSE helps land users that are not registered to become registered at the cadastral office; GSE contributes the registration fee for the land user.

USAID has requested copies of all agreements between GSE and the land owners; GSE has agreed to send said copies to USAID.

2 PURPOSE

2.1 Project Description

This project involves the rehabilitation/reconstruction of the Tskaltubo-Senaki 220 kV transmission line. The line connects the existing Menji and Tskaltubo Substations. The line was damaged in the early 1990s during the civil war in Georgia.

The Government of Georgia (GoG) is undertaking strategic interventions in the energy sector of Georgia aimed at enhancing the energy security of the country. The Tskaltubo-Senaki transmission lines and associated two substations require immediate reconstruction to secure the safe and reliable supply of electricity to west Georgia in order (i) to provide affordable energy to households and to reduce poverty; (ii) to facilitate industrial development in the urban areas of west Georgia; (iii) to support agricultural development and small enterprises; (iv) to strengthen Georgia's potential for the transiting of energy to the EU and world markets; and (v) to provide the Poti FIZ with permanent electricity supply.

The project bears strategic importance and is aimed at raising the energy and political security of the country.

(1) The upgraded electricity system will assist GSE in participating in new transmission infrastructure projects that will supply electricity to the FIZ. The upgraded system should be considered as a potential opportunity for diversification and for raising the energy security of Georgia.

(2) The Tskaltubo-Senaki line rehabilitation/construction other ongoing projects such as the Zestaphoni and Akhaltsikhe 500kV transmission line, the proposed transmission line from Enguri to Khorga, and the construction of Khorga substation. In combination with the current project, these initiatives will further ensure Georgia's energy security.

The rehabilitation and construction of the Tskaltubo-Senaki 58km transmission line and associated two substations will support Georgia by:

- Providing electricity to West Georgia;
- Assisting in the development of the Black Sea coastline resorts and recreational areas (e.g Batumi, Kobuleti and the newly-declared Zugdidi-Anaklia Free Touristic Zone);
- Supplying the Poti FIZ;
- Ensuring the safe and reliable supply of electricity and raising the energy security of Georgia; and by
- Ensuring the safe and reliable supply of electricity to the European Union.

2.2 Purpose and Need for the Proposed Action

The 58 km Tskhaltubo-Senaki transmission line and the Tskaltubo and Menji Substations were one of the major electricity transmission lines in west Georgia. Because the lines were stolenin the early

1990's the power transmission systemin west Georgia is less reliable than it used to be before the lines were stolen. In addition, for the economic development of the country more more electricity transmission is needed.

Inspections of the Tskaltubo-Senaki 220 kV transmission line and associated two substations have emphasized that there are only a handful of towers remaining; therefore, the complete transmission line needs to be rebuilt. The new transmission line is proposed to be constructed on the same central line where the original line was built. The towers must be rebuilt in the exact same location for right of way (ROW) purposes. Nearly all of the original towers are gone, but there are foundations in place which assists in the determination of the ROW. The bays in the substations where the transmission lines had terminated must be also rebuilt and new protection and control panels installed.

Based on recent economic development trends and the tourism development in Batumi, Anaklia and Svaneti, Georgia needs more energy resources. Therefore, the transmission line has to be reconstructed to satisfy new demand.

2.3 Threshold Determination

As a condition of USAID support, the Agency requires that any work conform to Environmental Procedures used by USAID and promulgated as Title 22 of the Code of Federal Regulations (CFR), Part 216 (22 CFR 216). As mentioned above, the IEE for this project recommended a Positive Determination, which requires that an EA be prepared.

In accordance with 22 CFR 216.3 (a)(4), after a Positive Threshold Decision has been made that an EA is required, the originator of the action shall commence the process of identifying the significant issues relating to the proposed action and of determining the scope of the issues to be addressed in the EA. The Scoping Statement was prepared by Tetra Tech in order to determine the extent of and the approach to an EA.

Pursuant to 22 CFR 216, the Positive Determination, and the Scoping Statement approval, this EA has been prepared to ensure environmental consequences and their significance are known and clearly identified prior to the approval of final design and start of construction.

2.4 Host Country Context

This project is part of a grant from USAID to the GoG signed on February 25, 2010, and all assets purchased and works constructed under the Contract will be the property of the GoG.

The grantee agrees to comply with Georgian law and any USAID EA in any USG-funded infrastructure design and/or construction funded by USAID under a host country agreement. The grantee agrees to operate and maintain all USG-supported assets in accordance with Georgian environmental standards throughout their useful life.

2.5 Environmental Scoping Statement

In accordance with 22 CFR 216.3 (a)(4), an Environmental Scoping Statement (ESS) was submitted by USAID/Georgia was approved by the BEO on July 22nd, 2011.

The Georgian environmental legislation does not consider preparation of the scoping statement as a part of the EIA process, and thus does not contain any specific requirements for the preparation of a scoping statement. An overview of Georgian environmental legislation is briefly presented in this EA.

2.6 Stakeholder Engagement and Host Government Consultations

The public was informed about the transmission line construction from the beginning of the Scoping Statement phase through the operation phase. According to CFR 216 and according to Georigan Law on Environmental Impact Permit, dated 14 December 2007, public consultations shall be conducted at least twice (during environmental scoping and before EA finalization) so as to obtain feedback on these reports and before the submission of these documents to the relevant state institutions for approval. The first round of consultations has already been conducted by Tetra Tech in different regions of the project area. The purpose of the Scoping Stage is to have stakeholder involvement in the early stage of the document development. The main messages discussed during scoping meetings were: a project description, the timeline of activities, further consultations, and potential environmental and social impacts and mitigation approaches.

The Scoping Team identified key stakeholders of the project during the scoping stage; these are people potentially interested or affected by the project. Some of these people were central, regional, or local government officials, members of government Ministries, and people who live in close proximity to the project site. The Scoping Team also identified groups who will benefit from the transmission line project and who are not affiliated with governmental organizations or key representatives of local community groups.

After finalization of the Scoping Statement and approval from USAID, Tetra Tech moved to the EA preparation phase which was the subject of a public consultation required by both USAID and national Georgian legislation. Public consultation meetings were held on September 20, 2011 as required under Georgian legislation for the Environmental Impact Permit (EIP). The minutes of the meeting were drafted and signed by the municipalities of the Tskahltubo and Senaki representatives. Minutes of the meeting will be part of the EA document during submission to the Ministry of Economic and Sustainable Development (MoESD) for Construction Permit, as required by Georgian law.

The following steps were taken in preparation for the EA public consultation:

- An announcement was placed in the primary newspapers within the regional territory in which the project takes place;

- The announcement contained the objectives, title, and location of project; the location where stakeholders could obtain information; the deadline for the submission of comments, and; the place and time of public meetings;
- The project summary, EA, or EMMP was made available to the public (depending on the consultation round);
- As required by Georgian law, a draft paper copy and corresponding draft electronic copy of this EA, along with a project description, were submitted to the Ministry of Environment (MoE) before the start of the public consultation process;
- Comments were requested from the stakeholders;
- Three (3) public meeting were held May 23, 2011 in the local governmental centers of the cities of Tskaltubo and Khoni, and Senaki. Two (2) public meetings were held on September 20, 2011 in the citeis of Tskaltubo and Senaki. Minutes were prepared of the meeting and signed by representatives of the local and national government bodies.

Going forward, the MoE will initiate a state ecological expertise procedure.

The construction permit is to be issued by the MoESD within 20 days of submission of
(a) the EA,
(b) the design documents,
(c) positive outcome from the state ecological expertise procedure startd by the MoE; and,
(c) other relevant documentation to the MoESD.

3 ALTERNATIVE ACTIONS, INCLUDING THE PROPOSED ACTION

3.1 Comparison Environmental Impacts of Alternative Actions

The following are the alternative routes that will be described in the EA. As required by 22 CFR 216.6(c)(3), and the comments of the BEO on Scoping Statements, reasonable alternatives will be explored and evaluated in the EA. Scoping meetings that were conducted for the scoping process did not identify any new alternatives to the current route of the transmission line and route Alternatives 3 and 4 were already included in the Scoping Statement. However, the environmental and design team evaluated additional alternatives (Alternative 5 and Alternative 6) during the development of the Environmental Assessment as they run along existing infrastructure (east-west roads). All these alternatives are discussed in the alternative section of this document.

Alternatives 1 through 6 involve either the rehabilitation or the construction of a 220 kV double chain (that is, double circuit) transmission line connecting the Menji Substations (near Senaki) and the Tskaltubo Substation (near Kutaisi).

The issues identified and the comparison of environmental impacts is based on the following major criteria:

- Geological conditions and design solutions;
- Environmentally sound design and construction;
- Minimization of the social costs;
- Cost effectiveness;

To ensure accuracy during the assessment, the following resources were used at each stage of survey:

- Geological and geotechnical maps;
- Topographic maps;
- Existing reference data;
- Baseline reports and field investigations;
- Desktop studies;

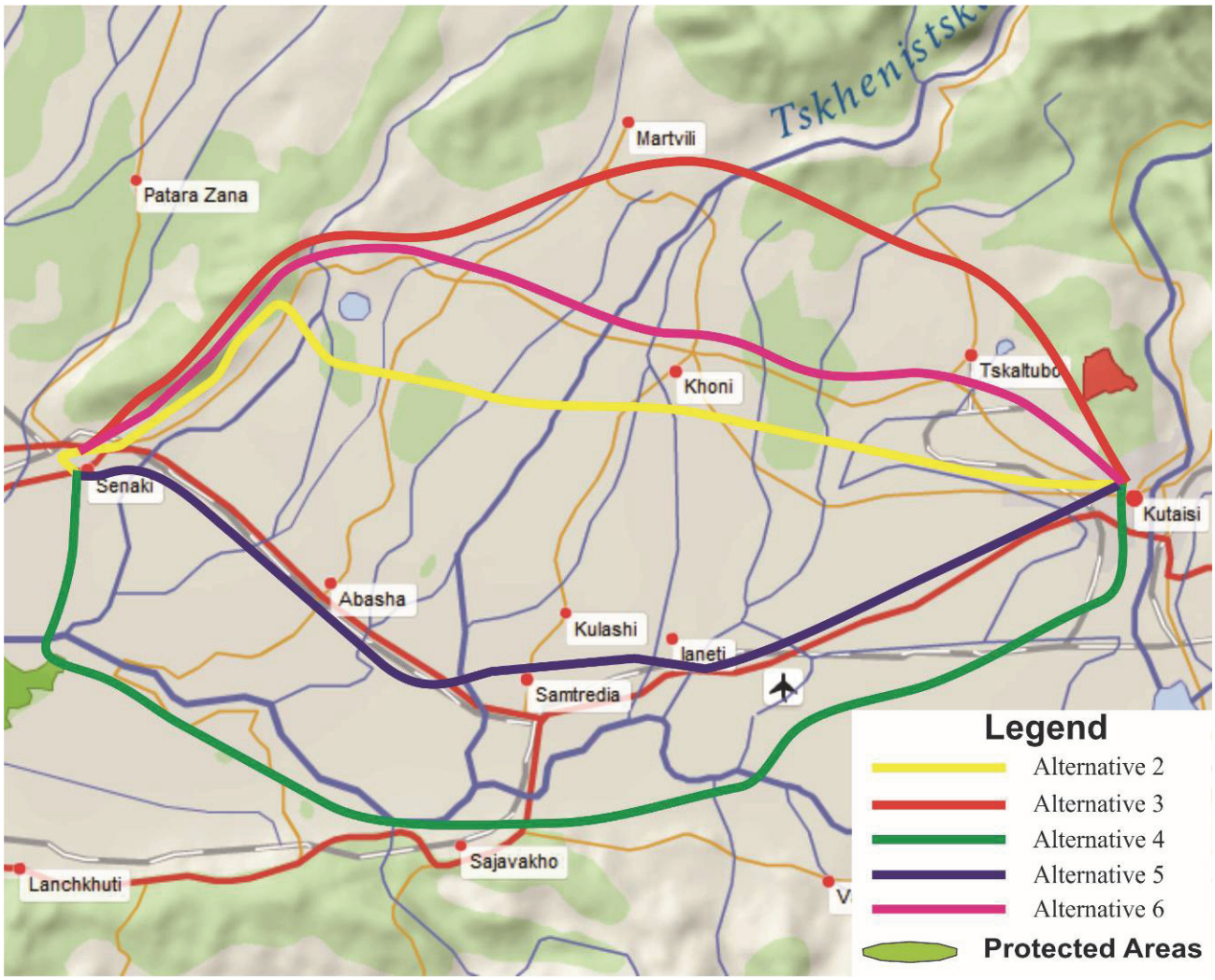
Discussion of Alternative Actions

In order to identify the priority route of the transmission line the following key factors were used during the study of the alternative routes:

- Environmental factors – impact of the TL location on the environment (landscape, eco systems, habitats etc);
- Social factors –densely populated urban areas and agricultural lands;
- Natural barriers – river crossings, forest, wetlands etc;
- Infrastructure crossings – irrigation, dams, highway, railway etc;

- Cultural heritage – monuments, archaeological sites etc;
- Technical parameters of the transmission line – length, placement of the foundations etc;

The alternatives considering the factors indicated above are discussed:



MAP 1.1. Alternatives of the Tskhaltubo- Senaki TL

3.1.1 Alternative 1: No Action

The "No Action" alternative: the power transmission line and sub-stations will not be re-constructed. The infrastructure will remain in its present condition and will probably continue to deteriorate since there will be no maintenance or management. In the present condition, all the cables and most of the towers are missing and so the line is unable to transmit electricity to the west part of Georgia. Without this source of power, development of the Anaklia touristic zone will be constrained and the GoG will not be able to develop the free industrial zone (FIZ) and provide electricity to local populations or to the EU. Overall economic development of west Georgia will be slowed in the "No Action" case.

3.1.2 Alternative 2: Use the Existing ROW (Proposed Action)

This Alternative includes reconstruction of the 211 tower foundations and conductoring of high voltage lines between all the towers. The proposed route is already within brownfield areas and the landscape of the area is mostly flat with some small mountains near the City of Senaki. The area is covered mostly with shrubs and there is forest only at the entrance to the city Senaki.

3.1.3 Alternative 3: Through the High Mountains

Whereas Alternative 2 uses the existing project route which was constructed and operated in early 1990th, Alternative 3 runs far to the north into the Caucasus mountains. This route may require careful alignment since it may run through the Sataplia Protected Territory. The alternative can also include some re-routes in order to minimize land clearing in the National Park which would further mitigate potential impacts. This alternative route will be longer than Alternative 2 since it goes north to the Caucasus Mountains. Alternative 3 goes further up towards the mountains to cross fewer rivers in comparison to Alternative 2. Alternative 3 has a longer distance with fewer stream crossings and higher cost. Alternative 3 would not be used to avoid water crossings since it crosses streams going north towards Caucasus. Alternative could be considered as an alternative to avoid river crossings since it crosses only streams. River crossings could be environmentally difficult with substantial social impacts. In addition, the terrain could be rockier and it is likely that more blasting and/or drilling would be required to construct foundations where the line goes north towards the Caucasus mountains.

3.1.4 Alternative 4: Along the River Riony

This Alternative runs south of Menji - Tskhaltubo region down to the Rioni River. The route would be aligned so that the route does not cross Kolkheti National Park. This Alternative may have visual impacts and disturbance to biodiversity. The proposed route may be a migratory route for the birds flying to Kolkheti National Park and Paliastomi Lake. Alternative 4 may require vegetation control measures in order to maintain access to the towers.

3.1.5 Alternative 5: South of Present Route

Alternative 5 would route the new transmission line south of the present ROW parallel to the existing east–west highway (Senaki–Abasha–Samtredia–Tskaltubo). Though technically feasible and ignoring cost, there would be severe social impacts and the resettlement of people since the area on either side of the east–west highway is heavily developed, residentially, industrially, and commercially.

3.1.6 Alternative 6: North of Present Route

The Alternative 6 route would be a few kilometers north of the present route. As a result, this route creates a new alignment that roughly parallels Alternative 2, although it is few kilometers longer. The line runs in parallel with the secondary road (Kutaisi-Tskhaltubo-Khoni and Senaki). This route may require purchase of additional land plots and could have moderate to major impact on substance farmers and herders. The longer route may also have more impact on environment.

3.2 Ranking of the Alternatives

In order to rank the alternative routes of the TL, the following potentially significant impacts were identified during preparation of the Scoping Statement (section 2.4):

- Conflicts between the power line and critical wildlife habitat
- Land tenure/right of way
- Land use
- Community concerns
- Historical sites
- Operation and Maintenance
- Effects on aquatic, terrestrial, cultural resources
- Land Acquisition/Tenure
- Electromagnet radiation, disruption of radio, television and cell phone transmission
- Aviation traffic
- Occupational safety and health hazard from construction and maintenance
- Herbicide releases and hazardous waste from excess herbicide and containers
- Waste and hazardous materials
- Use of herbicides for ROW maintenance
- Impacts from creation of new temporary access roads
- Difficulties in moving cattle across the RoW
- Negative impacts on local infrastructure (use of access road, sitting)

Table 1. Comparison of Alternatives

Potential environmental issues (identified in the Scoping Statement + added by EA Team)	Alternative 1 No action	Alternative 2 Existing RoW	Alternative 2 Existing RoW	Alternative 3 High Mountains	Alternative 3 High Mountains	Alternative 4 Along Rioni River	Alternative 4 Along Rioni River	Alternative 5 South of Present Route	Alternative 5 South of Present Route	Alternative 6 North of Present Route	Alternative 6 North of Present Route
		Construction (C)	Operation (O)	C	O	C	O	C	O	C	O
Conflicts between the power line and critical wildlife habitats	0	0	0	-2	0	-2	-2	+1	+1	-1	-1
Land /RoW	0	+2	+2	-2	0	-1	-1	-2	-2	-1	-1
Land use	0	+2	+2	-2	0	-1	-1	-2	-2	-1	-1
Community concerns	0	+2	+2	-2	0	-1	-1	-2	-2	-1	-1
Historical sites	0	0	+1	0	0	0	0	0	0	0	0
habitat fragmentation or disturbance, loss of forest	0	+2	+2	-2	-2	-2	-2	-2	-2	-1	-1
Operation and maintenance	0	+2	0	-2	-2	-2	-2	-2	-2	+1	0
Effects on aquatic, cultural terrestrial resources	0	-1	0	-1	-1	-2	-2	-1	0	-1	0
Land acquisition	0	+2	0	-2	0	-2	0	-2	0	+1	0
Electromagnetic radiation disruption of radio, cell phone and television	0	0	0	0	0	0	0	0	0	0	0
Aviation traffic	0	0	0	-2	0	-2	0	+2	0	+1	0
Occupational safety and health hazard from construction and maintenance	0	+2	0	-2	0	-2	0	-2	0	+1	0
Herbicide releases	0	0	0	0	0	0	0	0	0	0	0
Waste and hazardous material	0	-1	0	-1	0	-1	0	-1	0	-1	0
Use of herbicide for RoW maintenance	0	0	0	0	0	0	0	0	0	0	0

Potential environmental issues (identified in the Scoping Statement + added by EA Team)	Alternative 1 No action	Alternative 2 Existing RoW	Alternative 2 Existing RoW	Alternative 3 High Mountains	Alternative 3 High Mountains	Alternative 4 Along Rioni River	Alternative 4 Along Rioni River	Alternative 5 South of Present Route	Alternative 5 South of Present Route	Alternative 6 North of Present Route	Alternative 6 North of Present Route
		Construction (C)	Operation (O)	C	O	C	O	C	O	C	O
Impacts from temporary access roads	0	+1	0	-2	0	-2	0	-2	0	+1	0
Temporary difficulties in moving cattle across the RoW	0	-1	0	-1	-1	-2	-2	-1	0	-1	0
Negative impact on local infrastructure	0	+2	0	-2	0	-2	0	-2	0	+1	0
Total Sum (Sum up of Weighting	0	14	9	-25	-6	-24	-13	-17	-9	-2	-5

Notes:

(+2) highly positive effect/beneficial;
(+1) positive/beneficial;
(-2) significant negative effect/highly detrimental;
(-1) negative effect/detrimental;
(0) remains the same (i.e., no effect or same rate of change versus gets progressively worse or better)
(C) Construction
(O) Operation

3.3 Construction Phase Concerns

For Alternative 2, the route runs within existing brownfield areas. The line does not run through any protected territories. The access roads and tower foundations are already existent and may have no major impact on environment. The line does not go through migratory passes and no protected species are within the corridor.

As shown in the Table, many of the concerns are during the construction/rehabilitation phase of the alternatives. The construction phase concerns of Alternative 2 (i.e., waste, spills, disturbances due to construction, etc.) are shown as less detrimental than the Alternative 3, 4, 5 and 6 construction phase concerns.

Ownership issues are of concern for Alternatives 4, 5, and 6. Without clear ownership and title to the land parcels, it would be difficult to implement the project. Alternative 4 would require the disturbance of large agricultural areas by splitting corn fields and grazing properties in a significant number of villages. In addition, these Alternative 4 would require a larger area of disturbance for arranging the ROW than Alternative 2. It is also important to note that it would require new land acquisition for the ROW and access roads and bridges. This would complicate the arrangement for access roads during construction which may create a significant impact on vegetation and forested areas within National Parks. In addition construction and operation of the TL could have a major impact on migratory birds within Alternative 3. Alternative 5 has an impact on social issues such as relocation from buildings, houses, etc. No relocation would be required under Alternative 2. Relocations are a significant potential adverse effect of Alternative 5 that will require compensation to the private property owners.

Alternative 6 is north of the Alternative 2 route and would have environmental impact similar to Alternative 2. This new route would have to be land-surveyed with the land for the towers purchased, the rights along the ROW negotiated and purchased, and the towers and lines newly designed. The Alternative 6 route will be longer than Alternative 2, and hence higher in cost. The longer route also means more cumulative impact on the environment than Alternative 2. The access to tower locations will be achieved by the existing road crossing and entering the ROW by driving over the ground or by driving along dirt access roads where they exist.

Alternatives 2, 3, 4, 5, and 6 construction phase concerns can be mitigated with the best engineering practices and other environmentally sound, practicable mitigation measures.

3.4 Operational Phase Concerns

Potential significant adverse effects during the operational phase under Alternative 2 would be the maintenance of the ROW from overgrown forest near Senaki. Control and management of the shrub, trees and bushes will be done during the operation phase. Alternative 2 could also affect aquatic habitats. Under Alternatives 3 and 4, the constructions of towers, access roads, bridges and ongoing maintenance activities may have an adverse impact on fauna in protected areas as well as on sensitive areas. Alternatives 3 and 4 would have the most impact since the route reaches to the Rioni River and migratory pathes. Alternative 3 runs to Caucasus Mountains and regular control and management of bushes, trees and shrubs will be required. Alternatives 5 and 6 will have an

impact on local populations. Under Alternatives 2, 3, 4, 5 and 6 there could be effects on aquatic habitats and cultural resources as well. The mitigation measures to avoid impacts are discussed further in Chapter 6.

This table 2 Summarizes the technical, social and economical feasibility of the of the Alternatives

No	Alternative >	1	2	3	4	5	6
	Consideration	**No Action**	**Previous Route previous tower locations**	**High Mountains**	**Along Rioni River**	**South of Present Route**	**North of Present Route**
1	Environmental		Minimal environmental impact among Alternatives 2 thorough 6	High environmental impact	High environmental impact	Nominal environmental impact since it traverses a densely settled area the whole route	Minimal environmental impact among Alternatives 2 thorough 6
2	Technical (power systems and construction)		Technically possible and reasonable.	Technically possible and reasonable.	Technically possible and reasonable.	Technically possible and reasonable.	Technically possible and reasonable.
3	Economic (cost)		Lowest cost	Highest cost	High Cost	High cost	Second from lowest cost
4	Social Impact (from construction)		Minimal impact among Alternatives 2 through 6	Less than minimal social impact because the route is longer	Less than minimal social impact because the route is longer	Highest social impact since the area along the east - west highway is densely settled all the way.	Minimal impact among Alternatives 2 through 6

No	Alternative >	1	2	3	4	5	6
	Consideration	**No Action**	**Previous Route previous tower locations**	**High Mountains**	**Along Rioni River**	**South of Present Route**	**North of Present Route**
5	Government of Georgia	Not satisfactory; GoG is counting on US Government to fund the construction of the line.	Preferred				
6	Comment	Congressional Notification of December 7, 2009 is not honored.	Where local residents already know the transmission line to be; where the previous line existed.	Much longer route, more towers, environmentally sensitive area; highest cost.	A much longer route, crosses the densely settled east–west highway twice; runs along the environmentally important Rioni River.	Expected to generate much public opposition since it put a large transmission line with a 30 meter wide corridor through densely settled areas.	Possible, put not materially different than Alternative 2, just in a different adjacent location.

4 AFFECTED ENVIRONMENT

4.1 Environment Characteristics

In accordance with 22 CFR 216.6 (c) (4), Affected Environment, this section succinctly describes the environment of the areas to be affected by the Alternatives under consideration. The descriptions are no longer than is necessary to understand the effects of the Alternatives.

4.2 Population Characteristics

Alternatives 2, 3, 4, 5, 6 are located in the territory of Samegrelo-Zemo Svaneti region, which covers 7.4 thousand square kilometers and, according to data from 2008, has a population of 467,800 persons and a population density of 63 persons/sq.km. Approximately 40% of the population lives in cities, 60% in villages. 99.3% of population is Georgian, 0.7% - of other nationalities. The administrative territory of the Samegrelo-Zemo Svaneti region contains 8 rayons, 8 cities, 2 towns, 138 village councils and 488 villages.

The administrative territory of the Imereti Region consists of 12 rayons, 11 cities, 2 towns, 161 village councils and 544 villages.

The main demographic indicators of the Samegrelo-Zemo Svaneti and Imereti regions are presented in Table 3. Main Demographic Indicators.

Table 3. Main Demographic Indicators

	2006	2007	2008
Number of Those Passed Away			
Georgia	42,255	41,178	43,011
Samegrelo-Zemo Svaneti	3,892	3,802	3,836
Imereti	7,797	7,629	7,659
Number of Those Born Alive			
Georgia	47,795	49,287	56,565
Samegrelo-Zemo Svaneti	4,421	4,598	5,388
Imereti	7,131	7,310	8,397
Natural Growth			
Georgia	5,540	8,109	13,554
Samegrelo-Zemo Svaneti	529	796	1,552
Imereti	-666	-319	738
Population			
Georgia (thousand)	4,401.3	4,394.7	4,382.1
Samegrelo-Zemo Svaneti (thousand)	471	469.8	467.7
Samegrelo-Zemo Svaneti (%)	10.7	10.7	10.7
Imereti (thousand)	700.1	697.6	694.2
Imereti (%)	15.9	15.9	15.8

Source: Official Data and Consultant Assessments

4.2.1 Population Size

The most updated information available for the period of the present baseline study is data collected by the National Statistics office in 2009 (officially dated 1 January 2010).

The landscape of the region changes from lowlands to mountains andthe population density varies accordingly between municipalities, from 36 and 180 people per square km, respectively.Approximately 46% of the population lives in towns and the remaining 54% in villages.

Different from the Imereti Region, the population of the Samegrelo-Zemo Svaneti Region has a trend of growth, unevenly rising from 454,800 to 474,000 people during the previous decade with a growth rate of 0.4% per annum for this period.

4.2.2 Ethnicity

In terms of ethnic composition, the population is mostly Georgian, especially in the Samegrelo-Imereti region. The percentage of ethnic minorities is very low. There is some number of Russians, Armenians, Osetians, etc. but the community is almost completely Georgian. According to the latest data 95 – 98% of the population is ethnical Georgians. The ethnic population distribution is as follows: 98.5% - Georgian, 0.7% - Russian, 0.3% - Armenian, 0.5% - other nationalities.

4.2.3 Gender

In terms of gender equality, the situation in the project area depends on the specific social and economic characteristics of the municipalities. In general the number of women in the municipalities is slightly more than men, similar to the countrywide ratio.

The gender equality issues in the country are managed in accordance to the responsibilities taken by Georgia. In compliance with the action plan adopted at the IV International Conference in Beijing, in 1995, by the decree of the president, Georgia (1998) adopted the plan for the improvement of the status of women in which 12 priorities set out in the Beijing document were selected:

- development of institutional mechanisms of the gender equality;
- increase of the women's roles and participation in decisionmaking processes;
- economic policy;
- women and poverty;
- women and armed conflicts;
- improvement of women's health;
- women's rights.

It can be stated, that in the project implementation area, there are no specific gender-related issues different from the general social-economic issues common for the country.

4.2.4 Age Distribution

In Georgian villages, the trend towards the aging of the rural population is significant. Due to unfavorable socioeconomic and political conditions in the country, a notable amount of people migrate abroad. Net migration in Georgia has been negative for the last decade. This is reflected in the population growth rate in the country and its regions. In addition, there is a significant migration of the young population to the cities. Detailed statistics regarding internal migration is

difficult to access, but the tendency is clear and the trend can be clearly felt in the villages, where a mostly aged population is working.

4.2.5 Socioeconomic Characteristics

Added value created in the Samegrelo-Zemo Svaneti region constitutes approximately 7-8% of the added value of Georgia and its yearly real growth rate is about 4%. The main economic sectors of Samegrelo-Zemo Svaneti are: agriculture (18.4% of added value created in the region) and transport/communications (15.2%). Industry and construction is not large (6.6% and 4.2% respectively).

According to data from 2008, the number of enterprises registered in the Samegrelo-Zemo Svaneti region was 20,327. 80% of the registered enterprises were in the wholesale and retail sector and 2% to hotels/restaurants. The worth of the enterprises registered in the region was 750 million GEL in 2008. Approximately 20,000 persons were employed in these companies.

There is little economic diversity in this region. The proposed project will in part address this by providing a reliable electric power source which can attract additional enterprise to the region.

4.3 Labor Market

The economically active population of Imereti in 2008 constituted 376 thousand persons which is 20% of Georgia's economically active population.

54% of the economically-active population are men, 46% - women. 2.1% of this population has received primary education, 7.4% have a basic education, 40.4% received secondary education, 4.1% received primary professional education, 16.9% received basic professional education and 29.0% - has received higher education.

The official level of unemployment in the Samegrelo-Zemo Svaneti and Imereti regions is approximately 12%. About 65% of those employed are working in agricultural sector.

4.4 Infrastructure and Social Protection

Population income and expenses

Based on the social survey conducted in May 2011 and review of the literature in the last decade approximately 3/5 of the income of the project-affected households is financial income, and the remaining 2/5 by in-kind income which constitutes mainly privately produced agricultural products. The main source of financial income is income gained by selling agricultural products which constitute approximately 1/4 of the financial income. Loans, savings, income from Employment, self-employment constitutes 15% of income each. Remittances from abroad, relatives, pensions/stipends make up about 10% of household income each. According to the data of 2010, the average monthly income per person can be estimated at 135 GEL.

These cases also indicate a very high level of poverty in Samegrelo - Zemo Svaneti region.

Rayon Level

General Indicators

The project impact zone belongs to the Senaki and Abasha rayon of the Samegrelo-Zemo Svaneti region and to the Khoni and Tskaltubo rayon of the Imereti region. Main indicators of these rayons are given in Table 2. General Data of Abasha and Senaki , and Table 3. General Data about the Population of Tskaltubo and Khoni .

Table 2. General Data of Abasha and Senaki rayons

	Samegrelo-Zemo Svaneti region	Abasha rayon	Senaki rayon
Administrative Centre	Zugdidi City	Abasha City	Senaki City
Territory (thousand sq.km.)	7.4	0.323	0.521
Distance to Tbilisi (km)	339	283	294
Distance to Zugdidi	0	54	44
Nearest railway station	Zugdidi	Abasha	Senaki
Administrative Division			
Rayon	8	-	-
City	8	1	1
Town	2	-	-
Sakrebulo	138	15	14
Village	488	40	63
population more than 5 thousand	3	-	-
More than 10 thousand	8	-	-
Unsettled	22	-	2
Population (person)			
Population in total	466100	28707	52112
Urban population	183133	6430	28082
Men	82959	2936	12742
Women	100174	3494	15340
Rural population	282967	22277	24030
Men	134956	10434	11474
Women	148011	11843	12556
Ethnical composition (%)			
Georgian	99.3	99.2	99.4
Other	0.7	0.8	0.6

Source: Official Data

Table 3. General Data about the Population of Tskaltubo and Khoni Rayon

	Imereti region	Trskaltubo rayon	Khoni rayon
Administrative Centre	Kutaisi City	Tskaltubo City	Khoni City
Territory (thousand sq.km.)	6.5	0.632	0.427
Distance to Tbilisi (km)	236	249	264
Distance to Zugdidi	0	10	28
Nearest railway station	Kutaisi	Tskaltubo	Samtredia
Administrative Division			
Rayon	12	-	-
City	11	1	1
Town	3	-	
Sakrebulo	161	16	11
Village	544	49	39
population more than 5 thousand	3	3	-
More than 10 thousand	3	-	1
Unsettled	3	2	-
Population (per person)			
Total Population	699666	73889	31749
Urban Population	323792	16841	11315
Men	149469	7577	5143
Women	174323	9264	6172
Rural Population	375874	57048	20434
Men	182439	27616	9779
Women	193435	29432	10655
Ethnical Composition (%)			
Georgian	94.4	96.7	99.2
Other	0.6	0.3	0.8

Source: Official Data

4.4.1 Description of Project Beneficiaries

The project will improve electricity supply to hundreds thousands of households in west Georgia. The improvement in electricity supply will also support the development of the Poti Free Industrial Zone and Zugdidi-Anaklia tourist zone as well as the entire Black Sea Coast of Georgia.

The improved electricity supply system will bolster the local economy, create more jobs in the region, and will contribute to a higher living standard.
Job opportunities will be created for the local population during the project implementation period. There will be demand in unskilled and skilled labor. From the implementation of the project, certain benefits will go to the service sector and there will be chance for the local population to gain specific construction skills.

In terms of indirect benefit, the beneficiaries will be the population near the transmission line construction, especially the municipalities which are crossed by TL. The employment opportunities will be increased during the construction period.

4.5 Public Health Status

The public health system in Georgia is based on a centralized system. The main ambulances and hospitals are concentrated in large cities; however small outpatient clinics are available in practically all villages.

The health system is based on direct payments for services. However there is a governmental emergency service system comprised of motorized units available in municipal centers that provide emergency services to the population on site. If such needs arise, they provide transportation services to area hospitals. The Government-owned or private hospitals have an obligation to provide specific emergency care for free to customers paid for by the central budget.

According to the census of 2002, the main causes of mortality in Georgia are: cardiovascular diseases – 687.5 cases in every 100,000 persons; cancer – 131.2 cases in every 100,000 persons; diseases of digestive system – 51.4 cases in every 100,000 persons; respiratory diseases – 37.6 cases in every 100,000 persons; wounds, poisonings and external factors causing death – 28.8 cases in every 100,000 persons. Infant mortality (before the age of 1) according to the data of 2009 constitutes approximately 15 deaths for every thousand newborns.

4.6 Geographic Characteristics

The transmission line ROW Alternatives 2, 4, 5 and 6 pass through the Colchis Valley and Alternative 3 mainly transits the Imereti area to the North Caucasus.

The geographic features of the project zone (Alternatives 2, 4, 5, and 6) is a lowland and plain terrain with a humid and warm climate; abundant hydrographic network which is presented by slow rivers, marshes and relict lakes; soils characteristic to highly humid grounds and hygrophilous plants. These features of the Colchis Lowland are the result of contemporary geological history and its geographic location. It is known that the Colchis Valley is a former bay of the Black Sea that filled with river deposits. They were formed in the latest period of the quaternary age and it has not undergone significant changes over the geologic time period.

The geographic location of Colchis Valley, particularly its proximity to the Black Sea and the existence of a mountainous circuit open to oceanic air currents, causes consistent and high humidity in all seasons. This distinguishes the Colchis Valley from other parts of the Mediterranean, which experience a lack of humidity in summers.

The Colchis Valley is built with quaternary deposits, particularly with mid and upper quaternary deposits. The upper part of the loose material is alluvial and is transported by rivers from the Greater Caucasus and Smaller Caucasus. River deposits are represented by cobbles, sands and clays, which are combined with lacustrine clays and peats assembled in marshes.

The plain in Colchis Valley has two main geographic features: the lowest middle part of the Valley that is adjacent to the sea shore between the rivers Kodori and Supsa and is spread out from sea shore into the inland up to river Tskhenistskali tributary. It is characterized by an almost horizontal surface; its absolute height does not exceed 20-25m. This part of Colchis Valley is completely devoid of erosive forms and its morphological character is created completely from accumulative processes. Rivers here (Rioni, Khobi) flow into the elevated riverbeds, which is the result of intensive accumulation. In the sea line, the impact of waves is presented in the face of dunes, which slows the river water entering into the sea and causes ponding.

The peripheral parts of the Valley have different morphological features: they elevate towards the foothills. These hills reach up to 100-150 m above sea level and are cut through with erosive riverbeds.

The inclined, peripheral lowland is characterized with better draining; marshes and lakes are almost not found here and the rivers have significant speed. The rivers of the Colchis Valley are divided into two main types: transit rivers that start from the mountains and foothills around the valley (for example river Rioni, Khobi, Tsivi, etc.) and local rivers that start inside the valley (for example rivers Chiura, Pichora, etc.).

The soil structure of the valley is defined by atmospheric and soil moistening specificities of the bedrock. In the central part of the valley, marshy soils are predominant, the formation of which is linked to excessive humidity. In the periphery, parts of the valley with marshy soils give way to podzol soils. In several places along the river, deposits of alluvial soils are formed.

The lowland is overgrown with Colchis vegetation, including Colchis forests of evergreens and flora characteristic of peat marshes. However, a considerable part of forests and wetlands are already degraded due to human impact.

4.7 Land Use Characteristics

The economic sector affected by the project is mainly agriculture which is represented by the activities of many small households.

4.8 Cultural or Historic Resources

An archeological survey of the main proposed transmission line route was carried out during May, 2011 by Alexander Andronikashvili, Ph.D. of the Tbilisi State University

The survey encompassed the municipalities of Senaki, Khoni and Tskaltubo.

The survey was planned and implemented using two methods:

- Method one – scientific literature on archeological monuments and artifacts already found within the study area was collected and assessed;
- Method two – a field survey was carried out, and information available from Ministry of Culture was obtained;

Based on the above survey methodology and a Letter from the Ministry of Culture of Georgia (No 17/08/0 2614, of June 27, 2011) it was determined that Shkhepi Castle is located in close proximity of the transmission line territory. The castle is located northeast of the city of Senaki on a mountainous hill. In order to avoid any impact on the castle, relevant mitigation measures are included in the EMMP.

Figure 2 West View of the Shkhepi Castle

Protected Territories

The route is not within the close proximity of the Sataplia Protected Territory or any other Protected Territories. The Cave Chan is located in Tskaltubo City seven kilometers northeast of the city center. The nearby Imereti Cave Protected Territory was established in 2007. It is located in Tskaltubo, Tkhibuli, Terjola and Khoni rayons. This area consists of the Sataplia State Protected Territory and incorporates a series of caves located within this area. The comparatively small cave is famous for its dinosaur footprints dating back 120 million years. A spring winds along the floor of the cave. Construction of the transmission line and the substations will have no impact on the protected territory due to its location along the proposed route.

Based on this information, the main outcome of the initial assessment of environmental data is that there are no areas prone to severe geological hazards or restriction zones (e.g. protected areas or extremely sensitive environmental zones) – that may prohibit project implementation. The only restricted zone might be Sataplia State Protected Territory. Alternative 2 will avoid this territory.

4.9 Environmental Baseline Information

Environmental Data

The baseline data was collected by several different experts, e.g. botanists, zoologist etc during the May of 2011. They conducted field trips and a desk study.

Figure 3 River Tsivi

Figure 4 River Tskhenistskali

Access Roads

Access to the towers already exist from various points, However if the contractor will need to modify and change access routes, this should be identified during the pre-construction survey.

Land Acquisition

The Georgia State Electrosystem (GSE) is responsible for land registration and compensation. Land registration and compensation issues will be resolved by GSE before starting of the construction activities. See article 1.6 section 1.6.2.

Under Alternatives 3, 4, 5 and 6, land acquisition will also be required since these routes go through settled areas as well as pastures.

Productive Land

There are more agricultural lands along the Alternative 2 than other Alternatives.

Resettlement

There are minimum residential and other buildings affected along Alternative 2. For more details please, refer to Aarticle 1.6, Section 1.6.2.

Other Social Impacts

Impacts from workers (up to 100-150) and staging areas for the construction period are anticipated. Tskaltubo, Senaki, Khoni, Abasha and/or nearby villages could be used for housing and catering for the contractor's workforce. Recruiting possibilities for local unskilled labor will also be assessed and maximized as far as possible.

The introduction of short-term workers was determined in the scoping statement to be an insignificant impact and is not included in this EA.

Visual Impact

Short-term visual impacts from the presence in the ROW of construction crews and other permanent visual impact may appear from the transmission lines.

During the scoping exercise, this was determined not to be a potential significant impact and is not evaluated in this EA.

4.10 Policy, Legal, Regulatory and Permitting Requirements

4.10.1 Relevant and Application Host Government Policy, Legal and Regulatory Requirements

According to the Georgian legislation, during the planning and implementation process the investor/project proponent is obligated to take adequate measures for the reduction or elimination of adverse impacts on the environment and human health. At present the requirements related to environmental permitting and public participation are being revised for the purpose of placing them in compliance with international standards and environmental conventions.

The Constitution of Georgia (1995, amended in 1999, 2000-2006, and 2008) contains the legal framework for environmental protection. Though the Constitution does not address environmental matters, it does confirm the right of any person to live in a healthy environment, use the natural and cultural environment, and at the same time obliging any person to take care of the natural and cultural environment (Article 37, Part 3). The Constitution also establishes the legal framework that guarantees public access to information, stating that an individual has the right to obtain full, unbiased, and timely information regarding his work and living environment (Article 37, Part 5).

The Environmental Protection Law of Georgia (1996, amended in 2000, 2003, 2007) is the primary legal document of Georgian environmental legislation. This law regulates relations between state institutions, between physical and legal entities, and delegates responsibilities between different administrative bodies in relation to the environment and natural resource protection. A number of principles and notions are declared in the law including "sustainable development", "integrated pollution prevention and control", "best available technology", "cleaner production", and the "polluter pays principle".

Below is the list of laws relevant to environmental protection:

Table 4. List of Laws on Environment Protection

Adopted	Law of Georgia on
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

Adopted	Law of Georgia on
2005	Licensing and Permitting
2007	Environmental Impact Permit
2007	Ecological Expertise
2007	Cultural Heritage
2008	Environmental Protection Service

The 2005 **Law on Licenses and Permits** covers various types of licenses and permits, including environmental. Under this Law, licenses and permits must be issued within 20 days of receiving an application. The law defines three new principles for the issuance of a license:

- "One-window" principle ("one-shop stop"). This is a concept established by this law and means that the administrative body issuing the license must ensure the approval of additional licensing conditions by the other administrative bodies. - "Silence gives consent". The administrative body issuing the license is obliged to make a decision in due term after the submission of the application. Otherwise, the license is deemed issued if a decision is not made in the determined time period.- The "umbrella principle" – the holder of the general license is not obliged to apply for a specialized license.

In compliance with this law, a license or permit issued by a foreign country under an international agreement or law that is recognized by Georgia has a status similar to those granted by the Georgian government.

The new **Law on Environmental Protection Service** dated December 28, 2007 (in force since January 1, 2008 and replaceing the 2005 Law on State Environmental Control), establishes the State Environmental Protection Service (or environmental inspectorate) underneath the MoE and defines its competencies and procedures. The Law establishes the system of state environmental control to ensure (i) state control over the protection and enhancement of a safe environment for natural ecosystems; (ii) proper compliance of the legislation requirements by the subjects of the regulation; and (iii) strengthening of public confidence in the environmental regulatory system and governmental institutions in general, based on accountability and transparency in the field of state environmental control. Under the recent changes in 2010, Environmental Inspectors are authorized to monitor activities of the companies at least once in four month.

The **Law on the System of Protected Areas** of 1996 provides the definition of protected areas and outlines the limits for activities in these areas. Permitted activities are defined according to the area designation, territorial regulations, individual charters area management plans, and the requirements of international agreements and conventions to which Georgia is a signatory.

The following activities are generally restricted within protected territories:

- damaging or changing in any way natural ecosystems;
- destroying natural resources for exploitation or any other purpose;
- catching, disturbing, damaging natural ecosystems and species;
- environmental pollution;
- introducing new and exotic species of living organisms;
- bringing explosive materials or poisoning substances; and,
- Any other activities specifically prohibited by the management plan for a protected area.

The following table provides an overview of the definitions of the various categories of protected areas under the Georgian legislation.

Table 5. Protected Areas under Georgian Legislation

State Reserve	Georgian Law on Protected Areas, 1996, Article 4. A state preserve can be established for the purpose of maintaining nature, natural processes and genetic resources in dynamic and unchanged condition and to conduct small impact scientific research, educational activities and monitoring of nature. A state preserve can be a part of some protected territory as well as including some of them.
National Park	Georgian Law on Protected Areas, 1996, Article 5. National parks are created to protect ecosystems that are comparatively large and of exceptional qualities due to natural conditions for preservation and recreational activities. National parks can be divided into zones including strictly protected zones; visitor zones etc and can include different types of protected territories.
Managed Reserve	Georgian Law on Protected Areas, 1996, Article 7. A sanctuary can be established to protect in their natural condition wild living organisms, groups of species and non-organic natural beings of national importance that require special restoration and care from people. In sanctuaries, only limited usage of renewable resources is allowed only under strict controls. A sanctuary requires land or water sections that are of national and in some cases of international importance with rare living organisms, unique, characteristics and endangered local and migrant species and specific important components of ecosystems. A sanctuary can be a part of another protected territory and can also include natural monuments.

The **Wildlife Law** of 1996 mandates the MoE to regulate wildlife use and to protect the overall territory of the country, including existing protected areas. The same law provides the Department of Protected Areas (DPA, currently reorganized into Agency of Protected Areas – APA) with the responsibility to manage wildlife in protected areas.

The **Forest Code** (June 22, 1999) establishes the legal grounds for protection, restoration, and use of the Georgian Forest Fund and its resources. The Law defines property rights to the forests of Georgia, the principles for the protection and use of forest resources, and establishes the procedures for their use and the requirement to obtain a license. Currently, a review of this Code is underway.

The **Law on Minerals** of 1996 establishes the requirement to obtain a license according to the procedures established under this law and the Law on Licensing and Permits (June 25, 2005). According to the current system all quarries and borrow pits are required to obtain a license.

The new **Law on Cultural Heritage** was adopted May 2007 (in effect since June 2007 and replaces the previous Law on Cultural Heritage dated June 25, 1999). In article 16 of the Law, it specifies the requirements for 'large-scale' construction works. According to these provisions, any extraction of natural resources (e.g. at a quarry or borrow pit) exceeding an area of 2,000 m², as well as the construction of certain facilities determined by the Law, require clearance through the Ministry of Culture prior to the commencement of works. The same article specifies the direction of the required prior research and the issues to be considered in the frame of desktop studies and fieldwork.

The **Law of Georgia on Water** (1997) regulates the use of water resources, determines the rights and responsibilities of water users, establishes the types and rules of licensing on water use, describes the conditions and rules for issuing licenses, determines the conditions for their

suspension, cancellation, withdrawal and change, and regulates water abstraction and discharges.

The **Law of Georgia on Protection of Atmospheric Air** (1999) covers the protection of atmospheric air from harmful human impact throughout the territory of Georgia (Part I, Chapter I, and Article 1.1). Harmful human impact is an effect on atmospheric air caused by human activity, which may adversely affect human health and the natural environment (Part II, Chapter IV, and Article 11.1).

The **Law on Soil Protection** (1994) sets general basis for the protection of soil from erosion, contamination, sedimentation, sanitization, secondary swamping, etc., and the regulation of open extraction of natural resources and construction materials and their impact from human economic activity. The Law sets up norms and standards for allowable concentration limits of pollutants in the soil to ensure human health and a better environment.

The **Law on Hazardous Chemical Substances** (1998) specifies regulations regarding the classification, safe use, testing, labeling, export, import, transportation, storage and use of hazardous chemical substances and the roles of the Ministries of Environment and Health in regulating these activities.

The **Law on Compensation for Damage Arisen from the Use of Hazardous Materials** (1999) specifies how charges for the use of hazardous materials with a harmful impact on the environment are to be calculated and levied by the Ministry of Environment.

The **Sanitary Code of Georgia** (adopted in May 8, 2003) regulates the legal relations established for ensuring a healthy environment, as well as the state supervision implementation of sanitary norms.

The **Law on Red List and Red Data Book of Georgia** (adopted in May 8, 2003) establishes the legal basis for the preparation and approval of a Red List and Red Data Book in order to provide these instruments with the power to protect and restore threatened species of flora and fauna. The new **Georgian Red List** (GRL) was approved in May 2006. The new GRL has been organized in accordance with the guidelines and principles of the International Union for the Conservation of Nature (IUCN).

In accordance with the rule of health protection, Ministry of Health, Labor and Social Defense of Georgia affirm the existing norms of the environment protection. (Decree Nr. 297/N 16.08.2001, and by following decrees made by the Ministry 02/24/2003 Nr. 38/N; 09/15/2006 #251/N; 12/17/2007 #351/N; taking into the consideration changes made-up in them.) Noise and air pollution by unhealthy materials may cause special problem. As during the construction process (main constructive technique discharges, as emissions left after welding), as while exploitation process of rehabilitated objects (e.g. in case of diesel generator existence).

Qualitative Norms of the Atmosphere air are found in Chapter VI, paragraph 22 of the Social Health Security Rule of Georgia (27.06.2007). Following the goal of social health protection, the Georgian Ministry of Health, Labor and Social Defense creates and establishes the safe environmental norms for people that include the admissible concentrations of pollutants. According to this, the regulations governing air pollution protections and the limits of unhealthy concentration levels are given in the decree"Affirmation of the environment qualitative

condition norms and their affirmations" issued on August 16, 2001 Decree Nr. 297/N by the Minister of Georgian Ministry of Health, Labor and Social Protection. (Georgian Law Herald Nr. 90 24.08.2001) With some changes and additions, these have been placed in the decree of the same ministry. (Nr. 38/N 24.02.2003). The regulations for atmospheric pollution are given also in the decree Nr. 89 (October 23, 2001). This is a decree regarding the calculation of an air pollution index.

Table 6. Decree about Calculation of Air Pollution Index

Nitrogen dioxide	0.085
Sulphur dioxide	0.5
Carbon Oxide	5.0
Saturated hydrocarbons, C_6 - C_{10}	30.0
Inorganic dust	0.3

Allowed Boundary Concentrations of the Pollutants over the Above-Ground Layer of the Atmosphere

Noise standards: The standards regarding allowable noise levels are located in Decree # 297/N of Georgian Ministry of Health, Labor and Social Defense on "affirmation the norms over the qualitative norms of the environment" issued on August 16, 2001. In this document are defined the admissible levels of noise as a maximum of the admissible levels for several of the zones of the territories.

4.10.2 Relevant and Applicable International Standards and Best Practices

Aarhus Convention June, 1998

The Aarhus Convention establishes a number of rights of the public (individuals and their associations) with regard to the environment. The Parties to the Convention are required to make the necessary provisions so that public authorities (at national, regional or local level) will contribute to making these rights effective. The Convention provides for the right for everyone to receive environmental information that is held by public authorities ("**access to environmental information**"). This can include information on the state of the environment, but also on the policies or measures taken. They also include the state of human health and safety in cases where these can be affected by the environment. Applicants are entitled to obtain this information within one month of the request and without having to provide justification. In addition, public authorities are obliged, under the Convention, to actively disseminate environmental information in their possession. The right to participate in environmental decision-making is also guaranteed and arrangements are to be made by public authorities in order to enable the affected public and environmental non-governmental organizations to comment on, for example, proposals for projects affecting the environment, or on plans and programming relating to the environment. These comments are to be taken into due account in public decision-making, and the information is to be provided on final decisions and their justification ("**public participation in environmental decision-making**"). The right to appeal procedures challenging public decisions that have been made without respecting the two aforementioned rights or environmental law in general is also guaranteed ("**access to justice**").

Convention on Wetlands of International Importance

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 it pertains to waterfowl. The convention was developed and adopted by participating nations at a meeting in RAMSAR on February 2, 1971, and came into effect on December 21, 1975. It entered into force on July 06, 1997 in Georgia.

4.10.3 Relevant and Applicable Permitting Requirements

The Environmental Impact Permits (EIPs) are issued by the MoE (the ruling authority) under a procedure that includes a) an EA, b) ecological analysis and c) public participation. The detailed procedures are mainly determined by the **Law on Environmental Impact Permit** (dated December 14 2007 and the **Law on Licenses and Permits** (dated June 25, 2005).

According to the **Law on Ecological Expertise (2008),** the independent expert opinion is required in order to decide on the issuance of an Environmental Impact Permit. The environmental analysis is the responsibility of the MoE, which undertakes expert examination in accordance with the provisions on the Procedure of Conducting State Ecological Expertise.

The Law on Environmental Impact Permit contains the list of activities subject to an Environmental Assessment (EA) and the related procedures. It regulates the issuance of environmental impact permits. According to the Law, a developer seeking a permit prepares the EA, organizes public disclosure and all relevant measures which is determined by legislation. Investor/proponent also invites MoE to take part in the process and afterwards applies to the MoE for a permit. The MoE carries out the environmental analysis of the project (for which an EA hearing has already been conducted) and issues a permit within the timeframe of 20 days. In this context, the approval of other relevant Ministries and Departments is a prerequisite for issuing the environmental permit. The environmental analysis is a prerequisite to the Environmental Impact Permit and the Construction Permit (CP). If an activity requires a Construction Permit, the administrative body issuing a permit (the Ministry of Economic and Sustainable Development) ensures the involvement of the other Ministries, including the MoE. The environmental analysis is an essential element of the Construction Permit and is thus mandatory for the developer. Therefore, the Construction Permit shall incorporate elements of the environmental impact permit and the conclusions of the environmental analysis. In the event that an activity does not require a Construction Permit, an Environmental Impact Permit shall be issued by MoE based on the conclusion of the environmental analysis and procedures determined by legislation.

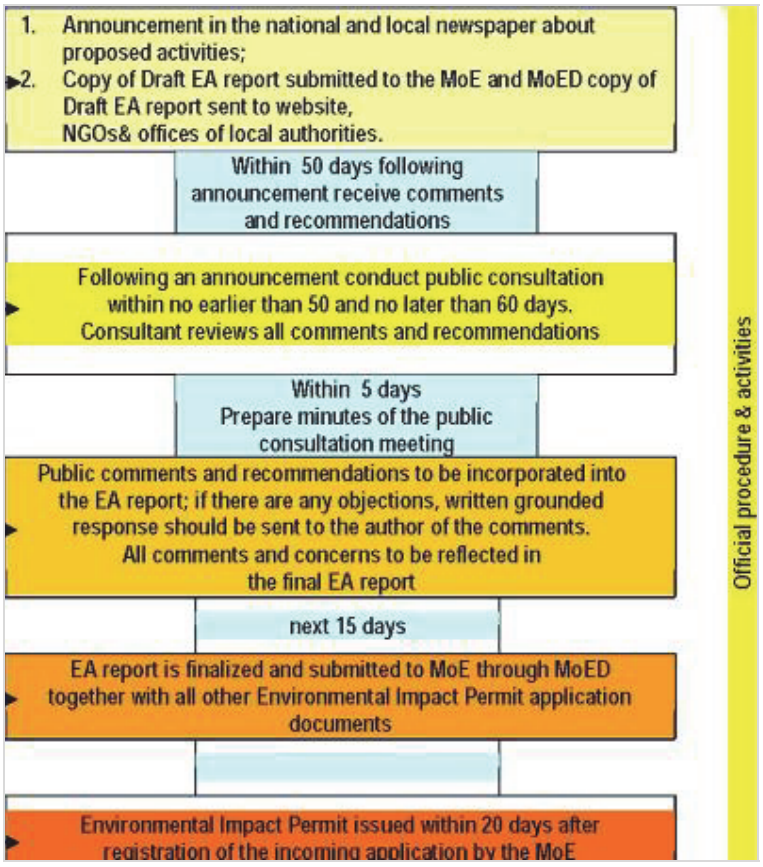
With regard to the public consultation of the EA, the Law on Environmental Impact Permit establishes the details on a succession of procedures, i.e. EA coordination, timeframes for information disclosure, and public discussion. Moreover, the Law determines how the outcomes of public discussions shall be documented. It also specifies documents to be submitted for obtaining permits, and provides the details on the procedure of permit issuance and the role of the MoE and the developer in this process.

The Law on Environmental Impact Permit establishes detailed procedures including EA coordination and establishes a timeframe for information disclosure and discussion. The procedures identified by the Law are as follows:

1. The developer provides public disclosure of the EA before the submission of the documentation to the administrative body for issuance of the Environmental Impact Permit;
2. The developer must publish information relevant to its activities in central and regional newspapers;
3. The advertisement shall contain the following information related to the title, location, place, and timeline of activities.

After the publishing of the information in the newspaper, within one week the developer has to submit the EA (in hard copy and electronic copy) to the relevant office. Within 50 days of the publication of the information, the developer should review comments from public. After publication of the information, the developer should organize public consultation on a planned activity not earlier than 50 days and not later than 60 days from the publication of the information. The developer should provide written invitation for the public consultation meeting to local governments, MoE, MoESD and other relevant authorities. The meeting shall be conducted within the administrative center of the municipality where the activity is planned. The developer is authorized to provide the minutes of the public consultations within the 5 days. Minutes must be signed by the relevant authorities present at the consultation meetings. If any objections are provided, the meeting developer should consider them and develop relevant justifications.

Table 7. Official Procedures and Activities



4.11 Natural Resources

4.11.1 Climate

Design Climate Conditions

The rehabilitation of 220 kV transmission line route is situated in the northern part of the Colchis Valley and crosses East to West. The route is lowland with a general plain character in the West. The climate of the region is humid marine, subtropical, and characterized by warm winters and hot summers. The meteorological factors have been well-studied, particularly wind and ice phenomena that may impact the transmission line. The rehabilitation route is divided into three zones according to designed climate conditions: I zone – from angle 1 to 32, II zone – from angle 32 to 51, III zone – from angle 51 to 83.

Table 8. Design Characteristics of Meteorological Factors are Presented

Rig. #	The Names of Meteorological Factors	Design Values		
		I zone	II zone	III zone
1	Air temperature:			
	maximum	+40º	+40º	+40º
	minimum	_10º	_10º	_10º
	average yearly	+15º	+15º	+15º
	during freezing	_5º	_5º	_5º
	the coldest five days	_3º	_3º	_3º

Rig. #	The Names of Meteorological Factors	Design Values		
		I zone	II zone	III zone
2	Maximum design speed of the win, m/sec	45	43	41
3	The width of the icing wall, mm	20	20	20
4	Average duration of thunder, h	>70	>70	>70
5	Average amount of precipitation, mm	1586	1793	1830
6	Maximum thickness of the snow cover, cm	80	70	60

4.11.2 Air

In several towns and regional centers, there are special hydrometeorology department units for monitoring the environment where observations of air quality are carried out on a regular basis on general and specific pollutants.

In the rayon of the 220 kV rehabilitation transmission line, there are no active industrial enterprises that could contaminate the air with emissions. There are also no large natural sources of air pollution. Vehicle emissions and wood burning in homes during the winter time could be considered as the only significant sources of air pollution.

4.11.3 Water Resources

According to the design the transmission line will cross the following rivers: r. Abasha, r. Tskhaltubostskhali, r. Gubistskhali, r. Tskhenistskali, r. Nogela, r. Tekhuri, r. Tsivi 2 places.

4.11.4 Ground Water

None of the foundations are planned to go deeper than 3 meters. A geotechnical survey has indicated that water is below the foundations. Furthermore, the foundations of the towers are "points" in the soil, not "lines" and as such will not interact with subterranean channels that will alter the water table. The project is not expected to impact groundwater resources.

In terms of availability, the water supply infrastructure is poorly developed in the project area. The centralized systems are available in the cities like Kutaisi, Abasha, Senaki, Tskaltubo, etc. but the systems are in poor condition so that most of populations are using groundwater wells for household and drinking purposes.

Groundwater resources are not used for purposes other than for household and drinking needs, i.e. there is no demand for irrigation water in the region.

4.11.5 Surface Water

The construction of the Tskaltubo-Senaki transmission line is planned for the central part of the Colchis Valley. Its route crossed by 82 water streams including 13 rivers, 16 gorges, 8 gullies and 45 channels. High power transmission line crossings include over rivers such as Tsivi, Tekhuri, Abasha, Noghela, Tskhenistskali and Gubistskali.

According to the ROW, the transmission line will cross r. Abasha, r. Tskhaltubostskhali, r. Gubistskhali, r. Tskhenistskali, r. Nogela, r. Tekhuri, r. Tsivi in 2 places. The hydrological characteristics of the rivers are seasonal, mainly characterized by spring and autumn floods. The main hydrologic characteristics of the Rivers and the major tributaries crossed are provided below.

Within the scope of the present EA, a detailed hydrological study was not conducted. The reason was that information regarding the main rivers and streams is available from reference sources and published studies.

The main pollution source for all the relevant rivers are related to human activities and agriculture in the region. The common pollutant sources of Georgian rivers are agriculture and city wastewater. The region is the agricultural and cattle raising area of Georgia, and the territory is densely populated along valley. Accordingly the main pollutants are nitrogen-containing compounds. The source of nitrates is agricultural fertilizers, which cause the increase of nitrate levels in the river during agricultural activities.

Household wastewater causes increased biological oxygen demand (BOD) and ammonia levels in the rivers, which has high levels at discharge points and dilutes downstream for the discharge points.

The other main pollutants such as surfactants and hydrocarbons are not detected in water samples, which means that the water to be crossed by the transmission line are of high background quality. It should be thus ensured that during the transmission line construction the rivers should not be affected.

The **Tsivi River** starts from the foothills of the Samegrelo mountain range from the height of 363 meters and joins the river Rioni from the right bank 46 km from the beginning, 1 km south-east from the village Mukhuri. The length of the river is 60 km with a total rise of 357 meters and an average slope of 5.9‰. The volume of the water catchment basin is 199km^2, and the average height of the basin is 140 meters. The river is joined by 138 tributaries of different types, with a total length of 256 km. Among them the main tributaries are Otskarie (length 12 km) and Shebe (length 16 km).

The upper zone of the river basin is situated in the foothills of the Samegrelo mountain range between the basins of rivers Tekhura and Khobi. The lower part of the river basin is situated in the Colchis Valley. The relief of the basin in the foothills is hilly. The relief of the lower zone is lowland. Clays, marls and sandstones contributed to the geological build-up of the upper zone, and the lower zone lies on alluvial layers. Clay soils are mainly distributed in the river basin. The main area of the river basin is taken up by agricultural land.

Within the hilly relief river gorge has a form of trapezium, the bottom width of which varies between 150-800 meters. In the Colchis valley on the other hand river gorge is not clear-cut. Terraces, the width of which varies from 30-80m to 400-700m and height – between 1-9 m follows the river along its whole length. The river does not have groves.

The riverbed is tortuous and not branched; the width of the stream varies between 2-12m, and the depth varies between 0.5-2m. The river speed varies between 0.2-1m/sec. On the Colchis Valley the riverbed is sandy and silty.

Figure 7a: Rivers crossed by the ROW

The river is fed with snow, rain and groundwater. The river is characterized by flash floods during the whole season. The river is used for village water-mills.

The transmission line crosses the river Tsivi twice. The river length to the lower crossing is 43.6 km with a total rise of constitutes 349, and average slope of 8.0‰. The area of the water catchment basin is 180km 2. The river length to the upper crossing is 41.0 km, with a total rise of 344 m at an average slope of 8.4‰. The volume of the water catchment basin is 177 km^2.

The **Tekhuri River** starts from the southern slopes of the Samegrelo mountain range at a height of 2360 meters and joins the river Rioni from the east side 57 kilometer from its origins. The length of the river is 101 km; total rise 2352 meters, and the average slope 23‰. The area of the water catchment basin is 1040 km^2 at an average height of 730 meters. The river is joined by 503 different tributaries with a total length of 1047 km. Among these tributaries are the Ckhorotskhu (11km), Chachkhura (12km), Gurdzeni (20km), Nakhuri (11km) and Abasha (66km).

The upper zone of the basin is located on the southern slope of the Samegrelo mountain range, and the lower zone is in the Colchis Valley. Limestones andsandstones consistute the geological construction of the upper zone of the river basin. The lower zone is mainly alluvial sediments. In the mountainous zone, there are humus soils; in the lowland the alluvial-marshland soils prevail. In the mountainous zone of the basin there are coniferous and leafy forests and the greater part of the lower zone on the other hand is taken up by agricultural land. 35-40% of the basin is covered with forest.

The river gorge starts with a V-like shape. From the village Nakalakevi downwards to the city of Senaki it has the form of a trapezoid. The width of the gorge bottom varies from 100-200 meters to 4-4.5 kilometers. Terraces are found along the whole river length. Their total length is 0.6-1 km, with a width of 0.5 km and height of 6-12 meters. The river gorge is well-developed in the middle and downstream. Its width varies from 100-200 meters.

The river basin is moderately tortuous and branches in areas. The width varies from 20-65 meters, with speeds from 0.6-0.8 m/sec to 2.0-3.2 m/sec. From the river Akhalsopeli to the tributary, berms of 3-4 meter height are on both riverbanks.

The river is fed with snow, rain and groundwater. The downstream is characterized by small spring floods and flash floods during the whole season.

34% of annual drainage is found in spring, with 21% in autumn and 18% in winter. The river does not freeze.
The river is used for village water-mills.

Before crossing the transmission line, the area of the water catchment basin is 562 km^2.

The **Abasha River** starts from the south-eastern slope of Tsekelda range, at the height of 1500 meters and joins the Tekhura from the left side 6.5 kilometer from its origins. The length of the river is 66 km, total rise 1489m, and average slope 22.5‰. The water catchment area is 350 km^2 and the average height of the basin 320 m. The river is joined by 126 tributaries with a total length of 353 km. Among these, the largest is the river Tarcheni, the length of which is 16 km.

From the tributary's origins until the village Bobati, the river basin is situated in the foothills of the Samegrelo Mountains, after 41 km the basin is begins in the Colchis Valley. In the foothill zone, the watershed range height varies between 1000-1500 meters. In this section the gorge slopes are steeply inclined towards the riverbed. The rock is mainly made up of limestone. There are cracks in the groul where whirlpools form as the water leaves the stream bed and flows into the ground.

Groundwater flows in the form of streams in the areas of the villages Balda, Inchkhuri, and Lebache, and constitutes the source of a small river. In the Colchis Valley basin, heights do not exceed 130-140 meters. Here the topology is flat. The geological composition of this zone is mainly alluvial sediments. Clay is spread out in the basin. Deciduous forests are found only in the upper part of the basin, while the lower is taken up by agricultural lands.

The river valley between the beginning of the river and the village of Bobota has a V-like form, and below the village it has the form of a trapezoid. The river bottom width at the beginning of the river is 5-10 meters and in the Colchis Valley it reaches 0.8-2.0 km. Its width varies between 50-100 m, and the height varies between 0.5-1.0 m. During floods and flash floods, the river banks are covered by water of 2-3 meter height.

The riverbed starts off moderately tortuous. In the Colchis Valley, the riverbed is meandering and branches frequently. As a result of these branches, low, unstable islands are formed. The width of the water varies from 3-9 m to 30-40 m, and the speed varies from 1-1.4 m/sec to 0.1-0.2 m/sec.

The river is fed by snow, rain and groundwater. It is characterized by flash floods throughout the year. Flow rates are highest in the spring, when the 30-45% of the annual flows occurs. Summer contains 16-18% of the annual flows, with autumn 20-30% and winter 20-25% respectively.

During low flow periods the river water is clear, transparent, and can be used for drinking. The river had been used for electric power: Abasha hydro-electric station is currently the power plant not in operation.

Before the point where the transmission line would cross, the river length is 44.0 km, with a total rise of 1452 m, average slope of 33.0‰, and the area of water catchment area is 252km^2.

The **Noghela River** starts from the southern slopes of Korchuleti range at the height of 680 meters and joins the river Rioni from the east 74 kilometers from its tributary. The length of the river is 59 km, with a total fall of 669 m and anaverage slope of 11.3 ‰. The water catchment area is 130 km^2, and the average height of the basin is 70 m. The river is joined by 42 different tributaries with a sum total of length of 163 km. The main tributary is the Sakaria River with a length of 22 km.

The upper zone of the basin, between its origin and the village of Khuntsa, is hilly. The lower zone is located in Colchis Valley. The hilly relief of the basin is characterized by a relatively smooth outline and occasional feeder streams in small valleys. The lower zone of the basin, situated in the Colchis Valley, is characterized by a low relief. The basin is situated between the basins of the rivers Abasha and Tskhenistskali. Marls, clay sands, limestones, conglomerates

and strong alluvial sediments make up the basin geology. Clay soils are mainly found in the basin. Almost the entire territory of the basin is taken up by agricultural land.

In the first 5 to 6 km of the river, its width varies from 20-50 meters. Much of the valley is under cultivation. During periods of flooding the fields are inundated under 0.2 to 2 meters of water.

The riverbed from Martvili until the village of Sakachravo is moderately tortuous and not branched, while below this area the river meanders. The width of the river varies between 2 meters and 40 meters, while the depth of the river varies between 0.4 meters and 2.0 meters, and speed of the river varies between 0.2 meters/second and 1 meter/second.

The river is fed with snow, rain and ground water. Rainwater is the major source. The water system of the river is characterized by rain-induced flash floods during the whole year. The river is most water abundant during the summer, when 35-40 % of the yearly water discharge flows. In autumn 25-30 % of yearly water discharge flows while in spring, 15-22 % and in winter 16-19 %. Freezing takes place only in some winter seasons near the beginning of the river.

The river is used for village water-mills and irrigation. It has one local and one primitive channel.

Before crossing the transmission line, the length of the Noghela river is 23.6 km with a total fall of 614 m and an average slope of 26.0 ‰. The water catchment area is 45.0 km^2.

The Tskhenistskali River starts from the central part of the Caucasus Mountain Range, south of the Sharictseki Pass at 2700 meters above sea level and joins the river Rioni from the eash near the village of Sajavakho.

The length of the river is 176 km with a total fall of 2684 m and an average slope of 15.0 ‰. The water catchment area is 2120 km^2, and the average height of the basin is 1660 m above sea level.

The river is joined by 897 tributaries. Among them the most important are the: Zeskho (19 km), Gobishuri (12l km), Laskanura (20 km), Kheledula (34 km), Lekrateshi (24 km) and Janaula (21 km). As for the other tributaries, the length of only 13 of these exceed 10 km. The area of glaciers within the river basin is 12.9 km^2.

The major part of the river basin is located on the southern slope of the Caucasus, and the smaller, lower part of the river basin (30-35 km) is situated in the Colchis Valley. The basin is sharply divided between high-mountainous, mountainous and lowland zones. The high-mountainous zone is located at the height of 2200-4000 meters and is characterized by rocky cliffs. The mountainous zones take up the most basin area and is characterized by deep gorges and dismembered reliefs. The height of this zone varies between 2000-3000 meters above sea level. The lowland zone is characterized by lowland reliefs, the height of which does not exceed 15-18 meters.

The geology of the mountainous zone contains granite, sandstone, limestone and conglomerates; the lowland zone contain alluvial sediments. Clay soils are mainly found in the basin. Vegetation cover with vertical zoning is found within the basin. In the lower zone of the basin up to the height of 800 meters, leafy forests are found. Up to a height of 2100-2300 meters there

are mixed forests, and above this mountain fields are found. The basin area of the Colchis Valley is taken up by agricultural lands.

At the start, the river gorge has a V-like form, while from the village of Tsageri southwards the river contains a box-like form. In the Colchis Valley the river gorge is not clear-cut. Two-sided terraces are found starting from the village of Mele to the village of Sakdari. Their widths vary from 50-100 to 500-700 meters, and the height varies between – 4-8 meters. The width of the river gorge varies from 10-20 meters to 200-400 meters.

At the start, the riverbed is tortuous and not branched. From the village Tsageto to the village of Larchavala and from the village of Matkhoji to the village of Khunjulori the riverbed is branched, and flows on as a single branch in the Colchis Valley. The width in the Colchis Valley varies between 20-120 m, with a depth varying between 0.6-1.5 m, and a speed between 0.8-1.5 m/sec.

The river is fed with snow, rain and ground water. Its water system is characterized by spring-summer floods and well-defined water-shortages in winter. In the spring-summer period, 70-75 % of the yearly water discharge flows, while in autumn it is 18-20 % and in winter about 8-10 %.

The river is used for irrigation and to provide energy. North of the city of Tsageri, on the west bank of the river there is a 6.5 km long tunnel which diverts water from the Tskhenistskali river at a rate of 60.0 m^3/sec toward the Lajanuri power water reservoir. A water reservoir created on the river Lajanuri, which is additionally fed with water from the Tskhenistskali, operates the Lajanuri power station. The processed water then flows into the river of Lajanuri and afterwards into the Rioni. Thus, from the river Tskhenistskali, water is being diverted to the river Rioni basin.

Near the village of Matkhoji, the main building of the Khoni-Samtredia irrigation system is located on the river. This irrigation system ensures the irrigation of 1200 hectares (ha) of land in the Imereti region.

Before crossing the transmission line the water catchment area of the Tskhenistskali river is 2030 km^2.

The Gubistskali River starts at the northeastern area of the village of Dedalauri, at the height of 105 m above sea level and joins the river Rioni from the east bank near the village of Akhalsopeli. The length of the river is 36 km with a total fall of 83 meters and an average slope of 2.3 ‰. The water catchment area is 442 km^2 with an average basin height of 150 m above sea level. The river is joined by 122 tributaries with total length of 363 km. Among these, the main tributaries are the: Semi (24 km), Shua - Kukhi (18 km), Tskaltubo (21 km) and Ogsakura (20 km).

The water catchment area is situated in the northeastern section of the Colchis Valley, between the water catchment areas of the rivers Rioni and Tskhenistskali. The basin is mainly characterized by lowland relief, and it is hilly only near itssource which is dismembered by small streams and ravines. In the geological construction of the basin's hilly zones, limestones make up the majority. The lowland zone contains alluvial sediments. Clay soils are found in the basin. The major area of the basin is taken up by agricultural lands.

The river gorge is not clear cut along its entire length. The downstream river has a grove in the middle. The grove width varies from 20-30 m to 80-150 m with a height from 0.3-0.4 to 1.0-1.5 m. In periods of floods and flash floods, the grove is covered by 0.2-1.8 m of water. The riverbed is moderately tortuous and mainly unbranched. The width of the river varies between 4-25 m with a depth between 0.2-1.4 m and a speed varying between 0.2-0.5 m/sec. The riverbed bottom is straight, gravelly at the start and silty in the tributary.

The river is mainly fed with rainwater. Its water system is characterized by rain-induced flash floods during the entire year. The most flash floods occur in autumn and rarely in spring. The length of time between flash flood events does not exceed 20-30 days and this lull mainly takes place in February. The lowest levels are in August and, rarely, in September. The river does not freeze.

The river is used for village water mills and irrigation. There is one local and one primitive channel on it.

Before crossing the transmission line, the length of the river is 13.0 km with an average slope of 79,0 ‰, and a water catchment area of 180 km^2.

The Rioni River
The Rioni River takes its origins 2620 m high in the Caucasus Mountains and drop into the Black Sea. The catchment of the Rioni River is 13,400 km2 and the river length is 327 km. The average gradient of the river course is 7.2%. The river has numerous tributaries which supply it with water. The river is fed by glaciers, snow melt, rainwater, and groundwater. Its flooding period is in spring and summer due to snow and glacier melting and spring rain. In the city of Kutaisi, the mean flow rate of the Rioni River is 134 m^3/sec which increases to 406 m^3/sec in the estuary. The maximum flow rate in Kutaisi is 1440 m^3/sec and in the estuary 3000 m^3/sec. The river is regulated with the use of several dams, constructed for power houses.

The seasonal distribution of the Rioni water flow is the following: in spring – 38.8 %, summer – 28.5 %, autumn – 18.4 %, and in winter – 14.3 %. The water mineralization for the Rioni is 150-300 mg/L and belongs to the hydrocarbon class.

4.11.6 Wildlife

During the baseline survey conducted in May 2011, it was determined that wildlife would not be studied. One reason for this is that the territory was cultivated previously as agricultural land and there is very few forest with mainly shrubs within the territory. No animal footprints were noticed within the territory. In terms of avian wildlife, the area does not contain many birds. However the impact on birds should be taken into account.

4.11.6.1 Endangered, threatened and protected species

Endangered, threatened and protected species
In order to define the baseline characteristics of any protected species of fauna and flora, it should be noted that the transmission line corridor and the Tskaltubo and Menji substations are located in a “secondary” landscape: during the survey conducted in May by the baseline team and the desk review of the literature, it was identified that no Red Book species or other protected species are within the corridor.

4.11.6.2 Avian Wildlife

The following birds listed in the table are found throughout west Georgia. It should be noted that west Georgia and especially the Kolkheti lowland south to Paliastomi Lake is a migratory path for birds during the spring and autumn season. During surveys done by the baseline team in May 2011, it was identified that only sparrows nest within the transmission line corridor. Therefore there would be a minimal risk that migratory birds will use the proposed corridor as a migratory path as they usually fly South to the Rioni river and Paliastomi Lake.

N	Latin Name	IUCN status	English Name	Georgian Name
	Pelecaniformes			
1.	*Phalacrocorax pygmies*	LC	Pygmy Cormorant	პატარა ჩვამა
2.	*Phalacrocorax carbo*	LC	Great Cormorant	დიდი ჩვამა
3.	*Egretta garzetta*	LC	Little Egret	პატარა ოყარა
4.	*Ardea cinerea*	LC	Grey Heron	რუხი ყანჩა
5.	*Nycticorax nycticorax*	LC	Black-crowned Night Heron	წყლის ბუღა
	Anseriformes			
6.	*Anas platyrhynchos*	LC	Wild duck	გარეული იხვი
7.	*Anas crecca*	LC	Common Teal	სტვენია იხვინჯა
	Falconiformes			
8.	*Milvus migrans*	LC	Black Kite	ძერა
9.	*Circus cyaneus*	LC	Hen Harrier	მინდვრის ძელქორი
10.	*Buteo buteo*	LC	Common Buzzard	ჩვეულებრივი კაკაჩა
11.	*Falco tinnunculus*	LC	Common Kestrel	ჩვეულებრივი კირკიტა
	Charadriiformes			
12.	*Tringa ochropus*	LC	Green Sandpiper	შავულა
13.	*Scolopax rusticola*	LC	Eurasian Woodcock	ტყის ქათამი
14.	*Larus ridibundus*	LC	Black-headed Gull	ტბის თოლია
	Columbiformes			
15.	*Columba livia*	LC	Rock Pigeon	გარეული მტრედი
16.	*Columba palumbus*	LC	Common Wood Pigeon	ქედანი

N	Latin Name	IUCN status	English Name	Georgian Name
	Cuculiformes			
17.	*Cuculus canorus*	LC	Common Cuckoo	გუგული
	Piciformes			
18.	*Dendrocopos major*	LC	Great Spotted Woodpecker	დიდი ჭრელი კოდალა
19.	*Dendrocopos minor*	LC	Lesser Spotted Woodpecker	პატარა ჭრელი კოდალა
20.	*Picus viridis*	LC	Green Woodpecker	მწვანე კოდალა
	Coraciiformes			
21.	*Upupa epops*	LC	Hoopoe	ოფოფი
22.	*Merops apiaster*	LC	European Bee-eater	კვირიონი
23.	*Alcedo atthis*	LC	Common Kingfisher	ალკუნი
	Passeriformes			
24.	*Alauda arvensis*	LC	Skylark	მინდვრის ტოროლა
25.	*Galerida cristata*	LC	Crested Lark	ქოჩორა ტოროლა
26.	*Hirundo rustica*	LC	Swallow	სოფლის მერცხალი
27.	*Delichon urbica*	LC	house martin	ქალაქის მერცხალი
28.	*Motacilla alba*	LC	White Wagtail	წყალწყალა
29.	*Motacilla flava*	LC	Yellow Wagtail	ყვითელი ბოლოქანქარა
30.	*Troglodytes troglodytes*	LC	Winter Wren	ჭინჭრაქა
31.	*Erithacus rubecula*	LC	European Robin	გულწითელა
32.	*Phoenicurus ochruros*	LC	Black Redstart	შავი ბოლოცეცხლა
33.	*Turdus pilaris*	LC	Fieldfare	ბოლოშავა
34.	*Turdus merula*	LC	Common Blackbird	შავი შაშვი
35.	*Turdus viscivorus*	LC	Mistle Thrush	ჩხართვი
36.	*Parus major*	LC	Great Tit	დიდი წივწივა
37.	*Parus caeruleus*	LC	Blue tit	წიწკანა
38.	*Aegythalos caudatus*	LC	Long-tailed Tit	თოხიტარა
39.	*Emberiza melanocephala*	LC	Black-headed Bunting	შავთავა გრატა
40.	*Pica pica*	LC	Common Magpie	კაჭკაჭი
41.	*Garrulus glandarius*	LC	Eurasian Jay	ჩხიკვი

N	Latin Name	IUCN status	English Name	Georgian Name
42.	*Corvus frugilegus*	LC	Rook	ჭილყვავი
43.	*Corvus corone*	LC	Carrion Crow	რუხი ყვავი
44.	*Corvus corax*	LC	Common Raven	ყორანი
45.	*Passer montanus*	LC	Eurasian Tree Sparrow	მინდვრის ბეღურა
46.	*Passer domesticus*	LC	House Sparrow	სახლის ბეღურა
47.	*Fringilla coelebs*	LC	Chaffinch	ნიბლია (სკვინჩა)
48.	*Fringilla montifringilla*	LC	Fringilla montifringilla	მთიულა
49.	*Carduelis carduelis*	LC	Goldfinch	ჩიტბატონა
50.	*Carduelis chloris*	LC	European Greenfinch	მწვანულა
51.	*Carduelis spinus*	LC	Eurasian Siskin	ჭივჭავი
52.	*Coccothraustes*	LC	Hawfinch	კულუმბური

4.11.6.3 Animals

Fauna in the project corridor as in west Georgia are few as these areas have long been used for agriculture. The transmission line route will cross shrubs and degraded forested areas. The field survey of the route showed no footprints of any large endangered mammals as identified and that faunal diversity is poor along the route as there were neither natural landscapes nor evidence of animals found.

The transmission line will cross some small shrubs, which might serve as animal habitats. Such woody vegetation is present between agricultural parcels; however, evidence of large mammals (wolf, bear, fox, deer, roe) were not found during the field reconnaissance. No animal traces were found during surveys.

Some IUCN species can be found in the area; however the lowest conservation status, Least Concern (LC), is assigned to them. The list of animals which can be expected in the project ROW including the alternatives provided in Table 9. List of Animals Typical for West Georgia, which also provides their conservation status. Additional categories are Endangered (EN), Critical (CR), and Vulnerable (VU).

Table 9. List of Animals Typical for West Georgia

	Latin Name	Red List of Georgia	IUCN Category	English Name	Georgian Name
Mammals					
Chiropeta					
	Nyctalus leisleri		LC	Lesser noctule	მცირე მეღამურა

	Latin Name	Red List of Georgia	IUCN Category	English Name	Georgian Name
2.	*Pipistrellus pipistrellus*		LC	Common pipistrelle	ჩია ღამორი
Rodentia					
3.	*Sciurus vulgaris*		LC	Red squirrel	ჩვეულებრივი ციყვი
4.	*Microtus majori*		LC	Major's Pine Vole	ბუჩქნარის მემინდვრია
5.	*Microtus socialis*		LC	Social Vole	საზოგადოებრივი მემინდვრია
6.	*Arvicola terrestris*		LC	European Water Vole	წყლის მემინდვრია
Insectivora					
7.	*Talpa*		LC	Mole	თხუნელა
Cornivora					
8.	*Lutra lutra*	VU	NT	European Otter	წავი
9.	*Vulpes vulpes*		LC	Red Fox	მელა
10.	*Canis aureus*		LC	Golden jackal	ტურა
11.	*Martes martes*			European Pine Marten	Tyis kverna
12.	*Martes foina*			Stone Marten, Beech Marten	Qvis kverna
13.	*Felis silvestris*			Wild Cat	Tyis kata
14.	*Capreola capreolus*			European Roe Deer	Sveli
15.	*Linx linx*	CR		Eurasian Lynx	focxveri
16.	*Canis lupus*			Grey Wolf	mgeli
17.	*Ursus arqtos*	EN		Brown Bear	Mura daTvi
18.	*Meles meles*			Eurasian Badger	maCvi
Amphibians					
Pelecaniformes					
19.	*Bufo viridis*		LC	green toads	მწვანე გომბეშო
20.	*Hyla arborea*		LC	European tree frog	ჩვეულებრივი ვასაკა

The entire transmission line runs through either agricultural lands or degraded forests, where as mentioned no footprints where identified since the TL route passes through heavily settled areas.

Bats

All bats in Georgia fall under the protection accorded by the EUROBATS Agreement. Bats are very dependent on shelter. Structure suitable for such roosting shelters include tree hollows, caves and abandoned buildings. Wintering and maternity colonies can be destroyed if trees with hollows are cut during clearing for the transmission line. There are 14 species in the area (among them two species protected by law - *Mediterranean and Mehely's Horseshoe* Bats) and two such species (*Nyctalus leisleri and Pipistrellus)* are within the survey area. Bats frequently feed far from their roosts. Therefore, we included all species that occur within the Kutaisi section in Table 11.

Bat species occurring within the work area (*according to A.Bukhnikashvili, 2004*) with the occurrence of the species from various references; **?** – indicates the occurrence of the species suspected; □□□- the species is included on the Red List of Georgia

Table 10 Bat species occurring within the work area

№	Species - Latin name	Common English name	Georgian name	Kutaisi	Senaki	Entire RoW	IUCN
1.	*Rhinolophus ferrumequinum*	Greater Horseshoe Bat	დიდი ცხვირნალა	+		+	LC
2.	*Rhinolophus hipposideros*	Lesser Horseshoe Bat	მცირე ცხვირნალა	+		+	LC
3.	*Rhinolophus euryale*	Mediterranean Horseshoe Bat	სამხრეთული ცხვირნალა	+		□	**VU**
4.	*Rhinolophus mehelyi*	Mehely's Horseshoe Bat	მეჰელის ცხვირნალა	+		□	**VU**
5.	*Myotis blythii*	Lesser Mouse-eared Bat	ყურწვეტა მღამიობი	+		+	LC
6.	*Myotis nattereri*	Natterer's Bat	ნატერერის მღამიობი	+		+	LC
7.	*Eptesicus serotinus*	Serotine Bat	მეგვიანე ღამურა	+		+	LC
8.	*Nyctalus leisleri*	Lesser Noctule Bat	მცირე მელამურა	+		+	NT
9.	*Nyctalus noctula*	Common Noctule Bat	მელამურა	+	**?**	+	LC
10.	*Pipistrellus kuhlii*	Kuhli's Pipistrelle	კულის ღამორი		+	+	LC
11.	*Pipistrellus pipistrellus*	Common Pipistrelle	ჯუჯა ღამორი	+	**?**	+	LC
12.	*Barbastella barbastellus*	Western Barbastelle	ევროპული მაჩქათელა	**?**		□	**VU**
13.	*Plecotus auritus*	Brown Big-eared Bat	რუხი ყურა	+		+	LC
14.	*Vespertilio murinus*	Parti-coloured Bat.	ჩვეულიბრივი ღამურა			+	LC
	Species protected by law			**2**	**0**	**3**	**3**
	Total			**14**	**3**	**14**	**14**

Table 11 Avian Red List Species or Protected Species with the Area

N	Latin Name	Red List of Georgia	IUCN status	English Name	Georgian Name
Pelecaniformes					
1.	*Phalacrocorax pygmaeus*	–	LC	Pygmy Cormorant	პატარა ჩვამა
2.	*Phalacrocorax carbo*	–	LC	Great Cormorant	დიდი ჩვამა
3.	*Egretta garzetta*	–	LC	Little Egret	პატარა ოყარა
4.	*Ardea cinerea*	–	LC	Grey Heron	რუხი ყანჩა
5.	*Nycticorax nycticorax*	–	LC	Black-crowned Night Heron	წყლის ბუღა
Anseriformes					
6.	*Anas platyrhynchos*	–	LC	Wild duck	გარეული იხვი
7.	*Anas crecca*	–	LC	Common Teal	სტვენია იხვინჯა
Falconiformes					
8.	*Milvus migrans*	–	LC	Black Kite	ძერა
9.	*Circus cyaneus*	–	LC	Hen Harrier	მინდვრის მელაქორი
10.	*Buteo buteo*	–	LC	Common Buzzard	ჩვეულებრივი კაკაჩა
11.	*Falco tinnunculus*	–	LC	Common Kestrel	ჩვეულებრივი კირკიტა
Charadriiformes					
12.	*Tringa ochropus*	–	LC	Green Sandpiper	შავულა
13.	*Scolopax rusticola*	–	LC	Eurasian Woodcock	ტყის ქათამი
14.	*Larus ridibundus*	–	LC	Black-headed Gull	ტბის თოლია
Columbiformes					
15.	*Columba livia*	–	LC	Rock Pigeon	გარეული მტრედი
16.	*Columba palumbus*	–	LC	Common Wood Pigeon	ქედანი
Cuculiformes					
17.	*Cuculus canorus*	–	LC	Common Cuckoo	გუგული
Piciformes					
18.	*Dendrocopos major*	–	LC	Great Spotted Woodpecker	დიდი ჭრელი კოდალა
19.	*Dendrocopos minor*	–	LC	Lesser Spotted Woodpecker	პატარა ჭრელი კოდალა
20.	*Picus viridis*	–	LC	Green Woodpecker	მწვანე კოდალა
Coraciiformes					
21.	*Upupa epops*	–	LC	Hoopoe	ოფოფი
22.	*Merops apiaster*	–	LC	European Bee-eater	კვირიონი
23.	*Alcedo atthis*	–	LC	Common Kingfisher	ალკუნი
Passeriformes					
24.	*Alauda arvensis*	–	LC	Skylark	მინდვრის ტოროლა

N	Latin Name	Red List of Georgia	IUCN status	English Name	Georgian Name
25.	*Galerida cristata*	_	LC	Crested Lark	ქოჩორა ტოროლა
26.	*Hirundo rustica*	_	LC	*Swallow*	სოფლის მერცხალი
27.	*Delichon urbica*	_	LC	*House martin*	ქალაქის მერცხალი
28.	*Motacilla alba*	_	LC	*White Wagtail*	წყალწყალა
29.	*Motacilla flava*	_	LC	*Yellow Wagtail*	ყვითელი ბოლოქანქარა
30.	*Troglodytes troglodytes*	_	LC	*Winter Wren*	ჭინჭრაქა
31.	*Erithacus rubecula*	_	LC	*European Robin*	გულწითელა
32.	*Phoenicurus ochruros*	_	LC	*Black Redstart*	შავი ბოლოცეცხლა
33.	*Turdus pilaris*	_	LC	*Fieldfare*	ბოლოშავა
34.	*Turdus merula*	_	LC	*Common Blackbird*	შავი შაშვი
35.	*Turdus viscivorus*	_	LC	*Mistle Thrush*	ჩხართვი
36.	*Parus major*	_	LC	*Great Tit*	დიდი წივწივა
37.	*Parus caeruleus*	_	LC	*Blue tit*	წიწკანა
38.	*Aegythalos caudatus*	_	LC	Long-tailed Tit	თოხიტარა
39.	*Emberiza melanocephala*	_	LC	Black-headed Bunting	შავთავა გრატა
40.	*Pica pica*	_	LC	Common Magpie	კაჭკაჭი
41.	*Garrulus glandarius*	_	LC	Eurasian Jay	ჩხიკვი
42.	*Corvus frugilegus*	_	LC	Rook	ჭილყვავი
43.	*Corvus corone*	_	LC	Carrion Crow	რუხი ყვავი
44.	*Corvus corax*	_	LC	Common Raven	ყორანი
45.	*Passer montanus*	_	LC	Eurasian Tree Sparrow	მინდვრის ბეღურა
46.	*Passer domesticus*	_	LC	House Sparrow	სახლის ბეღურა
47.	*Fringilla coelebs*	_	LC	Chaffinch	ნიბლია (სკვინჩა)
48.	*Fringilla montifringilla*	_	LC	Fringilla montifringilla	მთიულა
49.	*Carduelis carduelis*	_	LC	Goldfinch	ჩიტბატონა
50.	*Carduelis chloris*	_	LC	European Greenfinch	მწვანულა
51.	*Carduelis spinus*	_	LC	Eurasian Siskin	ჭივჭავი
52.	*Coccothraustes*	_	LC	Hawfinch	კულუმბური

4.11.6.4 Aquatic Life

A survey of river habitats and aquatic life along with a desk study were carried out to establish a project baseline. The field survey was performed in May 2011 during which all river crossings were visited and evaluated in terms of fish and their habitats and their sensitivity to the planned works.

This section describes aquatic habitats for each river crossing. The summary lists all fish species recorded in the river crossings and is provided in Table 13.

The Noghela River – The width of the river at the crossing is 5-6 m, and depth 30-40 cm. The river banks are slightly eroded. Five fish species were recorded therethat use the river section for feeding and spawning. Therefore, this river crossing should be considered as sensitive.

The Tekhura River – The river is deep and narrow. The bed is covered by clay. The river flows slowly to the mouth of the river. The width of the river crossing is 40-50 m and the water level is 2.5-3 m. An abundance of fish can be found in the river. It is likely that in the target section, 19 species can be found of the 20 previously recorded in the river as a whole. Fish use this section for foddering, spawning and wintering and therefore, this crossing should be considered as sensitive.

The Tsivi River – The river has 4-5 m high river banks at the crossing which would be prone to scouring. The river bed is covered by silt and fine stone and the waterflow is low. Among 18 fish species recorded in the river, 17 species are likely to be found in this section. Fish use this section of the river for foddering, spawning and wintering. Together with non-migratory fish, other migratory species have been recorded there. These are: Pontic shad (*Alosa pontica*) and European eel (*Anguilla anguilla*). Therefore, the river crossing is deemed sensitive.

Sensitive Areas

In general, the crossings of the Tskaltubo - Senaki Section of the transmission line can be estimated as moderately sensitive in terms of ichthyofauna. However, some of the sections are more sensitive than others due to the diversity and value of the fish species, some of which are protected internationally under the IUCN Red List or the Bonn Convention. These crossings include those at the:

- River Tekhuri
- River Tsivi
- River Tskhenistkali
- River Noghela

Table 123. Fish Species Recorded in the River Sections at Alternative 2

0	Fish Species			River and Sensitivity Assigned					
	Georgian name	English name	Latin name	Gubistskali	Tsknenistskali	Shavitskali	Noghela	Tekhuri	Tsivi
			River Sensitivity	*Low*	*High*	*Low*	*Low*	*High*	*High*
1	კავკასიური ქაშაპი	European chub	*Leuciscus cephalus orientalis*	√	√		√	√	√
2	კოლხური ტობი	Colchic nase	*Chondrostoma colchicum*	√	√	√	√	√	√
4	კოლხური წვერა	Barbus	*Barbus tauricus escherichii*	√	√		√		
5	კოლხური ტაფელა	Colchic bitterling	*Rhodeus colchicus*						
6	გოჭა (ველური კობრი)	Common carp	*Cyprinus carpio*					√	
7	ღლავი (ლოქო)	Catfish	*Silurus glanis*		√			√	√
8	სამხრეთული ფრიტა	Spirlin	*Alburnoides bipunctatus fasciatus*	√	√	√	√	√	√
10	კავკასიური მდინარის ღორჯო	Caucasian goby	*Neogobius cephalarges* constructor	√			√	√	√
12	დასავლეთ ამიერკავკასიური ციმორი	Gudgeon	*Gobio gobio*		√			√	
13	კოლხური (ბათუმის) თრისა	Dunabe bleak	*Chalcalburnus chalcoides*					√	
14	კოლხური თაღლითა (თეთრულა)	Common bleak	*Alburnus alburnus*		√			√	
15	მცირე ვიმბა	Zarte	*Vimba vimba*						√
17	კოლხური ნაფოტა (ტარანი)	Common roach	*Rutilus rutilus*		√			√	√
18	ბლიკა	Silver bream	*Blicca bjoerkna*		√			√	√
19	კაპარჭინა	Common bream	*Abramis brama*		√			√	√
20	მდინარის ფარგა	Zander	*Stizostedion lucioperca*		√			√	√
21	მდინარის ქორჭილა	European perch	*Perca fluviatilis*		√			√	
22	გუწუ (ლოქორია)	Tench	*Tinca tinca*						√
23	მდინარის გველთევზა	European eel	*Anguilla anguilla*		√				√
25	ჭერეხი	Asp	*Aspius aspius*						√
26	წერი	Northern pike	*Esox lucius*			√			
27.	მდინარის კალმახი	Trout, (Sea trout, Brown trout)	*Salmo fario*		√	√		√	√

4.11.6.5 Terrestrial Life

4.11.6.5.1 Plants

The botanical survey of the study area was conducted in the ROWs of four of the rayons (Senaki, Abasha, Khoni and Tskaltubo) of the Senaki I and II transmission line. The possible negative impacts on the adjacent flora have been identified. During the survey some vegetation communities with conservation value as well as rare species and species of economic value have been identified.

Figure 7b: Vegetation Communities KP_34_35

First Section from Tskaltubo to Tskhenistskali River

The Tskaltubo - Menji substation section of the rehabilitation starts from the Tskaltubo substation; goes to the west and then crosses the Kutaisi - Tskaltubo section of the electrified Georgia National Railway roadbed. In this area, the transmission line crosses agricultural land and grazing land.

Afterwards, the route alignment goes westwards, bypassing a wine factory to the north and the ruins of the former furniture factory to the south and continues along the existing ROW. Afterwards the transmission line route moves south-west, crosses bush area, arable land and the rivers Gubistskali and Tskaltubostskali. It crosses the Kutaisi-Khoni highway, bypasses tea plantations in the villages of Jikhiani and Gocha Jikhiani, bypasses the territory of a psychiatric clinic from the south and then goes south-west crossing agricultural land and an unfinished railway in Kutiri and afterwards crosses the Tskhenistskali River. The transmission in this section crosses grazing lands, bushes,

arable lands, former tea plantations, crosses another transmission, telephone lines and then Samtredia - Khoni highway.

In the following presentation, the word 'land-plot' refers to a parcel of land which is considered homogenous. The latitude and longitude numbers provided below define the northeast corner of the land-parcel, looking north.

Figure 5 Land Plot Nr. 1: Grazing Land, Highly Degraded Alder Trees

The GPS coordinates of land-plot Nr. 1 are: N 42^{9} 16' 33.5"; E 042^{0} 35'55.6", 107 meters above the sea level. It contains grazing land and degraded (cut down) sections of Alder trees. The habitat has low conservational value.

Figure 6 Land Plot Nr. 2: Agro-landscape-Grazing Lands Highly Degraded Alder

The GPS coordinates of land plot Nr. 2 are: N 42^{0} 16^{I} 26.2^{II}; E 0420 34I 53.6II, 104 meters above the sea level. Here are agro-landscape-private plots, grazing land, and highly degraded alder trees. The habitat has a low conservational value.

The GPS coordinates of the land plot # 3 are: N 42^0 16^I 25.5^{II}; E 042^0 27^I 06.3^{II}; 92 meters above the sea level, grazing lands, highly degraded sections of alder trees, arable lands. The habitat of a very low conservational value.

Figure 7 Land Plot Nr. 3: Highly Degraded Alder Trees, Highly Arable Land

Figure 8 Land Plot Nr. 3: Grazing Lands, Sections of Degraded Alder Trees

GPS coordinates of land plot # 4 are: N 42^0 16^I 25.5^{II}; E 042^0 27^I 06.2^{II}, 84 meters above the sea level. It contains abandoned tea plantations and grazing land. The habitat has a low conservational value.

Figure 9 Land Plot Nr. 4: Abandoned Tea Plantations, Grazing Land

Figure 10 Land Plot Nr. 4: Abandoned Tea Plantations

Figure 11 Land Plot Nr. 5: Windbreak with Poplar Trees, Corn Fields

The GPS coordinates for land plot Nr. 5 are: N 42^0 16^I 58.0^{II}; E 042^0 25^I 27.1^{II}, 90 meters above the sea level. This is has awindbreak zone made of poplar trees, and it contains corn fields, abandoned tea plantations, and private land plots. The habitat has a low conservational value.

Figure 12 Land plot Nr. 6: Agro-Landscape - Grazing Lands, Former Orchards

GPS coordinates for the land plot Nr. 6 are: N 42^0 17^I 10.0^{II}; E 042^0 23^I 28.3^{II}, 81 meters above the sea level. This land plot contains agro-landscape-grazing lands. The habitat has a low conservational value.

Figure 13 Land Plot Nr. 7: Agro-landscape - Orchards, Corn Fields, Degraded Alder Tree Fragments

GPS coordinates for land plot Nr. 7 are: N 42^0 17^I 31.1^{II}; E 042^0 21^I 57.2^{II}, 81 meters above the sea level. It contains orchards, corn fields, and degraded Alder forest fragments. The habitat has a low conservational value.

Figure 14 Land Plot Nr. 7: Highly Degraded Alder Tree Fragments

Figure 15 Land Plot Nr. 8: Young Elder Trees in Highly Degraded *Gledatschia Triacanthos* Windbreak (Scene 1)

GPS coordinates for land plot #8 are: N 42^{0} 15^{I} 56.8^{II}; E 042^{0} 19^{I} 50.1^{II}, 66 meters above the sea level. It contains grazing lands and young elder trees that have developed into a highly degraded *Gleditschia triacanthos* windbreak. The habitat has a low conservational value.

Figure 16 Land Plot Nr. 8: Young Elder Trees in Highly Degraded *Gledatschia Triacanthos* Windbreak (Scene 3)

Figure 17 Land Plot Nr. 8: Young Elder Trees in Highly Degraded *Gledatschia Triacanthos* Windbreak (Scene 2)

Second Section: from Tskhenistskali River to the Menji Substation

After the transmission line route passes land plots in the villages of Samikao and Makhata, it bypasses the village of Vedidkari and travels along the existing road and river Chitaghele. From here, the transmission crosses the river Abashistskali, arable lands and bushes in the territory of the village of Gejeti and crosses the river Tekhuri. After crossing Tekhuri River, the route goes southwest, then south while bypassing the territory of the Senaki Animal Farm. It then passes settled areas in the east, arable land, a forest and several small gorges.

Afterwards, the route keeps a southward direction as it crosses forest, bushes, grazing lands, arable land and private lands. In the next section, the route turns right towards the southwest, passing arable land and agricultural land of the villages Shkhepi and Senaki. Then sharply turning to the left, it crosses an electrified railway and bypasses Teklaki from the south. It passes through grazing land, arable land, and agricultural land, crosses the Tsivi River and other trasnmission lines, and enters the Menji substation from the northwest. The total length of the transmission line to be rehabilitated is 58.086 km.

GPS coordinates for land plot Nr. 9 (below) are: N 42^{0} 18^{I} 15.1^{II}; E 042^{0} 12^{I} 02.2^{II}, 55 meters above the sea level. There are marshes dominated by rush plants (*Juncus effusus*) with some *Sparganium neglectum*. In places, fragments of degraded alder trees are found along with intrusions of *Clematis vitalba*, *Prunus divaricata*, *Thelycrania australis*. It is a habitat of intermediate conservational value.

Figure 19 Land Plot Nr. 9: Fragments of Degraded Alder Trees

Figure 18 Marsh with Domination of Rush (Juncus Effusus)

GPS coordinates of land plot Nr. 10 (left) are: N 42^0 18'58.4 ''; E 042^0 09' 49.8'', 60 meters above sea level. An agricultural area – corn fields, grazing lands. The habitat is of low conservational value.

Figure 21 Land Plot Nr. 10: Agro-Landscape

GPS coordinates of land plot Nr. 11 (left) are: N 42^0 19^I 15.4 ^{II} ; E 042^0 09^I 15.1^{II}, 58 meters above sea level. Agricultural area with arable land. The habitat of low conservational value.

Figure 20 Land Plot Nr. 9: Fragments of Degraded Alder Trees

GPS coordinates of land plot #12 are: N 42^0 19^I 08.0^{II}; E 042^0 09^I 05.6 ^{II}, 74 meters above sea level. An agricultural area – grazing lands, corn fields. The habitat is of low conservational value.

Figure 22 Land Plot Nr. 11: Agro-Landscape - Arable Lands

Figure 23 Land Plot Nr. 12: Agro-Landscape - Arable Land, Corn Fields

GPS coordinates of land plot Nr. 12 (left) are: N 42^0 19^I 08.0^{II}; E 042^0 09^I 05.6^{II}, 74 meters above sea level. An agricultural area– grazing lands, corn fields. The habitat is of low conservational value.

Figure 24 Land Plot Nr. 13: Degraded Field - Graze Land with Small Fragments of *Carpinus Orientalis*

GPS coordinates of land plot Nr. 13 (left) are: N 42^0 19^I 05.7^{II}; E 042^0 08^I 43.0^{II}, 72 meters above sea level. A degraded field, with instances of *Carpinus orientalis*. The habitat is of low conservational value.

Figure 25 Land Plot Nr. 14: Highly Degraded Hornbeam Bushes with Fragments of *Pteridiumtauricum*

GPS-is coordinates of land plot Nr. 14 (left) are: N 42^0 18^I 48.2 ^{II}; E 042^0 08^I 14.2^{II}, 113 meters above sea level. Highly degraded hornbeam bushes with small fragments of *Pteridium tauricum*. The habitat is of low conservational value.

Figure 26 Land Plot Nr. 15: Degraded Field - Graze Land

GPS coordinates for land plot Nt. 15 (left) are: N 42^0 18^I 02.1 ^{II}; E 042^0 07^I 47.5^{II}, 88 meters above sea level. Degraded grain-multi-grass field-graze land. The habitat is of low conservational value.

Figure 27 Land Plot Nr. 16: Highly Degraded Hornbeam Bushes with Fragments of *Pteridiumtauricum*

GPS coordinates for land plot Nr. 16 (left) are: N 42^0 18^I 05.5 ^{II}; E 042^0 07^I 40.9^{II}, 112 meters above the sea level. Highly degraded hornbeam bushes with fragments of *Pteridium tauricum*. The habitat is of low conservational value.

Figure 28 Land Plot Nr. 17: Highly Degraded Hornbeam Bushes, alder Trees *Alnus Barbata*

GPS-is coordinates for land plot Nr. 17 (left) are: N 42^0 17^I 41.5 ^{II}; E 042^0 06^I 37.3^{II}, 168 meters above sea level. Graze lands, highly degraded hornbeam bushes, alder trees *Alnus barbata*. The habitat of low conservational value.

GPS coordinates for land plot #18 (below) are: N 42^0 17^I 17.7 ^{II}; E 042^0 05^I 40.0^{II}, 141 meters above sea level. West slope of Shkhepi Castle. Highly degraded hornbeam bushes. Graze lands. At places, highly degraded (cut down) Alder trees. The habitat is of low conservational value.

Figure 29 Land Plot Nr. 18: West Slope of Shkhepi Castle

Figure 30 Land Plot Nr. 18: Highly Degraded Hornbeam Bushes, Graze Lands

GPS coordinates for land plot Nr. 19 (below) are: N 42^{0} 17^{I} 03.6 ^{II}; E 042^{0} 02^{I} 18.1^{II}, 75 meters above sea level. Highly degraded fragments of Colchis forests, with fragmental intrusions of: *Gleditschia triacanthos, Ficus carica, Prunus divaricata, Sambucus ebulus, Clematis vitalba*. The habitat is of low conservational value.

Figure 31 Land Plot Nr. 19: Fragment of Degraded Colchis Forest (Scene 1)

Figure 32 Land Plot Nr. 19: Fragment of Degraded Colchis Forest (Scene 2)

Figure 33 Land Plot Nr. 19: Fragment of Degraded Colchis Forest (Scene 3)

GPS coordinates for land plot Nr. 20 (below) are: N 42^{0} 16^{I} 59.2 ^{II}; E 042^{0} 02^{I} 41.2^{II}, 152 meters above the sea level. Graze lands, fragments of a highly degraded forest with intrusions of *Alnus barbata, Thelycrania australis, Corylus avellana, Clematis vitalba,* Rubus sp. The habitat is of a low conservational value.

Figure 34 Land Plot Nr. 20: Fragment of a Degraded Forest (Scene 1)

Figure 35 Land Plot Nr. 20: Fragment of a Degraded Forest (Scene 1)

Sensitive Areas

After conducting detailed botanic studies in the ROW of the planned project, it was possible to identify sensitive areas and create a detailed characterization. Based on a literature review and field studies, only one sensitive area was determined in the project ROW:

> GPS coordinates for land plot #9 are: N 42^0 18^I 15.1^{II}; E 042^0 12^I 02.2^{II}, 55 meters above the sea level. Marshes dominatedby rush plants (*Juncus effusus*) with fragments of Sparganium neglectum. In places fragments of degraded alder trees are found with intrusions of *Clematis vitalba*, *Prunus divaricata*, *Thelycrania australis*, etc.

Existence of Species Entered in the Red List of Georgia in the Project ROW

> As a result of the botanical field study species on the Red List of Georgia were not identified in the project ROW.

It is noteworthy that in the project ROW some rare and vulnerable species can be found. For example: *Clemais vitalba* (the number of which is decreasing), *Fraxinus oxycarpa, Lonicera caucásica, Amaracus rotundifolius* (a rare species), and *Ficus carica* (under the risk of extinction).

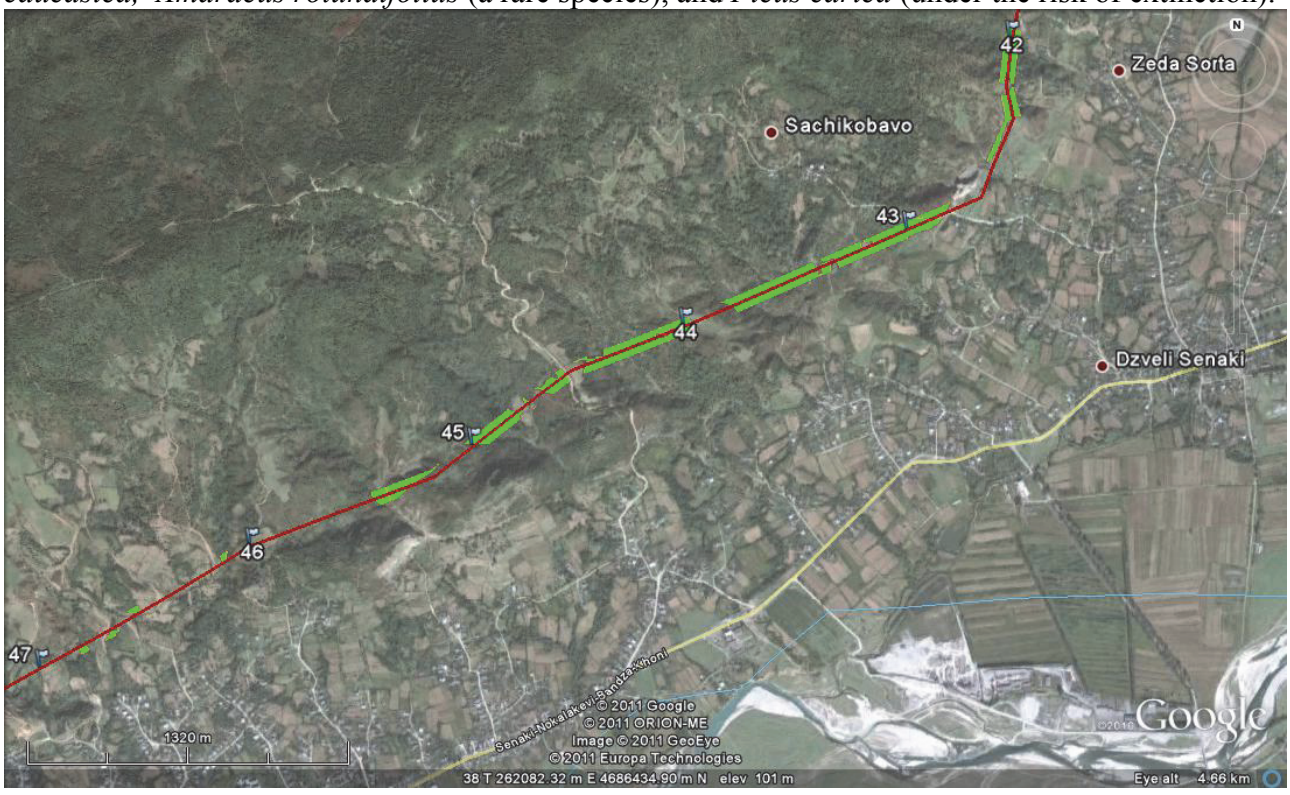


Figure 38: Vegetation Locations KP_42_47

Land Resources

The temporary ROW for the construction of the line is divided into two parts: agricultural and non-agricultural lands

The sections mainly covered by forest are mostly found near the section in the Senaki rayon and near hazelnut farms near the Village of Martvili.

4.11.6.6 Forests

West Georgian forests are divided into sub groups: riparian forests on floodplains, forests found in valleys, and forests on plateaus. The main composition of species in each subtype is presented in Table 14 below.

Table 13 Main Composition of Species in Each Subtype

Riparian forest on floodplains	Georgian Name	English Name	Latin Name
	ლაფანი	Caucasian wingnut	*Prerocarya prerocarpa Knth*
	ხვალო		*Populus hybrida M.B*
	მურყანი	Black alder	*Alnus barbata C.A.M.*
on valleys	ჰართვისის მუხა	Hartwiss' oak	*Quercus hartwissiana Stev*
	რცხილა	Hornbeam	*Carpinus caucasica A.Grossh*
	წიფელი	Oriental beech	*Fagus orientalis Lipsky*
	წაბლი	Sweet chestnut	*Castanea sativa Mill*
Samegrelo Plateau and lowland	დაფნა	Bay laurel	*Laurus nobilis L.*
	ჯაგრცხილა	Oriental hornbeam	*Carpinus orientalis Mill*
	ლეღვი	Common fig	*Ficus colchica A.Grossh*

In addition to the listed species, common species found throughout Georgia are also in Colchic forests. These are large trees of the species listed in Table 39 below:

Table 14. Large Size Trees of Different Species

Georgian Name	English Name	Latin Name
იფანი	Common Ash	*Fraxinus excelsior L.*
ნეკერჩხალი	Field Maple	*Acer campestre L.*
ცაცხვი	Linden	*Tilia multiflora Led*
თელა	Elm	*Ulmus foliacea Gilid*
თელადუმა	Elm	*Ulmus elliptica G. Koch*
მაჟალო	Wild apple	*Malus orientalis Ugl*
პანტა	Caucasian Pear	*Pyrus caucasica An. Fed*
ძელქვა	Zelkova	*Zelkova carpinifolia Dipp*

In the sublayer of forest, common for forests located in wet climates, are the following species: *Hedera colchica C. Koch, ivy Hedera helix L., Vitis silvestris Gmel., Periploca graeca L, Smilax excelsa L., Rubus sanguineus Friv; Rubus candicans; Weihe Rubus abchaziensis Juz Sudre .; Rubus ponticus, Hedera colchica C. Koch, ivy Hedera helix L., Vitis silvestris Gmel., Periploca graeca L, Smilax excelsa L., Rubus sanguineus Friv; Rubus candicans; Rubus abchaziensis Sudre.; Rubus*

ponticus etc. These plants grow on the trunk and branches of trees, creating a secondary green cover in the forest.

The landscape is characterised by shrub forest. The underforest is strong in these areas where the forest has degraded and very dense undercover is growing. The underforest mostly consists of mixed evergreen species and deciduous plants.

Table 15. Species of Bushes Common in West Georgia

წყავი	Cherry Laurel	*Laurocerasus officinalis Roem*
ძმერხლი	Israeli ruscus	*Roscus hypophyllum L*
თაგვისარა	Butcher's Broom	*Roscus pontucus G .Wor*
მაჯაღვერი	Mezereon	*Daphne mezereum L.*

Table 16. Deciduous Type of Bushes

მოცვი	Bilberry	*Vaccinium myrtillus L*
თხილი	Hazel-nut	*Corylus avellana L.*
კოლხური ჯონჯოლი	Bladder-nut	*Staphylea colchica Stev.*
უცვეთელა	Mock orange	*Phyladelphus caucasicus Koehne.*
კვიდო	European privet	*Ligustrum vulgare L.*
შინდანწლა		*Svida australis Pojark*
ზღმარტლი	Common medlar	*Mespilus germanica L.*
დიდგულა	Black elder	*Sambucus nigra L*
კუნელი	Hawthorn	*Crataegus spp.*
ძახველი	Guelder rose	*Viburnum opulus L.*

Forest fragments near the corridor are mostly degraded due to human activity. In the vicinity of the corridor, only near the city of Senaki can healthy forests be seen but along the ROW vegetation cover is degraded.

4.11.6.7 Mountainous Areas

Mountains occur in fragments along this section, mainly to the north of Senaki with downhill and rocky slopes, a soil-weathering crust and volcanic rock.

4.11.6.8 Agricultural Land

Approximately 90-95% of the project ROW passes through agricultural land, including arable lands and pastures. A major portion of the state-owned lands have been privatized since the 1990s. Both in Imereti and Samegrelo-Zemo Svaneti, farmers mainly cultivate one-year crops including maize, vegetables, potatoes, melons, etc. The most common crop for the regions is maize due to the local soil and climate. In Imereti and Samegrelo-Zemo Svaneti, respectively, 76 % and 83 % of arable land produce maize; in the project area, the arable land also mainly produce maize.

4.11.6.9 Urban Areas

The socioeconomic conditions of Imereti and Samegrelo-Zemo are incorporated in the section above. Currently urban water supply, sanitation, solid waste management and water drainage

facilities are under rehabilitation with the help of international donors. The construction of the proposed transmission line will significantly contribute to the improved reliability of electric supply in west Georgia. As such it will contribute to economic growth and new businesses and electricity will supply facilities for water supply, sanitation, and public health, thus improving the quality of life among the urban settlements along the route.

5 ENVIRONMENTAL CONSEQUENCES

This chapter assesses the significance of the potential environmental and social impacts identified during the scoping exercise. A description of the likely impacts arising from each alternative is also included in each subsection in addition to whether an assessment of significance is likely to change if an alternative is adopted. The assessment of significance is a function of both the sensitivity of the receptor and the magnitude of the impact. The significance can then be determined using Table 1-1. The following subsections follow this method and a summary of the direct impacts is provided below. Where significant adverse impacts are predicted to arise, measures to avoid, reduce, or mitigate impacts have been identified throughout this chapter and in the Environmental Management and Monitoring Plan in Chapter 6.

5.1 Environmental Impacts of the Proposed Action and Alternatives

A general method for grading the significance of environmental impacts was adopted to ensure consistency in terminology. The two principal criteria determining significance are the sensitivity of the receptor and the magnitude of the change. Table 5.1.1 shows that the significance of impacts was classed as major, moderate, minor, or none, and either as positive (beneficial) or negative (adverse). This categorization is widely recognized and accepted in the field of environmental impact assessment. Where appropriate, topic-specific assessment methods and criteria for determining significance are described in Chapter 5.

Table 17. Determination of Environmental Impact Significance

Sensitivity of receptor			
Magnitude of change	***High*** *(e.g. international, national protection)*	***Medium*** *(e.g. regional, local protection)*	***Low*** *(e.g. no protection*
High *(e.g. >75% of area or receptor affected)*	Major (H,H)	Major (H, M)	Moderate (H, L)
Medium *(e.g. 25-75% of area or receptor affected)*	Major (M, H)	Moderate (M, M)	Minor (M, L)
Low *(e.g. 5 to 25% of area or receptor affected)*	Moderate (L, H)	Minor (L, M)	Negligible (L, L)
Very Low *(e.g. >0, but <5% of area or receptor affected)*	Minor (VL, H)	Negligible (VL, M)	Negligible (VL, L)
No Change	None (NC, H)	None (NC, M)	None (NC, L)

Another consideration is the duration of impact - whether the impact would be temporary or permanent – and, if temporary, whether impacts would be short, medium, or long term. Defining the duration of the impact can be subjective, depending on the receptor. For instance, following

construction, it may take some time for vegetation to become fully re-established, particularly in drier areas. Although in ecological terms, this period may not be a long time, for the people who use the land for orchards or pastures, this period could be significant and might therefore be considered permanent.

5.1.1 Direct Effects and their Significance

Direct impacts are generally those that occur either within the project footprint (such as habitat disturbance) or as a direct consequence of a project activity (such as visual impact or a waste generated).

The potential sources of impacts of the transmission line in the construction stage are related to site clearance, the establishment of access and construction corridors, foundation excavation, backfilling, site restrictions, etc. When construction will be in place, there will be movements of heavy machinery on site. All these will cause the generation of different types of waste, which can affect the environment. Proper waste management practices will be required in order to minimize such impacts.

Impacts on soil, water and vegetation are also expected during the demobilization of the construction team and the removal of support infrastructure. These impacts can be caused by generated hazardous and nonhazardous materials, construction debris, demobilization of staging areas and vehicle maintenance facilities, sanitary facilities etc.

Direct environmental impacts during the operation period are expected due to frequent movements of the maintenance crews along the transmission line corridor and substations for the purposes of repair and maintenance activities, etc.

The above described impacts represent the **direct impacts** and are addressed in details below.

From the scoping statement[1], these are the potential significant impacts that are to be discussed in this section.

Terrestrial Habitat Alteration

- Vegetation damage, natural habitat (and critical natural habitat) loss along the ROW and access roads and around any substation sites (during construction and during operation)
- Potential for invasive plant species on the ROW
- Habitat fragmentation or disturbance, loss of forest area
- Interference with (migratory) bird and bat flight patterns
- Waste management, discharges, emissions, land degradation and damage to vegetation, disturbance of wildlife during line construction

[1] "Environmental Scoping Statement for Rehabilitation of Tskaltubo – Senaki Transmission Lines and Reconstruction of Substations Menji and Tskaltubo," July 20, 2011; DCN 2010-GEO-004.

Aquatic Habitat Alteration

- Runoff and sedimentation from grading for access roads, tower pads, and substation facilities, alteration of hydrological patterns due to maintenance roads
- Construction activities near or in aquatic ecosystems at water crossings of the ROW
- Discharge of liquid waste into aquatic ecosystems, accidental spills

Impacts on Socio-Economic Issues and Cultural Property

- Disturbance, degradation, or removal of physical cultural assets
- Health effects and nuisance from electromagnetic radiation and ambient noise
- Interference of power line operation with communication systems in the area (telephone, radio, television, etc.)

Waste Materials

- Insulating oil pollution
- Fuels and lubricants used during construction time
- Construction site waste management

Direct Impacts on Land Use

The significance of direct impacts to land use is considered to be of medium sensitivity due to their economic importance. As a result, the ultimate significance of the environmental impacts to land use is classified as high in the protected areas of Alternative 3 and negligible for work in all other sections in Alternative 2.

This section describes the direct impacts of the project and on each alternative for existing land uses. The sensitivity of the land uses at the substation sites and along the majority of the route of the transmission line (and access roads) is assessed as medium. Alternative 2 includes the use of the sites for foundations and towers that were previously built. The proposed action consists of the construction of approximately 58 kilometers of transmission line. Ultimately, new 220-kV conductors (line) will be installed along the entire project route, which will result in a moderate construction impact for land use. Alternative 2 potential impacts on land use include:

- Clearing and maintenance of the 30-meter corridor along the previously constructed but overgrown sections of the ROW.
- Expansion of two existing substations (Menji and Tskaltubo), and construction of towers and transmission lines that would not change the uses of the lands on which the towers are built.

Table 18. Alternative 3,4, 5, and 6

Type of land	*Significance*	*Direct impact*	*Magnitude and duration*	*Impact significance*
Protected Areas	High	Removal of trees and understory shrubs in forested areas, loss of use of non-forested land.	Low overall (Moderate Locally, Permanent as long as vegetation in right-of-way is controlled.	Minor Adverse (Locally Major adverse)
Other areas	Medium	Loss of land use due to new ROW clearing in forested areas and areas lost to access roads, towers and substation improvements	Low overall (moderate locally)	Negligible adverse (Locally Major adverse)

Table 19. Alternative 2

Type of land	*Significance*	*Direct impact*	*Magnitude and duration*	*Impact significance*
Protected Areas	None	None	None	None
Other areas	Medium	Loss of land use due to the existing ROW clearing in forested areas near Senaki	Low overall (Moderate locally)	Negligible adverse (Locally Major adverse)

Table 20. Alternative 1 (No Action)

Type of land	*Significance*	*Direct impact*	*Magnitude and duration*	*Impact significance*
All areas	Medium to High	None	None	None

Direct Impacts from Construction and Conductoring

The most significant impact to land use will be in areas under the transmission line route or access roads to the tower sites. Existing roads will be used as much as possible and as practical. Impacts will be most significant in the forested areas which are near Senaki, where trees and understory species may need to be cleared to support the project. Open grasslands, shrub lands, meadows, and agricultural areas (including lands planted for crops or maintained as pasture) will not be as significantly impacted because those land uses can still be used for those purposes under the transmission lines. Impacts to these areas will be limited to the lost use of the land associated with access roads, towers, and substation improvements. Owners or farmers will be compensated for lost use and lost income. Alternative 2 has the least impact on overall land use and Alternative 3, 4, 5, and 6 has the greatest. Impacts to forested land use account for at least 75 percent of all land use impacts. Alternative 2 affects the least amount of forested area while Alternatives 3, 4, 5, and 6 affects the most since it will require more land to be utilized.

In addition, Alternative 3 crosses Sataplia National Park. The National Park is land that is legally protected under Georgian law and will affect land use in this area. Alternative 2 would require much less forest cutting of branches. Although some of the forested corridor along Alternative 2 was cut in the 1990s, it was not cut to the full 30 meter width; the corridor is recovering and is overgrown with lush grasses, shrubs, and small trees.

In summary, Alternative 2 would require cutting fewer trees and only the branches of trees may be required for cutting. Alteratives 3, 4, 5, and 6 are more sensitive and more forest have to be cut due to the route's new alignment.

Direct Impacts from Operation and Maintenance

Ongoing operation and maintenance activities associated with the towers, access roads, transmission line, and substation improvements will generally not change land use permanently. Ongoing maintenance activities associated with vegetation control in forested areas will be required to prevent the reestablishment of tall trees in the cleared right-of-way areas; vegetation will need to be at least eight meters below the lines. However, the areas affected by ongoing vegetation management in former forest areas are the same as during construction. In most areas, clearing is expected to be required every two to three decades.

Direct Impacts on Air Quality, and Geohazards

This was determined to be insignificant in the scoping statement; therefore, they are not considered in this EA.

Direct Impacts on Surface Water and Groundwater

This section describes the direct and indirect impacts associated with the project on surface water and groundwater resources. GIS-based maps were used to identify and assess the surface water drainage systems, floodplains, wetlands, and the groundwater resources in the study area. Each project activity was evaluated with respect to its direct impact on these hydrologic features and these impacts are summarized in terms of hectares potentially affected and potential flood control impacts.

Direct impacts to groundwater are likely to be minimal due to the nature of the project. Impacts to surface waterways, floodplains, and wetlands will be considered with respect to the relative importance of each impacted resource and resource area impacted by the project.

Activities with potential to affect surface water or groundwater

Construction and operation of the project is not anticipated to have any long-term impact on surface water or groundwater resources. Water availability is not a significant issue because there are no consumptive uses or large amounts of water needed for construction, maintenance, or operation of the planned project.

The main project activities with the greatest potential to impact surface water and groundwater include building access roads, excavating tower and substation foundations, and clearing and grubbing of vegetation for the transmission line right-of-way. These activities can affect water quality and the hydrology of local water bodies and are briefly described below.

• *Access roads.* Road construction, operation, and maintenance activities may cause significant erosion, resulting in increased turbidity and sediment deposition in receiving water bodies, and thus adversely affect water quality, at least temporarily. Cutting and filling activities during road construction may disrupt subsurface hydrologic flow and bring water to the surface in new areas or destabilize sensitive hill slopes which may cause slope failure. Road surfaces may allow water to flow without restriction, resulting in accelerated surface erosion, channel scouring, and transport of sediment loads to water bodies.

• *Transmission Tower and Substation Excavation*. Excavation for transmission tower and substation foundations will remove grass and vegetation, making exposed soil temporarily prone to erosion from wind and rain. At locations of shallow groundwater conditions, dewatering operations may be required in order to temporarily lower groundwater levels in order to install the proposed new foundations and towers, as well as any underground transmission lines. Towers placed in floodplains can disrupt water flow and trap debris which could further impede floodwater flow.

• *Clearing of Transmission Corridor*. Clearing and grubbing of vegetation, trees, and shrubs in forested areas may make the soil more susceptible to erosion and increase water runoff, temporarily increasing the amount of suspended solids and turbidity in receiving waters, and potentially increasing the risk of flooding and sedimentation of drainage systems.

• *Direct Impacts from Construction*

The main impact on surface and groundwater during construction will be potential adverse impacts to water quality and potential disruption of water flow.

Potential Water Quality Impacts

Degraded water quality can be caused by erosion of exposed soil. The resulting sediment that washes downstream can be a major problem for new project development. Earthmoving activities – for example, excavation, vegetation clearing, grading and grubbing for site preparation, and heavy equipment hauling over unpaved ground – disturb soil and create fugitive dust and particulate matter which can be washed into nearby surface waters, resulting in increased levels of turbidity and sediment deposition. These effects can, in turn, impact populations of aquatic organisms in the area.

Table 21. Examples of General Sensitivity of the Water Environment

Sensitivity	Examples
High	- River which supports fish with conservation status or provides major fisheries resources. - River with good water quality (no pollution sources). - Surface or groundwater which is used for drinking water. - Large floodplain.
Medium	- River which supports common fish or provides resource for small scale fishing. - River with fair water quality (occasional pollution sources) - Surface or groundwater used for industry or agriculture. - Small floodplain.
Low	- River which does not support fish resources. - River with poor water quality (pollution discharge sources). - Intermittent or no use of surface or groundwater by humans. - No floodplain.

Tower construction activities and soil disturbance from vegetation clearing done in close proximity to streams will introduce sediment carried in runoff into these streams. It is unlikely that soil disturbances from the small work areas associated with the towers would be carried more than 100 meters from a tower construction site. With each Alternative there are towers located within 100 meters of a stream and some sediment could be carried into these streams during construction. There will be an extensive amount of ground clearing and earth moving activity during this construction. Due to the proximity of the Tskhenistskhali River to the existing ROW, there is a high potential for significant sediment to be carried into the River during rainfall or snowmelt events without proper controls. There will also be some potential for water pollution and contamination from hazardous material or fuel spills during construction, operation and maintenance activities.

Transformers and other substation equipment may contain insulating oils which can contaminate both soil and groundwater if released. Impacts to surface water and groundwater quality resulting from construction or operation of the project can be minimized through the use of best management practices to protect water from sedimentation due to the storm water runoff of excavated materials (for example, silt fencing, hay bales, and re-vegetation as appropriate), dewatering activities, and accidental spill events.

Potential Disruption of Water Flow

Increased water runoff and the resulting disruption of surface flow can occur with development. Altering the natural vegetation and topography of a site may increase runoff flow rates, resulting in more water moving offsite and carrying sediment with it. The increased water runoff may accelerate erosion downstream, increase deposits of sediments and increase the potential for flooding. Such phenomena are particularly of concern in areas with steep topography such as hillsides, ravines, mountain slopes, and similar features.

Paved roads and impervious areas at the proposed substations as well as on access roads will reduce the surface area that is available for infiltration of rain and other precipitation into the ground, thereby reducing the recharge of subsurface aquifers as well as increasing water runoff to surface water bodies. The foundations for the towers are impervious; however, these are so small (less than

one square meter for each foundation) as a percentage of the overall infiltration in the right-of-way that they will have a negligible impact on groundwater infiltration of surface water runoff.

Placement of towers in floodplains can disrupt water flow and could trap debris in the river, which could further disrupt river flow. During periods of high water flow (for example, spring run-off), this could result in flooding of upstream areas. The locations for these towers should be examined carefully to choose locations that will be least likely to impede flow.

Operation and Maintenance

The main impact on surface water hydrology during operation and maintenance of the project will be the increase in vulnerability to erosion and subsequent impacts on water quality. The following types of operation and maintenance activities could lead to potential soil erosion and adverse impacts to water quality:

- Periodic clearing of vegetation as part of normal right-of-way and access road maintenance activities may make soil more susceptible to erosion. Vegetation clearing will also increase water runoff. This could be a long term and permanent impact along right-of-way areas that are presently shrub land and forest as these areas will not be allowed to fully revert to these habitats.

- Soil and water contamination can occur from the use, improper handling, and spill of hazardous materials, such as insulating oils, wood preservatives, paints, and other toxic substances which could be used during the operation and maintenance of the project. Other contamination would result in a short-term impact with the potential to become a long-term impact without mitigation measures. No herbicides will be used so there will be no contamination from herbicides.

Impact Summary and Significance

The significance of the environmental impacts to surface and groundwater quality associated with this project is the same for all alternatives (except the no action alternative) and are summarized in Table 23. As a receptor, the surface water potentially impacted by the project is classified as medium sensitivity because the potentially impacted streams have fair water quality, some industrial pollution and relatively small floodplains. The magnitude of change, as described in Table 22. Significance of Environmental Impact: Surface Water and Groundwater Quality for all alternatives is greater than 0 but less than 5 percent of the overall receptor area, indicating a very low magnitude of change. As a result, the significance of the environmental impacts to water associated with this project is classified as “Negligible” for Alternatives 2 and as “High” for Alternatives 3, 4, 5, and 6.

Table 22. Significance of Environmental Impact: Surface Water and Groundwater Quality

Environmental Receptor	*Sensitivity of Receptor*	*Direct impact*	*Magnitude of Impact and Duration*	*Significance*
Streams and Rivers	High	Sedimentation caused by runoff from compacted soil, rutting from vehicle and equipment traffic on bare ground	Very low Temporary but could be permanent	Negligible adverse
		Placement of towers in Flood plains can impede flood flows and produce flooding in upstream areas.	Low Permanent	Minor adverse
		Clearing of trees and shrubs make the soil more susceptible to erosion and dust generation as the soils under these plants are now exposed to wind and precipitation.	Very Low Permanent	Minor adverse
		Sedimentation caused by runoff from right-of way and access road clearing.	Very low Temporary	Minor adverse
		Soil contamination can occur from the use, improper handling and spills of hazardous materials, such as fuels and petroleum lubricants, insulating oils, wood preservatives, paints, and other toxic substances which could be used during the construction of the project.	Very low Temporary but could be permanent	Minor adverse
		Vegetation control techniques that use herbicides (project does not use herbicides) can introduce contaminants into the soil, surface water, and groundwater	Very low Temporary but could be permanent	Negligible adverse

Direct Impacts on Ecosystems, Animals, and Plants

This section describes the impacts to ecosystems, flora, and fauna from construction, operation and maintenance of the proposed project and alternatives. Impacts to dominant flora, known fauna, and potential species of special concern (for example, from the International Union for Conservation of Nature (IUCN) Red Lists) are assessed for each ecosystem, and a description of the specific habitat requirements for each protected species is provided. Direct and indirect impacts associated with the project and all alternatives on these ecosystems and species are discussed.

This section of the EA specifically describes the direct and indirect impacts of the project with respect to habitat alteration, the increased risk of forest fires (an impact to habitats and ecosystems), and avian and bat collision and electrocution (an impact to fauna) consistent with *Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution (*IFC/WB, 2007). Additional mitigation measures and best management practices are provided in that guidance.

For areas, habitats, and ecosystems where species of special concern may be affected, this section includes recommendations for pre-construction surveys to be conducted to determine their specific locations and the suitability of the habitat in the area to support them. These surveys are to be performed before the specific tower and access road locations and the installation techniques for each are known and proposed. This will ensure that design modifications and mitigation techniques can be considered in the detailed design phase.

The sensitivity of the areas along the transmission line is described in the sensitive area section. These areas are where the most significant impacts can be expected, so the details of the areas or of the plants, fish and animals that could be affected, are not described again in this section.

Project Activities That May Cause Impacts

The main project activities with the greatest potential to impact ecosystems, flora and fauna include the construction of the transmission line right-of-way, access roads, and substations as well as the installation of conductor wires and maintenance activities along the transmission corridor.

- *Clearing and Construction*. Construction of the transmission line right-of-way and towers (including rehabilitation), access roads, and substations may transform habitats depending on the characteristics of existing vegetation, topographic features, and installed height of the transmission lines.

  In addition, animals and plants could be injured or crushed, and individual animals could be disturbed by noise and visual disturbances due to the presence of machinery, construction workers, transmission towers, and associated equipment. Some impacts would be permanent (for example, the tree removal on the right-of-way, use of land for foundations/towers, etc.) and some temporary (for example, vegetation removal or crushing in the lay down area, human activities).

- *Conductor Installation*. Impacts from the installation of transmission conductor wires would be relatively short-term and temporary. Vehicular traffic and machinery to pull the conductor wire and unloading activities at the staging (lay down) areas can cause physical impacts such as injuring or crushing animals and plants. Installation of conductor wires over the entire length of the transmission corridor will cause noise and visual disturbances that could temporarily disturb and displace various animal and bird species.

- *Maintenance Activities*. Disturbances from noise and the physical presence of machinery and workers will occur during activities such as mowing, weed cutting, tree trimming, inspections, tower and foundation repairs, and maintenance of damaged or downed transmission wires.

Direct Impacts on Terrestrial Habitat

The construction, operation, and maintenance of substations and the transmission line right-of-way, especially for sections that pass through forested areas, will result in the alteration and disruption to terrestrial habitat. Excavation, grading, and earthmoving activities physically disturb and remove topsoil which contains plant seeds and invertebrates which are critical for a healthy ecosystem.

Erosion and associated loss of topsoil become a concern in terrestrial habitats due to construction activities.

Work crews will gain access to tower locations by driving to existing road crossings and entering the right-of-way by driving over the ground or along dirt access roads. Neither permanent nor temporary paved or gravel access roads are proposed to be constructed in the right-of-way which will greatly reduce direct impacts.

Maintenance activities for the project to control vegetation are to be conducted every six to eight years. Herbicides are not to be used for vegetation control, which reduces the direct impacts to plants and to terrestrial habitat.

An adequate terrestrial habitat is critical for the survival of plant species and must provide suitable food resources, territory, loafing areas, nesting sites, and reproduction dens for birds and animals that depend on the ecosystem. The major impacts of the project are expected to be the loss of wildlife habitat including the fragmentation of forest, an increased potential for forest fires, and the establishment of non-native invasive species due to site development and the presence of construction workers, vehicles and machinery, the disturbance of soil and vegetation, and the trimming and removal of trees. These are described in more detail below.

Terrestrial Habitat Modifications. Habitat modifications associated with transmission line construction can adversely affect wildlife populations but can also result in certain positive impacts (presented in next Section). Right-of-way clearing during the transmission line construction process can result in a loss of suitable habitat, which is a leading cause of the decline of many plant and animal species including threatened and endangered species. Biodiversity may be reduced in the construction areas because certain species of plants and animals may be unable to tolerate the disturbance and subsequently leave the area, at least temporarily. Biodiversity of importance is described above. There are specific species that should be protected during construction and during maintenance activities. Maintenance, if not using herbicides and other types of pesticides, would not be a concern.

Migratory pathways can be affected such that seasonal migration patterns can be interrupted or modified, at least during the construction period. It is noted that the construction period at any one location will be relatively brief, about one or two weeks or less.

Forest Fires. If underlying growth is left unchecked, or if slash from initial construction or routine maintenance is left to accumulate within or near the corridor right-of-way, sufficient fuel may be available to promote forest fires. Regular maintenance of vegetation (every six to eight years) within the right-of-way is necessary to avoid damage to overhead power lines and transmission towers. Vegetation maintenance is needed since unchecked growth of tall trees and the accumulation of vegetation may result in power outages through the contact of branches and trees with energized transmission lines, the ignition of forest and brush fires, the corrosion of steel equipment, and interference with critical grounding equipment. Forest fires may also be started by construction and maintenance activities if workers are not careful with use of flammable materials and fuels.

The ROW can help reduce the impact of forest fires by providing fire-breaks (areas were the vegetation is much less and a fire may have a harder time crossing). Also, the ROW can serve as an access path or trail for fire crews to reach the site of a forest fire.

Invasive Exotic Species. Intentional or accidental introduction of alien or non-native flora species into areas where they are not normally found can be a significant threat to biodiversity since some alien species can become invasive, spreading rapidly and outcompeting native species. The potential is limited and can be adequately controlled by using only native species and their seeds when revegetating areas where activities have had to remove vegetation.

Clearing or cutting branches of forested habitats along the project route will be the only significant change in habitat type. Once the vegetation has been cleared away, the ground will naturally revegetate.

Due to the potential risk of introducing invasive exotic species in the forested habitats of the project, some mitigation measures may be needed. For example, vehicles and machinery that comes from other parts of Georgia or from other countries should be cleaned to remove seeds and cuttings from the wheels, tracks, under-carriage, and beds.

Direct Impacts on Aquatic Habitat

Construction and maintenance activities may negatively impact water quality of streams, water bodies and groundwater, resulting in direct impacts on local aquatic habitat and downstream river biota, communities, and fisheries. Impacts to water quality may result from the erosion and accumulation of sediment and organic debris in water bodies (for example, at stream crossings of the transmission line right-of-way and access roads). Chemical contamination may occur from the use and spills of liquid fuels or lubricants, equipment coolants, and transformer lubricants. Increased nutrient loads may result from the erosion and use of fertilizers. Changes in stream flows may affect fish and aquatic biota populations.

Increased Turbidity and Sediment Deposition. Cutting and filling activities can result in accelerated surface erosion, channel scouring, and sediment transport which can lead in turn to increased turbidity and sediment deposition in receiving water bodies. The same can occur when vehicles cross small streams or when vehicle traffic reduces vegetation cover near streams. Such impacts can adversely affect water quality and, in turn, the health of fish and aquatic invertebrates by interfering with respiration, feeding, and other activities. Depositions of large amounts of silt and sediment can also cover critical habitat and spawning grounds, making them unavailable for use and can smother incubating eggs.

The chapter above on surface water hydrology impacts concluded that impacts to water quality are not expected to be significant; therefore, the impacts to the wildlife that use these habitats will also be insignificant. However, impacts on a specific small stream or wetlands could be possible in Alternative 3. For that reason, project activities will avoid activities near and in water as much as possible, and any damage to stream banks or streambeds will be repaired when work is concluded.

Disruption of Watercourse. Power lines and associated roads and facilities may require heavy machinery working in, or the construction of crossings over, aquatic habitats. Such activities may disrupt affected watercourses and wetlands, physically uproot aquatic vegetation, and interrupt fish migration and spawning patterns. Slash and debris from construction and maintenance clearing can accumulate in ditches and other drainage structures, enter lakes, streams and wetlands, and block natural hydrologic flow and migratory pathways. Cutting and filling activities may disrupt surface and subsurface hydrologic flows and bring water to the surface in new areas including existing streams and rivers. Hydrologic changes (i.e., changes in flow rates; flow velocities; etc.) can result in conditions that are unsuitable for certain species or life stages.

The overall impacts to water flow are not significant; therefore, the impacts to the wildlife that use these habitats will also be insignificant. However, impacts on a specific small stream or wetland could be significant. For that reason, the project is to avoid activities near and in the water as much as possible, and any damage to stream banks or streambeds will be repaired when work is concluded.

Invasive and Exotic Species. Intentional or accidental introduction of alien or non-native species of flora and fauna into aquatic areas where they are not normally found can be a significant threat to biodiversity, since some alien species can spread rapidly and out-compete native species. Invasive, exotic species may force resident species out of the area, introduce diseases which existing species have no resistance to, compete with indigenous species, or lead to increased predation of resident plants and animals. There are no activities anticipated that will occur close to aquatic habitats that could introduce invasive exotic species into these habitats.

Direct Impacts on Fauna. Direct impacts to fauna would occur from bird and bat collisions with towers or wires during migration, local movement or when animals and their dens or nests are located at or near a tower, access road, or substation will be placed. These are described below, along with mitigation measures.

Avian and Bat Collisions and Electrocutions. The combination of the height of transmission towers and the electricity carried can pose potentially fatal risks to birds and bats through collisions and electrocutions.

Avian collisions with power lines and transmission structures can occur in large numbers if located within daily flyways or migration corridors, or if bats or groups of birds are traveling at night or during low light conditions such as dense fog. Bird species characterized by rapid flight and the combination of a heavy body and small wings run a high risk of colliding with power lines because of their lower speed of reaction to unexpected obstacles. Among the fauna that could be at risk from collision with wires are mainly bats and sparrows.

For electrocution to occur, a bird or bat must either (a) touch two wires at the same time, or (b touch one wire and earth (ground) at the same time.

- Conductors (wires) of the 220 kV lines will be spaced far enough apart to prevent birds from touching two wires at once.

- Insulator strings of the 220 kV line at the towers are longer than the wing spans of nearly all birds, so it is improbable for a bird's wings to simultaneously touch a phase conductor and the tower steel (which is grounded). Furthermore, the insulator strings consists of a series of round glass or plastic plates, which are hard for birds to perch upon.

Den and Nest Destruction. In most cases, animal and bird species are mobile and would be likely to vacate an area prior to significant disturbance activities and thus avoid direct impacts. However, during breeding and rearing seasons, which for various species could range from March through July or August, animals and birds may not be willing or able to leave the area. During breeding and rearing, installation of foundations, towers, substations, access roads, and the driving over areas of the right-of-way can destroy or damage nesting and den areas for animals. In addition, the noise and other disturbances from construction could disrupt or stop breeding or rearing for a season. In general, construction would take place in only one year, so any direct impacts would normally occur during only one year.

Significance of Impacts. There are no areas identified where important or rare birds or animals could be affected; therefore, the direct impact to fauna in these high sensitivity areas is classified as insignificant. The two most common species identified in the territory were bats and sparrow.

Mitigation for Direct Impacts. Two broad categories of mitigation will be necessary, one intended for direct impacts to birds and the other for terrestrial animals. Mitigation measures for birds include:

- During the breeding season for raptors, cranes, and other large birds of concern, a pre-construction survey will be conducted by a qualified expert immediately prior to any construction or other activities in the areas identified. If any active nests are identified, then artificial nest platforms (at least three for every recently used nest) will be constructed at least 0.5 kilometer from any area where there will be disturbance.

- If at all possible, both construction and maintenance in areas should be conducted outside of breeding season, which lasts from about April to July or August.

- Conductors (wires) are to be spaced farther apart than the wingspan of large birds (approximately three meters), and towers will be constructed so as to be "bird-proof" as possible.

- So-called "bird diverters" should be placed at intervals along the conductor wires on as much of the east-west portions of the line as possible. These are shiny metal objects that spin in the wind and catch birds' attention and cause them to avoid the wire.

- If locations are found to have nests of raptors or protected species, bat roosting sites, or Brandt's hamster colonies, or any other such areas related to protected species, these may not be disturbed or destroyed without permission from the relevant authorities.

Direct Impacts on Flora

Direct impacts to floral species and communities are likely to occur anywhere a tower is located or a vehicle travels. As noted in Chapter 4, there is no significant impact on flora except for in marshes. The specific direct impacts to floral species will depend on where new towers and access roads are located and on the species composition around existing foundations and towers. Detailed botanical surveys were conducted by a qualified expert during the baseline period. The survey identified the degree of risk that project activities will have on marshes and whether mitigation measures are needed.

The baseline information provided during the survey is reported in this document and relevant mitigation measures are determined in Chapter 6. Each location that needs mitigation will be surveyed again during and after implementation of the approved mitigation. The baseline conditions documented in the plan will also be compared to post-construction monitoring results to allow an evaluation of mitigation necessity and success. If necessary, the mitigation can be adjusted as needed until it meets its original goals.

Several types of mitigation could be used, including such activities as:

- Modifying construction or other activities to reduce or prevent any impacts (for example, moving a staging area or re-routing a planned access road).
- Preventing vehicle or worker access to some areas (with fencing or flagging, for example).
- Moving the tower(s) of concern, which may be possible in areas where no foundations have been constructed.
- Relocation of plants away from the site. This not practical for shrub and tree species, including the plants characteristic to forested areas, but could be possible for grass, flowers, or other smaller species.
- Collecting plants or seeds for use in later reinstatement.
- Placing currently unprotected areas that support the same species under the same degree of protection as the project area formerly provided (also known as forest eco-compensation program, or forest off-set). The goal would be to establish or protect an equivalent area of forest or other ecosystem.
- Monitoring during and after construction to detect damage or destruction to species of concern, and measurement of the success of mitigation and allowing of adjustments to mitigation as needed.

Direct Impacts Ecosystems

In addition to the impacts discussed above, the project was assessed with respect to the potential for impacting ecosystems, flora, and fauna in specific areas along the project route. Ecosystems are described in Section 4 and these ecosystems are the basis for flora and fauna. The criteria for assessing the sensitivity of ecological impacts and the magnitude and significance of impacts are described below.

Forested ecosystems are of medium sensitivity as they are regionally and economically important habitats; in protected areas, they are of high sensitivity. Outside of protected areas, ecosystems are considered to be of low sensitivity as they are not protected or particularly unique. None of the

impacts would affect much of the ecosystem as a whole; therefore, the magnitude of change is classified as very low. Based on this information, the significance of impact to all ecosystems is considered to be negligible.

Because the transmission line crosses protected areas under Alternatives 3, 4, 5, and 6, there could be major adverse impacts to ecosystems, flora, and fauna from all of these Alternatives. Thus, the significance of their impacts is generally similar for all Alternatives (except the no action Alternative). Alternatives 3, 4, 5, and 6 will require clearing a 30-meter corridor of trees, but retaining the low lying vegetation of grasses, and shrubs. This would have a significant effect on the forest ecosystem. Alternative 2 requires clearing and cutting of branches in the forest near Senaki. The ROW corridor was last cut in the 1980s, and it is now over grown with shrubs and bushes. The impact of trimming the vegetation under the Alternative 2 route is essentially the same impact as the trimming of vegetation under the Alternatives 3, 4, 5, and 6 routes.

Direct Impacts to Soil

This section describes the direct and indirect impacts associated with the project on geology and soil. GIS-based maps were evaluated to identify geological issues (other than those discussed in Chapter 5) and assess soil types along the study area for each alternative. The main impacts on soil and geology are likely to arise during various site preparation and construction activities. However, soil will also be vulnerable during the operation and maintenance phase.

Activities with the Potential to Affect Soil

Project activities with the greatest potential to affect geology and soil include clearing and grubbing of vegetation for the transmission line right-of-way and access roads, excavation for tower and substation foundations, and ongoing operation and maintenance. These activities are described below.

- *Clearing and grubbing*. The clearing of trees and shrubs would make the soil more susceptible to erosion and dust generation as the soil under plants become exposed to wind and precipitation. The right-of-way and access road clearing can also increase sedimentation carried in water runoff. Under Alternatives 3, 4, 5, and 6, there are areas along the corridor that would be most susceptible to erosion.

- *Excavation*. Excavation for transmission tower and substation foundations would remove grass and vegetation, expose soil, and make the soil more prone to erosion from wind and rain. The disturbance potential would be greatest during excavation for transmission line tower structures since these can be up to several meters deep while substation foundations would be shallower and affect less soil volume. A total of 214 towers will be constructed under Alternative 2. The potential for soil erosion from construction will be highest at these tower locations so mitigation will be required.

- *Operation and Maintenance*. There will be direct impacts due to soil erosion and compaction associated with driving maintenance vehicles over the right-of-way during operation and maintenance, although this would only happen once every few years. Additionally, there would be some small potential for soil contamination if there were leaks of (non-PCB-

containing) insulating oils from transformers or spills of fuel and oil from vehicles. The potential for erosion and contamination would be highest where the corridor crosses rivers.

Soil Erosion Impacts

Loss of vegetation and soil compaction increases soil's vulnerability to erosion. It can be difficult for vegetation to re-colonize bare and compacted areas of ground. Once vegetation is lost and not restored, the areas affected by erosion often tend to spread through the effects of wind and rain. Soil will be particularly vulnerable when the ground is wet and when vehicle traffic is likely to cause the greatest damage.

The rrosion of exposed soil can occur during project development by causing water pollution from sedimentation due to soil being transported to water bodies. As indicated above, heavy equipment hauling over unpaved ground may loosen soil and cause fugitive dust and particulate matter to become airborne. The potential risk for erosion is increased by placing project components in areas with steep slopes, on unstable soils such as peat, humus and alluvial soils, and on clay which is fine-grained and susceptible to dust and erosion in dry conditions.

Direct Impacts from Contamination of Soils

Paints and other toxic substances could be used during the construction, operation, or maintenance of the transmission line. In addition, substations typically use transformers. Paints, fuel, and other hazardous materials are often stored at substations as well as in associated maintenance shops.

The towers and conductors should not present a hazard with respect to soil contamination unless paint or other coating is used. The conductors are aluminum, which should not corrode or rust. The towers are made of steel. The leaching potential for elements from these structures is extremely low. If paint or another coating is used to prevent rust or corrosion of the steel towers or to protect aluminum from the elements, drips and spills could contaminate the soil.

- *Insulating oils.* Polychlorinated biphenyls (PCBs) were widely used in the past as a dielectric fluid to provide electrical insulation, most commonly found in transformer equipment. Although their use has been largely discontinued due to potentially harmful effects on human health and the environment, the equipment for this project is not to contain PCB insulating oils. PCBs will not be used in new transformers. The plan is for the contractor to provide and use test kits that detect PCBs in, for example, the soil and underneath where old circuit breakers and transformers were installed so that if the area is contaminated it can be cleaned per the appropriate procedures.

- *Wood pole preservatives*. While wood preservatives should not pose a risk along the transmission route due to the use of steel tower structures, there may be some soil contamination impact from the leaching of preservative-treated wood if preserved wood is used at the substations. In addition, such poles may be stored in piles at the substation and could also leach preservatives. Poles are typically treated with creosote or chromate copper arsenate. This leaching could contaminate the soils.

- *Petroleum fuels and lubricants*. Liquid petroleum fuels and lubricants for vehicles and other equipment pose a risk of contaminating soils if spilled or leaked during construction as well as during operation and maintenance activities.

- *Herbicides and pesticides.* All vegetation control along the ROW and at the substations is to be done mechanically and not chemically with no pesticide or herbicide use.

- *Paint.* Paint is likely to be used on substation components and buildings and may be used on the towers. Spills of stored paint and drips from painted equipment could contaminate soil.

Construction Impacts

The main impact on soil during construction would be the increase in vulnerability to erosion and the potential for soil contamination. The potential types of impacts are the same for all alternatives except the no action alternative, which would have no impacts. The following types of construction activity could lead to potential soil erosion or contamination:

- Vehicle and other construction equipment traffic along access roads and the right-of way during construction may cause soil compaction, soil rutting, and dust generation. Additionally, mud could be carried off the site on vehicle tires and could result in sedimentation in off-site areas. This would be a short-term impact with a potential to become a long-term impact without mitigation measures during operation and maintainence phases..

- Vegetation will be cleared from shrub and forest areas and at least some soil will be removed for the construction camps, the substation and expansions, tower foundations and work areas, and access roads. The clearing of trees and shrubs make the soil more susceptible to erosion and dust generation because it exposes soil to wind and precipitation. Right-of-way and access road clearing, where needed, also increase water runoff. This would be a long term and permanent impact for towers and substations if grass is not restored after activities are completed.

- Blasting for tower foundations will result in the removal of vegetation and topsoil and near-surface rock. This will remove the natural erosion and wind control elements and make the soil susceptible to increased erosion and dust generation. Restoration of bare ground after construction will make this impact temporary.

- Soil contamination can occur from the use, improper handling and spill of hazardous materials, as described above. This would be a short-term impact with a potential to become a long-term impact without mitigation measures.

- Alternatives 3, 4, 5 and 6 would affect the greatest expanse of soil due to their extra length in winding around the Caucasus Mountains and the new foundation excavations on the way south to the river Rioni.

- Alternative 2 would affect the least amount of soil.

- The no action alternative (Alternative 1) would not affect any soil and is not discussed any further here.

Operation and Maintenance Impacts

As described for construction, the main direct impact on soil during operation and maintenance of the project would be the increase in vulnerability to erosion and potential for soil contamination. The following types of operation and maintenance activity could lead to potential soil erosion and contamination:

- Vehicle traffic along access roads and the right-of-way during construction may cause or make worse any soil compaction and soil rutting. Additionally, mud could be carried off site on vehicle tires and could result in sedimentation in off-site areas. This will be a short-term impact likely to occur every few years with a potential to become a long-term impact without mitigation measures. The highest potential would be at river crossings and where roads are near streams and rivers.

- Periodic clearing of vegetation as part of normal right-of-way and access road maintenance may make the soil more susceptible to erosion. Again, the highest potential would be near river crossings. Right-of-way and access road clearing could also increase water runoff. This could be a long-term and permanent impact along right-of-way areas that are presently shrub land and forest because these areas will not be allowed to revert to these previous habitats. Mitigation could reduce either direct impact.

- Soil contamination could occur from the use, improper handling, and spill of hazardous materials that may be used during the operation and maintenance of the project. Herbicides will not be used so there would be no contamination by herbicides. Any contamination would be a short-term impact with a potential to become a long term impact without mitigation measures.

Once construction is complete, there should be a minimal need for vehicles to travel along the right-of-way and along access roads except for periodic vegetation management activities and to respond to damage from vandalism or natural causes. Routine access would normally only occur every few years. The extent of soil impact during operation and maintenance would be substantially lower than during construction and has been characterized as negligible adverse overall, with potential for impacts to be moderate on a local basis unless these impacts are mitigated.

Impact Summary and Significance of Direct Impacts to Soils

The significance of direct impacts to soils is generally the same for all Alternatives (except the no action Alternative) and is summarized in Table 23. Significance of Environmental Impact: . As a receptor, soil is classified as high sensitivity due to national regulations addressing erosion protection and environmental contamination. As a result, the significance of the environmental impacts to soil associated with this project is classified as “minor” for Alternative 2, moderate significant for Alternatives 3, 4, 5, and 6, and “none” for Alternative 1.

Table 23. Significance of Environmental Impact: Soils
Action Alternative

Environmental Receptor	*Sensitivity of Receptor*	*Direct impact*	*Magnitude of Impact and Duration*	*Significance*
Soils	High (Subject to national regulation/ protection)	Soil compaction, soil rutting, and dust generation from vehicle and other construction equipment traffic along access roads and right-of-way	Very low Temporary but could be permanent	Minor adverse
		Mud could be carried off the site on vehicle tires and could result in sedimentation in off-site areas.	Very Low Temporary	Minor adverse
		Clearing of trees and shrubs make the soil more susceptible to erosion and dust generation as the soils under these plants are now exposed to wind and precipitation.	Very Low Permanent	Minor adverse
		ROW and access road clearing also increase sedimentation carried in water runoff.	Very low Permanent	Minor adverse
		Blasting for tower foundations will remove vegetation, topsoil, and near-surface rock making the soil susceptible to increased erosion and dust generation.	Very low Permanent	Minor adverse
		Soil contamination can occur from the use, improper handling and spills of hazardous materials, such as fuels and petroleum lubricants, insulating oils, wood preservatives, paints, and other toxic substances which could be used during the construction of the project.	Very low Permanent	Minor adverse

No Action Alternative

Environmental Receptor	*Sensitivity of Receptor*	*Direct impact*	*Magnitude of Impact and Duration*	*Significance*
Soils	High (Subject to national regulation/ protection)	No impacts	No change	None

Public and Occupational Safety

Nearby residents. Nearby community members could be affected by noise, dust, accidents, and other disturbances, mostly during construction. People and property, including livestock, could be harmed by falling towers and live lines in case of any line or tower failure (from earthquakes or high winds, for example). The construction company is to provide information on security measures that local communities should take. This will include a pamphlet in local languages that outlines activities, dangers and the steps that community members should take to avoid accidents. Residents are to be instructed when it is especially dangerous to be under or around the lines (during extreme winds and electrical storms, for example), measures to take to ensure that they will be protected, and to stay away from downed lines or towers. During construction and for the entire time the line is in operation, the construction company is to establish a 24-hour emergency contact telephone number for reporting problems or damage to the line.

Noise that will be generated by vehicles and heavy equipment should not be excessive. However, because it could disturb nearby residents and others, noise disturbances during construction, operation and maintenance will be managed by controlling the working hours: typically 08:00 to 19:00 hours. Measures will be taken to minimize noise and advance notice will be given to communities about the type, duration, and severity of noise.

During operation, a low, normal, buzzing sound will be audible under the TL and perhaps a few meters outside the line's width. This could be louder during wet weather. However, it should not be audible from the nearest residence, which will be over 30 meters away.

Overall, the direct impact on public safety will normally be negligible, but could be major adverse in case of serious accidents.

Transmission line workers: Workers will be subject to injury or death from falls, falling objects, electrocution, heavy equipment use, vehicle accidents, and possibly from contact with solvents or other chemicals. The construction company is to develop and implement a safety program that meets international norms and will ensure that every manager and worker receives training before they perform any work on the line and that workers are provided refresher training at least every year thereafter. This applies to temporary workers as well.

Every day, each crew is to participate in a safety meeting/briefing, and the languages of all crew members will be used. At this meeting, the crew will be told the day's activities, the hazards that may encounter, actions to take or to avoid in order to minimize risk, and how to respond in case of

illness or injury. The foreman and at least one other person in every crew will be trained in first aid, and each crew will have a first aid kit with them at all times. Foremen are to always know where the nearest medical facilities are located, and should have the telephone number available at all times.

Forest Fires. A fire prevention and management plan will be prepared before construction begins, and will be updated as needed. All workers will be trained in safe practices. The construction company will take action against workers who engage in unsafe practices or who cause fires. As noted previously, woody debris from cutting trees and brush in the corridor will not be left where it can contribute to forest fires but will be removed. If permission is granted by the authorities, woody debris may be burned in place under strictly controlled conditions and with firefighting equipment ready to take action if needed.

Trespassers: Trespassers could be subject to injury or death if they climb on towers or interfere in any way with the conductors (lines). Each tower will have appropriate signs – in Georgian and in the language of nearby residents – that warn trespassers of the risk of electrocution, falls, and other dangers. The sign will also have the 24-hour telephone number to which emergency calls can be made.

Direct Impacts on Public Health

Disease

If during excavation there is an outbreak of anthrax, the construction company should notify relevant parties. The Ministry of Health will provide instructions on how to proceed in covering carcasses and taking other action to prevent anthrax. In such cases, the construction company will pay for medical monitoring of all workers who could have been exposed. If construction or maintenance takes place in areas where other diseases (plague, for example) have been detected in the recent past, they will consult with the Ministry of Health and take whatever action is directed by the Ministry.

Human Trafficking and HIV/AIDs is a potential impact on public health. In order to avoid these issues, construction companies will be required to have a public awareness campaign to avoid the problems described in Section 6 of the EMMP.

Electrical and Magnetic Fields

Overview. Electric and magnetic fields (also known as electromagnetic fields or EMFs) are invisible lines of force emitted by and surrounding any electrical device, including power lines and electrical equipment (such as home appliances). Electric fields are produced by voltage -- they increase in strength as the voltage increases, and they are measured in volts per meter (V/m). Electric fields are blocked or shielded by materials that conduct electricity, and other materials such as trees and buildings. Magnetic fields result from the flow of electric current and they increase in strength as the current increases. They are measured in units of gauss (G) or tesla (T), where 1 T equals 10,000 G. Magnetic fields pass through non-metal materials but are easily attenuated (reduced) with metal sheets and beams. Both electric and magnetic fields decrease rapidly with distance.

Although there is public and scientific concern over the potential health effects associated with exposure to EMF radiation (not only from high-voltage power lines and substations, but also from everyday household uses of electricity like cell phones), there is limited empirical data demonstrating adverse health effects from exposure to the typical EMF levels characteristic of power transmission lines and equipment. While the evidence of adverse health risks is weak, an evaluation of EMF impact is still warranted in environmental assessments.

The construction and operation of this project is not anticipated to have any significant impact to nearby residents or the environment due to electric and magnetic fields. The World Health Organization (WHO) published its latest review of EMF research in June 2007 and experts concluded that EMF radiation does not cause any long-term, adverse health effects (WHO, 2007). EMF exposure from the operation of the planned project's power lines (<12.6 milliGauss at the edge of the right-of-way) is lower than the average exposure from household electrical appliances that are used every day. The level of EMF associated with the operation of the proposed project will not change over the project life although the levels of magnetic field will vary somewhat with variations in load demand by hour, day, week, and season.

This section describes the potential effects that electric and magnetic fields (EMF) associated with the project may have on local nearby residents. The Georgia Ministry of Energy and Natural Resources has established a 100-meter distance from 220kV transmission lines as the potential human impact zone for EMF radiation and does not allow anyone to live within 30 meters of a 220kV transmission line (that is, of the nearest energized line, which would be the outside edges of the corridor).

This section also identifies mitigation measures that are typically employed to eliminate or minimize impacts from EMF radiation and provides an assessment of how each may be applied to this project. These mitigation measures will be based on those practices typically employed for similar projects in Europe and the U.S. Additional mitigation measures are provided in International Finance Corporation / World Bank guidance (IFC/WB 2007).

Activities that generate EMF. Project activities that will generate EMF include operation of the energized transmission line and substations. The EMF in the range of power line frequencies typically range from 50 to 60 Hertz (Hz) and are considered Extremely Low Frequency (ELF). The most common impact from nearby power transmission lines is electrical interference with sensitive equipment, such as computer monitors.

Potential Human Health Impacts. Over the last 30 years, extensive research has been conducted in the U.S. and around the world to examine whether exposure to EMF radiation has adverse health or environmental effects. Exposure to EMF radiation is affected by the types of electrical sources, the distance from these sources, and the amount of time spent near these sources. Scientific research has focused on magnetic fields, since objects such as trees and walls act as physical barriers that easily block and shield electric fields.

In most homes, background alternating current magnetic field levels average about 1 milligauss (0.001 gauss), resulting from wiring within the home, appliances, and power lines outside the home. Since the intensity of magnetic fields diminishes quickly with distance from the source, few homes

are close enough to transmission lines for the lines to have an impact on the magnetic field level within the home. Rather, the major source of residential magnetic field levels comes from electrical appliances within the home. The average daily exposure is the composite of instantaneous, high exposures (such as driving under a power line) and long-term, low exposures (such as wiring within a home).

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) reviewed the epidemiological and experimental evidence and concluded that there was insufficient evidence to warrant the development of standards limiting long-term exposure to EMF radiation. Rather, the guidelines put forth in its 1998 document set limits at much higher field levels to protect against direct short-term health effects (for example, stimulation of nerves and muscles, a shock-like effect) that are known to occur at very high exposure levels. The ICNIRP recommends a residential exposure limit of 833 mG and an occupational exposure limit of 4,200 mG (ICNIRP, 1998). Also, the International Committee on Electromagnetic Safety (ICES) recommends that exposure for the general public be limited to 9,040 mG (ICES, 2002). Both standards are designed to provide a very large margin of safety.

The exposures of workers and persons living in close proximity to the proposed project transmission lines should be below these guidelines. Based on EMF exposure levels cited in the National Institute of Environmental Health Sciences June 2002 report titled “EMF, Electric and Magnetic Fields Associated with the Use of Electric Power” (NIEHS, 2002), an electrical worker has an average EMF exposure of 9.6 mG, and typical EMF levels 20 meters from a 500 kV power transmission line is 29.4 mG, decreasing to 12.6 mG at 30 meters. Based on this data, the EMF field levels within and at the edges of the 100-meter wide corridor of the proposed project and at the edge of the 30-meter buffer zone, should be well below the levels recommended by the ICNIRP and the ICES (12.6 mG exposure compared to ICNIRP recommendation of 833 mG).

Research on EMF radiation in residential settings and on health was prompted by a 1979 epidemiological study of children exposed to EMF radiation, mostly from neighborhood transmission lines. A weak statistical association has been reported in some studies between childhood leukemia and an average exposure to magnetic fields greater than 3 - 4 mG. Hundreds of studies have subsequently addressed almost all issues that have been raised on EMF and health impacts. These later studies did not find convincing or consistent evidence to suggest that EMF exposure was higher or more frequent in children with leukemia, thus supporting the idea that EMF is not a cause of cancer. Since there is very little support in other areas important for evaluating causation (for example, similar findings in animal studies and a plausible biological mechanism), the overwhelming scientific consensus is that these findings are insufficient to establish a cause-and-effect relationship between residential EMF exposure and childhood leukemia. Rather, most researchers agree that where associations exist in epidemiology studies, they are likely the result of study design issues such as bias or confounding.

Using a weight-of-evidence approach to evaluate this large body of research, the scientific consensus of numerous organizations is that no cause-and-effect relationship between EMF from any source and ill health has been established at the levels typically found in residential environments. As a result, no scientific organizations have recommended standards to prevent long-

term health effects (such as cancer), nor are there any standards in the U.S. or most countries for limiting exposure to the levels of EMF typically encountered in people's everyday lives.

However, Russia and former Soviet Union state have established safety or hygienic protection zones (SPZs or HPZs) that limit exposure to EMF. Georgia's *Rules of Installation of Electric Equipment*-ПУЭ (Ministry of Energy, undated-2) establish a buffer zone of 30 meters (measured from the outermost line) within which there can be no residents. In addition, Georgia's *Rules of Installation of Electric Equipment*-ПУЭ (Ministry of Energy of Georgia, undated-2) establish a buffer zone of 30 meters as the minimum distance from occupied houses to transmission lines.

Environmental, Animal and Plant Impacts. EMF power from sources in the 50 to 60 Hz frequency range carry little energy, has no ionizing effects, and usually has no thermal (heating) effect. Because EMF in the range of power line frequencies is far too weak to damage molecules or break up DNA, they cannot lead to mutational changes or cancer. EMF radiation can cause very weak electric currents to flow in the body. In animal studies, scientists exposed rat and mice test subjects to electric or magnetic fields, some as high as 50,000 mG, and compared the amount of disease they observed to the amount of disease observed in animals that had not been exposed. WHO concluded in their June 2007 review of EMF and health (WHO, 2007) that no consistent adverse health effects, including cancer, were reported in animals even after exposure to high levels of electric and magnetic fields.

Overall, the research does not establish that EMF exposure causes or contributes to any disease or illness.

Aviation Traffic

Currently Georgian economy is under development and the system of internal aviation within the country is very low. The area where the TL is constructed is not used for aviation. The only airport located nearby is Kopitnati near Kutaisi which is not under operation at this stage.

Summary of Direct Impacts

This section summarizes the direct impacts on all the environmental and socioeconomic resources. There are several moderate to major adverse impacts associated with this project that will require mitigation:

- For Alternatives 3, 4, 5, and 6 construction and ongoing operation of the transmission line in Tskaltubo National Park, the Caucasus Mountains, and the Kolkheti lowland will create a moderate to major adverse impact on aesthetics and views for tourists and naturalists. This cannot be completely avoided, except possibly by adjusting some locations so that towers in hilly or mountainous terrain cannot be seen from specific high-use areas. The impact would be reduced under Alternative 2 by staying within the existing RoW. Alternative 2 avoids the National Parks so there would be no impacts under that Alternative.

- For Alternatives 3, 4, 5, and 6 the construction of towers, access roads, and ongoing maintenance activities may have a major adverse impact on flora in the sensitive areas.

- For Alternatives 3, 4, 5, and 6 the construction and operation of transmission lines could have a moderate to major impact on migratory birds and bats due to collisions and electrocution, especially in areas where the transmission line is near Kolkheti protected territories flyways.

- For Alternatives 3, 4, 5, and 6 the construction of towers, access roads, and ongoing maintenance activities may have a major adverse impact on nesting raptors and other large birds. This impact is less significant for Alternative 2 since the access road is already existing.

- For Alternatives 3, 4, 5, and 6 the construction of towers, access roads, and ongoing maintenance activities may have a major adverse impact on fauna in protected areas and in sensitive areas. Alternative 2 should have the least impact due exiting route.

- For Alternatives 3, 4, 5, and 6 construction and operation may require several households to be relocated to residences farther from the line. This will be a matter of negotiation in accordance with Georgian law, with compensation or alternative housing agreed to by the landowner or resident.

- For Alternatives 3, 4, 5, and 6 construction or maintenance could damage crops or herds and have a moderate to major impact on subsistence farmers and herders. This can be avoided or reduced by adherence to best management practices for vehicle movements and tower construction sites, and further mitigated by compensation in accordance with the National Legislation.

In addition, most adverse impacts that are minor or negligible will be reduced or avoided altogether by the use of best management practices. Avoidance strategies, mitigation measures, and best management practices are presented as part of the Management and Monitoring Plans in Chapter 6.

Preferred alternative

Alternative 2 was determined to be the environmentally preferred alternative following evaluation of direct impacts for all alternatives. As noted previously, it was selected following visits to the site that made a preliminary evaluation of flora and fauna in and near the selected area.

Key advantages of this alternative, and disadvantages of others, include:

- Much less disturbance to the existing environment than Alternatives 3, 4, 5, and 6. Alternative 2 would reduce the number of towers and the associated land clearing and disturbance. This in turn would significantly reduce visual impacts as well.
- Placement of the line within Alternative 2 results in minimal environmental and social impact when compared with Alternatives 3, 4, 5, and 6.
- Much less disturbance overall than Alternatives 3, 4, 5, and 6 which run many additional kilometers in order to go all the way around Tskaltubo National Park to the North.
- Much less direct impact to plants and animals, especially rare ones. Alternative 4 runs near existing access roads.
- Using existing roads for access will significantly reduce the new disturbance in the area compared to Alternative 3, 4, 5, and 6.
- Fewer disturbances to land at the new substations Tskaltubo and Menji and less direct impact on nearby residents.

5.1.2 Indirect Effects and Their Significance

No significant indirect impacts (secondary or chain impacts) such as the degradation of surface water quality by the erosion of land cleared (like it may occur in road or railroad case) are expected, because the Tskaltubo-Senaki transmission line follows the existing transmission line along already disturbed areas. The ROW will be restored to baseline conditions and include the mitigation of residual impacts of previous projects and maintenance activities.

Increased economic growth in Svaneti and Samegrelo regions will be beneficial for Samegrelo and Svaneti regions. These areas are under tourism development. This will create work for the population and they will generate income. The construction of the proposed TL will contribute significantly to economic growth and new business.

Positive indirect impact is anticipated as a result of the improved electricity supply to the west Georgia regions as well as new electricity distribution to particular villages along the Southern (Red) alternative route. This may, to a certain extent, facilitate local development especially development related to the improvement of agricultural production (green houses, fruit and vegetable processing, etc.).

5.1.3 Cumulative Effects and Their Significance

Cumulative impacts occur when the addition of single impacts from a number of individual events results in a compounding effect. Although each impact may not be significant alone, cumulatively these impacts may be significant if they occur close together in terms of location and time, resulting in incremental, widespread, and often slow change of environmental conditions. One of the main reasons for rejecting Alternatives 3, 5, and 6 is the significant increase of potential cumulative impacts due to the E-60 highway construction and pipeline construction activities.

For Alternative 2 the combination of construction effects such as dust, noise, and visual impact will cause little disruption to those living and working along the proposed transmission line route given the fact that the settlements are located mostly 150-200 m and more from the transmission line. No other significant construction projects (like road or railway rehabilitation) are expected along Alternative 2. The cumulative impact of noise and emissions (dust) on protected areas, habitats and especially migratory birds should not be significant due to the remote location, mobile/moving source, and very short construction period.

The cumulative environmental impacts of the proposed project can be mitigated by a set of mitigation measures comprising the following:

(i) Good pre-construction surveys by the Contractor to determine specific mitigation measures where possible and appropriate;
(ii) Careful planning of construction works and coordination with other projects and construction activities in the area;
(iii) Adequate provision of environmental mitigation via clauses in work sub-contracts (technical specifications for site clearance, grading, excavation, fill and site reclamation);
(iv) Proper development and implementation of site-specific detailed environmental management plans (based on this EA and EMMP); and
(v) Efficient contract management.

Based on the above, the proposed E-60 East-West Highway reconstruction and pipeline construction activities have been identified as having the potential for possessing cumulative effects in combination with Alternatives 3, 5 and 6. This cumulative impact complicates design solutions related to restrictions for safety distances between infrastructure and has the potential for an overlap of construction activities.

5.1.4 Area of Land Disturbance

Construction activities will be undertaken within ROW, which will generally be 30 m wide. The majority of land crossed by the transmission line are agricultural and pasture land. The transmission line will have a minimal impact in terms of landscape, ecology and human disturbance. The impacts on agricultural operations are generally short–term and confined to the construction phase. During construction, normal agricultural usage of the land within the working area will be temporarily suspended, although it is anticipated that public rights of way will be maintained or a diversion or temporary closure will be applied for.

Following the completion of all transmission line construction works, the land within the working area will be fully reinstated in the staging areas and an entire reinstatement may not be required. Shrubbery sections removed will be replanted and field boundary and stock fences re-erected.

As mentioned above, the main portion of the project corridor passes through agricultural and pasture lands; accordingly the only forest resources in vicinity of the corridor are near the City of Senaki. Project implementation does not include the sections covered by natural landscapes and the forested area is very small near Senaki. The remaining forests are either secondary growth or degraded on agricultural or pasture land after they have been abandoned.

There will therefore be no permanent loss of land. In most instances, following construction this will not affect the existing land use although conditions will usually be attached to the servitude agreements restricting certain activities to ensure that there is no accidental damage to the transmission line.

The assessment indicates that there is likely to be little if any impact to residences along Alternative 2 as a result of the Proposed Action. At the same time, the impact to residences along Alternatives 3, 4, 5, and 6 may be significant due to its complicated landscape and narrowing corridor.

5.1.5 Possible Conflicts between Proposed Action and Land Use Plans

Land use and development policies and controls are largely within the purview of the Ministry of Regional Development and Infrastructure of Georgia, the agency responsible for municipal governance and oversight. No policies or controls have been identified which will impact transmission line rehabilitation work.

Alternative 2 of the transmission line will not require any resettlement of individuals or communities from their homes. Communities living on or near the transmission line route will experience some effects from the project. There will be some disruption to the use of agricultural land. The majority of the transmission line route passes through low population rural areas with a low number of houses especially where agricultural and pasture activities are predominant. The project will also involve impacts on land, productive assets, and livelihood throughthe temporary use of land for construction purposes. The project will impact privately owned land. However, GSE will compensate the land owners for the lost crop with accordance to the Georgian regulations.

There will be temporary disruptions to communities during conductoring of the transmission line, the construction of associated facilities, and the effects from the influx of construction workers. Concerns are also raised around the safety for local residents and their property during construction of the transmission line and during the operational phase of the transmission line.

The above mentioned risks have the potential to appear in Alternative 3 by passing densely populated areas at a distance of about 50-60 m from houses. The elimination of such risks can be achieved only through resettlement of affected residents that will create a negative social impact. Also the local land use plans will be affected, limiting the development prospective in the subject area and increasing impact on community.

5.1.6 Energy Requirements and Conservation Potential

It is expected that the transmission line project completion would result in an increase in energy consumption in west Georgia. The increase in energy consumption will come from Georgia's renewable hydro power sources and not from fossil fuel based sources. Furthermore, the switch to renewable hydro power electric energy will reduce the deforestation of the area for fire wood and reduce the use of fossil fuels for heating and cooking.

Within the area that will be impacted by the project, the rural population relies on traditional household fuel (wood, bushes, turf/peat, crop residues and animal waste) for its energy needs. Non-sustainable production and the use of fuel wood leads to deforestation and severe environmental degradation in some areas. However, local fuel will not be required during the construction phase of the project as all power requirements will be met using diesel generators. All energy requirements will be met by importing fuel. No significant impacts to forests or wetlands are anticipated to result from fuel requirements.

5.1.7 Natural or Deployable Resource Requirements

Rehabilitation of the transmission line will not require the use of noticeable quantities of natural resources. The country is well supplied locally with concrete and various types of inert and aggregate construction materials, as required (in small quantities) for the proposed rehabilitation activities. All required materials are to be supplied from licensed sources.

5.1.8 Conservation Potential of Various Requirements and Mitigation Measures

Based on baseline data and available information, there are no species requiring conservation or special mitigating measures; however, a pre-construction survey must be conducted prior to construction and special fauna and flora conservation plans need to be developed by the construction companies.

5.1.9 Urban Quality

The socioeconomic conditions of Imereti and Samegrelo-Zemo Svaneti regions for Alternative 3 and 4 routes have been described above. Currently urban water supply and sanitation, solid waste management and storm water drainage facilities are under rehabilitation with the help of international donors. The construction of the proposed transmission line will contribute significantly to economic growth and new business.

5.1.10 Historic and Cultural Resources

The loss of archaeological, historical and cultural heritage is an irreversible process and, for that reason, historical and archaeological sites are legally protected in Georgia. Nearby the project is

Shkhepi Castle near the City of Senaki. A detailed list of the archaeological monuments in the region is in Annex D: Letter of Ministry of Culture About Monuments Located Within the TL .

In view of this risk, a Chance Finds Procedure should be developed by the Contractor as a part of a Cultural Heritage Management Plan to ensure that any important archaeological material is properly recognized, recorded and preserved if necessary. Should any archeological deposits be found, a fully measured, drawn and photographic survey should take place prior to any further work in the area. Additional mitigation measures should be agreed to with the Department of Historical Monuments under the Ministry of Culture of Georgia. If, as a result of the work method statement developed by the Contractor, there is a possible impact on any cultural monument, this impact should be avoided and the method statement revised. In the unlikely event that an impact is genuinely unavoidable, further mitigation measures should be agreed to with the Department of Historical Monuments under the Ministry of Culture of Georgia. Impacts on cultural heritage during the operations phase of the Project will be of low to negligible significance.

5.1.11 Means to Mitigate Adverse Environmental Impacts

During the assessment of social environment and the sources of potential effects, none of the impacts in Alternative 2 have been identified that cannot be mitigated at the construction and operation stage. Mitigation measures are presented in Section 6.

5.1.12 Comparison of Remedies Available for the Environmental Consequences of Alternatives

The analysis conducted in detail in Section 3 and Section 5 of this report summarizes impacts for Alternatives 2, 3, 4, 5, and 6 with respect to feasibility, ability to meet project goals, environmental impact ranking, costs, and schedule for completion of the project.

Based on the impact analysis and comparison of Alternatives undertaken throughout this report the following conclusions are made:

Alternatives 3, 4, 5, and 6 are not feasible due to following disadvantages:

- In order to avoid water crossings, new pastures and green lands and additional kilometers of the land need to be utilized for tower foundations and for the ROW. In addition, it will be required to fell trees which will cause an impact on flora and fauna species protected under the Red Book. The route will end in the Caucasus Mountains where high mountain plants are the subject of protection. In addition it will be required to build new towers. For the ROW purposes, resettlement issues will also be critical. The route will also cross the Sataplia protected territory. Therefore, this route will cause more impact on environment than Alternative 2.

- To avoid river crossings, Alternative 4 goes to the north shore of the Rioni which will again require new alignments to determine the level of new disturbance on the environment and on protected species. The route will need to cross the E-60 East-West Highway, which is already under construction, and will increase the cumulative impacts and complicates design solution.

- There are a number of complicated crossings with different types of infrastructure: several railway crossings, high voltage power line crossings, municipal infrastructure crossings (water supply, communication cables, local roads, etc.). These significantly increase the construction costs for ROW. The most important environmental impact is that the Alternative 4 route will disturb migratory passes.

An environmental consequence ranking is undertaken in Section 5 based on a detailed impact analysis for these Alternatives.

In summary, the Alternative 2 route has been identified as more feasible and environmentally acceptable based on the ranking results (with an "average" calculated as "LOW") and it is selected as the preferred Alternative due to following factors:

- ✓ More efficient alignment;
- ✓ The route runs through less urbanized areas;
- ✓ No property demolition required, families will not be relocated;
- ✓ No interference with new highway construction;
- ✓ No multiple crossings with urban infrastructure;
- ✓ Not many protected species under the Red Book;
- ✓ Few existing significant archeological sites;

5.2 Adverse Impacts that Cannot Be Avoided

The proposed project would result in small or temporarily unavoidable adverse impacts that are discussed in detail in Section 5. Many adverse effects could be avoided through the mitigation measures presented in Section 6. None of these effects are considered to be significant.

5.3 Relationship between Short Term Uses of the Environment and Maintenance and Enhancement of Long Term Productivity

The construction of this proposed transmission line will result in short-term uses of land. After the construction is finished the ROW will be reinstated to original conditions and during the operational phase of this proposed transmission line the land could be used for other purposes with certain restrictions, as described above.

Short-term impacts on the environment would be associated with construction activities. They would include impacts on aesthetics, , air, wetlands, and transportation environments. Aesthetic impacts affecting nearby residents would include effects on viewsheds from land-clearing activities and increased noise levels. Aesthetics and air quality would both experience short-term impacts from emissions and dust. The impacts to vegetation and wildlife along the ROW would be considered short-term because those resources would likely be reestablished after the completion of construction activities. Short-term impacts would also include traffic diversions and disruptions.

In the long-term, the project would support the objectives of improving clean energy (electricity) supply to west Georgia by minimizing the use of local firewood, peat and other ecologically-sensitive energy sources.

5.4 Irreversible and Irretrievable Commitment of Resources

A resource commitment is considered irreversible when impacts from its use would limit future use options and the change could not be reversed, reclaimed, or repaired. Irreversible commitments generally occur to nonrenewable resources such as minerals or cultural resources and to those resources that are renewable only over long timespans, such as soil productivity. A resource commitment is considered irretrievable when the use or consumption of the resource is neither renewable nor recoverable for use by future generations until reclamation is successfully applied. Irretrievable commitments generally apply to the loss of production orharvest of natural resources and are not necessarily irreversible.

The rehabilitation of Tskaltubo-Senaki Transmission Line is considering the permanent acquisition of land under the towers (foundations) and substations. (The substations already exist and have existed for decades.)

The majority of the land crossed by the transmission line is agricultural and pasture land. The transmission line will have a minimal impact in terms of ecological, agricultural and human disturbances. The impacts on agricultural operations are generally short-term and confined to the construction phase. During construction, normal agricultural usage of the land within the working area will be temporarily suspended, although it is anticipated that public rights of way will be maintained or a diversion or temporary closure will be applied for.

Following the completion of construction works, the land within the working area will be fully reinstated as near as practically possible to its former condition. In most instances, following construction this will not affect the existing land use although conditions will usually be attached to the servitude agreements restricting certain activities to ensure no accidental damage to the transmission line.

6 ENVIRONMENTAL PLANS

The construction, operation, and maintenance of this power transmission line and substations could have a moderate or major adverse impact on several environment and social resources. It is therefore imperative that precautions be taken to ensure that significant adverse effects be avoided, reduced, or otherwise mitigated. This will take a concerted effort from the Ministry of Environment of Georgia, Georgia State Electrosystem, Tetra Tech and the construction companies to ensure that proper design and operating procedures are implemented throughout the project, and that the mitigation measures called for in this Chapter are incorporated into the requirements for design, construction, operation and maintenance of the line.

6.1 Environmental Management and Monitoring Plan

The Environmental Management and Monitoring Plan (EMMP) is developed to clearly identify mitigation measures that should be implemented to minimize, reduce, or eliminate moderate and major adverse impacts identified in the EA. In addition, the EMMP also identifies best management practices (BMPs) and other mitigation measures that will minimize, reduce, or eliminate some negligible and minor impacts that could escalate to become more important if they are not handled properly. The EMMP also ensures close scrutiny over the actual environmental and socioeconomic performance of the project and allows prompt action to be taken to rectify any practices that do not adequately mitigate actual impacts. Tables below comprise the EMMP for the Tskaltubo-Senaki Transmission Line and the Tskaltubo and Menji Substations rehabilitation projects. The contractor, as part of their contract with USAID, is required to perform site-specific EMMPs, pre-construction surveys, ecological surveys and other reports as required by the client, and to submit these reports to USAID. These measures include training for workers so they are familiar with the practices required in the EMMP. The EMMP should be regularly updated as the project progresses through the different phases and experience is gained as to actual practices and their actual impacts.

Tetra Tech will review and audit the contractor's report to USAID to ensure whether the contactor is fully complying with the required practices and mitigation measures.

The environmental impacts that may result from construction, operation, and maintenance of the Tskaltubo-Senaki Transmission Line Project are described in this EA. The Sections above specify appropriate mitigation measures that need to be implemented to mitigate or reduce potentially significant impacts and a monitoring program that is needed to verify the effectiveness of the proposed mitigation measures in reducing impacts and also to allow mitigation measures to be refined or developed as needed to address actual impacts or to develop plans for future development.

More specifically, the objectives of this Environmental Management and Monitoring Plan (EMMP) are to:

- Record project impacts during construction and operation.
- Evaluate the effectiveness of mitigation measures and identify any shortcomings.
- Meet legal and community obligations.

- Allow refinement and enhancement of mitigation measures to further reduce impacts.
- Allow development of mitigation measures to deal with unforeseen issues or changes in operations.

This EMMP describes the parameters to be monitored, the activities to be executed, sampling locations, time and frequency of monitoring activities, and the collection, analysis, and reporting of monitoring data. Environmental monitoring activities should be based on direct and indirect indicators of emissions, effluents, and resource use applicable to the particular project.

The table below presents the EMMP for pre-construction, construction, and operational phases of the Tskaltubo-Senaki transmission line project. As part of their contract with USAID, the contractor will be responsible for all monitoring, logging, reporting, and archiving activities during the construction phase, and the results are to be reported to USAID. USAID, in turn, will forward the relevant documents to GSE, the Ministry of Environment, and other appropriate Government entities of Georgia.

The following table presents the key points of the environmental mitigation plan.

The Impacts are rated as follows in the following table.

1. Minor Beneficial
2. Negligible
3. Negligible Adverse
4. Minor
5. Minor Adverse
6. Moderate
7. Adverse
8. Moderate Adverse
9. Major
10. Major Adverse
11. Required

6.1.1 Permitting Phase

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
Georgian and USAID regulatory compliance for power transmission lines and substation construction projects	Issues to consider: Compliance with national and international standards and requirements in environmental conservation and carrying out EA for power transmission line and substation construction projects.	Required for further project implementation	Ensure that all government and funding and co-funding agency requirements and procedures relating to the EA are complied with. This preliminary assessment should be completed prior to the construction stage and should verify that: 1. All necessary permits for Project construction and operation are or will be obtained after the EA submittal (construction permit, permit for entering and crossing National Parks and Protected Areas, if any). 2. All issues, associated with land use, property and ROW acquisitions are resolved, coordinated, or negotiated, including national and USAID requirements for compensation, payments and potential resettlement of residents along the route. 3. Completion of the analysis of project design and specifications and its cumulative impacts on environmental and socio-economic conditions. The analysis is to ensure the Project is in line with best international practices and allows incorporation of appropriate measures to minimize, reduce, or avoid adverse environmental and socio-economic effects of the project implementation with an enhancement of beneficial impacts. 4. Assurance that properly developed environmental and monitoring plan will be in compliance with USAID and national standards.	The monitoring indicators are: 1. Scoping Statement approved by USG; 2. US EA approved by USG; 3. Georgian EA approved by GoG; 4. Construction Permit issued by MoESD; 5. All land parcels are registered; and, 6. Servitudes have been obtained for all land parcels of the entire ROW.
Planning for construction, pre-design	Protection of flora andfauna	Required by this EA	1. As part of planning and design, do a thorough ecological baseline assessment to identify species populations and habitats of special concern. 2. During the clearing of the route, mark areas of the concern and minimize disturbance to flora and fauna.	1. Areas of concern are clearly marked, and confirmed as such during monitoring visits. 2. Areas that are environmentally sensitive identified elsewhere in this EA (for example, see section Animals, page

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
			3. Incorporate flora and fauna requiring special protection into the chance finds procedure developed for cultural resources. 4. Preparation of Emergency Prevention and Management Plan. 5. Preparation of Fuel Handling and Waste Management Plan for construction phase.	58) are indicated in plans as such by using the abbreviations VU, CR, and EN. These areas are marked with stakes at least 1 meter high, painted yellow, or with yellow ribbon (tape) at least 5 cm between each of the stakes. The construction company shall develop these two plans fifteen days after signing of the contract with USAID. 3. These two plans are to be submitted to USAID, who is to review and approve them.

6.1.2 Pre – Construction Stage

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
Power transmission line, ROW, and substations planning	Impacts and issues to consider: 1. Adverse impacts on land use 2. Adverse impacts on environmental conditions	1. Negligible to Moderate Adverse 2. Negligible to Major adverse	• Alternatives analysis to estimate relevant impacts of each alternative for power transmission line routes. • As much as possible avoid critical habitat areas through use of existing utility and transport corridors for transmission and distribution, and to avoid existing roads and tracks for access roads, whenever possible. • Give special consideration to minimizing the number of river crossings and to avoid settlements and residential areas.	Will be completed when this EA is approved by the USG BEO and when the Georgian EA is approved by the MoE.
			• Carry out extensive public consultations during the Project Planning phase, e.g. siting of power line, • Site power line and substations with due consideration to environmental and community concerns.	Will be completed when this EA is approved by the USG BEO, and when the Georgian EA is approved by the MoE.
	Occupational, public health, and safety issues (Electromagnetic Fields)	Negligible to non - existent.	1. Avoid areas potentially dangerous to site the power line and substation locations, such as schools, residential areas, offices etc.) 2. Establish a minimum 30 meter wide buffer zone (15 m buffer zone from the centerline on both sides of the power line). 3. No new structures are to be located within the 30 m wide ROW. 4. Any existing structure within the 30 m wide ROW has to be moved out, and the land user compensated by GSE.	1. Will be completed when this EA is approved by the USG BEO and when the Georgian EA is approved by the MoE. 2. The ROW is 30 meters wide. 3. All Servitude Agreements are to contain requirements that no construction, old or new, is allowed in the ROW
Planning for the access roads and staging area	Impacts to consider: 1. Physical impact on soil, vegetation clearing, surface and groundwater, loss of land (grasslands) and alteration of habitats 2. Soil erosion	Range 1. Negligible to Major Adverse 2. Negligible to Minor Adverse 3. Negligible 4. Negligible Adverse	1. If any new roads are required, clearly identify and demarcate access roads on detailed topographic maps before construction. 2. Identify access points from main roads where crews can access tower locations by driving along ROW as much as possible to minimize the need for access roads outside the ROW. 3. Confine equipment to demarcated areas and assign temporary staging areas,	1. New roads are indicated on the topographic maps, and confirmed as such during auditing trips. 2. Access points to new roads are indicated on the topographic maps and at the main roads, and confirmed as such during auditing trips. 3. Equipment is confined to demarcated areas and temporary staging areas, and confirmed as such during auditing trips.

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
	3. Contamination of soil with litter 4. Local contamination of surface and groundwater from oil, petrol and other hazardous materials spills.		where majority of equipment will be temporarily stored and maintained, and wash down areas where equipment can be regularly cleaned and sediment-, oil-, and grease-laden run-off can be captured and treated 4. Develop and implement run-off and erosion control measures, especially in mountainous, hilly terrain areas and on slopes. Implement these measures for both construction and operation periods. 5. Develop a Waste and Hazardous Materials Management Plan for the construction staging areas. 6. Clearly demarcate access roads where construction equipment will be moved and stored. 7. Clearly demarcate construction, other equipment storage areas and temporary tank farm areas, and fueling area. 8. Confine vehicles to demarcated roadways. 9. Provide erosion control measures at the staging areas. 10. Establish native grasses around the staging area after construction works are completed.	4. Item Number 4 at left, run-off and erosion control measures, is complied with, and confirmed during auditing trips. 5. Waste and Hazardous Materials Management Plan must be written and submitted to USAID within 15 days of the signing of the contract between the construction company and USAID. 6. Item Number 6 at left, access roads where construction equipment will be moved and stored.is clearly demarcated, is complied with, and confirmed during auditing trips. 7. Item Number 7 at left, construction, other equipment storage areas and temporary tank farm areas, and fueling are clearly demarcated, is complied with, and confirmed during auditing trips. 8. Item Number 8 at left, vehicles confined to demarcated roadways, is complied with, and confirmed during auditing trips. 9. Item Number 9 at left, erosion control measures provided at the staging areas, is complied with, and confirmed during auditing trips. 10. Item Number 10 at left, native grasses around the staging area completed after construction work is completed, is complied with, and confirmed during auditing trips.
Pre-construction survey, ecological survey	Habitats, and ecosystems where species of special concern may be affected	Negligible to Major adverse	The construction company is to conduct pre-construction or/and ecological surveys to identify species and develop any mitigation measures during the construction period	Confirmed during auditing trips
220 kV overhead lines	Collision risk and risk of electrocution for birds and bats.	Minor with proper mitigation	Design power line to reduce or eliminate electrocution risk for birds and bats, found in the habitats through power line crosses. 1. Align power line route to avoid critical aquatic habitat (wetlands, riparian areas, watercourses etc.) where migratory waterfowl may congregate.	1. Will be completed when this EA is approved by the USG BEO and the Georgian EA is approved by the MoE. 2. The line spacing for this 220 kV line is to be 6.5 meters between phases and, the insulator strings to be 2 meters long. These distances will mitigate against birds

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
			2. Design the separation of conductors on the circuit and other energized hardware to be larger than the maximum protected bird species wingspan to prevent electrocution.	and bats being electrocuted.

6.1.3 Construction of the Staging Areas, Transmission Line, Access Roads, Temporary Areas along the Line

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
Preparation of the staging areas	Damage to topsoil and subsoil, vegetation cuttings, and loss of grassland habitat. Soil erosion.	Minor to adverse	1. Clearly demarcate access roads. 2. Clearly demarcate construction, other equipment storage areas and temporary tank farm areas, including a helicopter pad and chopper fueling area. 3. Confine vehicles to demarcated roadways. 4. Provide erosion control measures at the staging area. 5. Establish native grasses around the staging area after construction work is completed.	1. Access roads are clearly marked, to be confirmed on each audit visit. 2. Construction, other equipment storage areas and temporary tank farm areas, including a helicopter pad and chopper fueling area are clearly marked, and are to be confirmed on each auditing visit. 3. Confirmation and visual inspection that there is no evidence that vehicles have left the demarcated roadways, to be checked on each audit visit. 4. Erosion control measures at the staging area and access roads are in place during each monitoring visit; will be confirmed at auditing visits. 5. Established native grasses have been seeded around the staging area after construction work is completed; to be confirmed at each auditing visit.
	Contamination of air from vehicle and other construction equipment emissions (bulldozers, etc.)	Negligible to Adverse	1. Implement regular vehicle maintenance and repair procedures at designated areas. 2. Utilize fuel efficient equipment and vehicles to the extent required by GoG regulations. 3. Restrict unnecessary traffic. 4. Utilize emission control devices such as catalytic converters, to the extent required by GoG regulations.	1. Shop records showing that vehicles have been maintained regularly; to be confirmed during audit visits. 2. Fuel efficient equipment and vehicles used and shown to be used in the company records; to be confirmed by audit visits. 3. Only visitors on job-related work are at the job site. Access roads are not used as through roads by local inhabitants. To be confirmed during audit visits. 4. All vehicles have whatever emissions control equipment is required by Georgian regulations. To be confirmed by the audit visits.
	1. Domestic and construction waste generation. oily and chemical waste generation on-	Negligible Adverse or no impact if mitigation measures applied	1. Develop a Waste Management and Handling Plan for construction sites. 2. Properly store and dispose of construction, sanitary and oily waste. 3. Collect solid, oily and	1. The Waste Management Plan has been prepared, is acceptable to the client (USAID), and is distributed to all employees with adequate training provided. To be confirmed by audit

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
	site. 2. Contamination of soil and surroundings with litter and construction debris.		chemical waste and store them until transported to a designated waste disposal places.	visits. 2. Waste material is properly stored and disposed of, as confirmed by each audit visit. 3. Solid, oily, and chemical waste materials are properly stored and disposed of, as confirmed by each audit visit. .
	Sanitary waste contamination from construction workers.		1. Collect sanitary waste in septic tank. 2. Transport sanitary waste to designated off-site disposal facilities. 3. Provide adequate facilities for disposal of garbage (bins, litter trays) 4. Provide training to workforce in waste management 5. Organize clean-ups of existing garbage around each temporary staging area.	Confirmation and visual inspection of trash and sanitary facilities around construction site during audit visits. Before and after photographs shall be taken and retained.
	Local soil, surface water and groundwater contamination from oil, diesel and chemical spills	Negligible Adverse	1. Establish a secured, designated fuel and chemical storage area, with an impervious base and sufficient containment volume. 2. Store all fuel, oil and chemical storage in the designated secure area only. 3. Check hoses and valves regularly for signs of wear and ensure they are turned off and securely locked when not in use. 4. Place diesel pumps and similar items on drip trays to collect minor spillages. 5. Check drip trays regularly and remove any accumulated oil. 6. Provide and make available supplies for cleanup of minor spills. 7. Implement vehicle maintenance and repair procedures only in designated areas.	Confirmation and visual inspection of possible contamination around construction site during audit visits.
ROW clearing, and other typical activities in the ROW include, but are not limited to: 1. General earthwork activities 2. Cutting and grubbing of vegetation for ROW 3. Removal of old tower foundations. 4. Installation of new tower	Impacts on soil - clearing of trees and shrubs that make the soil more susceptible to erosion and dust generation as the soil previously underneath these plants are now exposed to wind and precipitation.	Negligible to Minor Adverse	1. Avoid damage to areas outside construction activities. 2. Provide erosion control (e.g. silt fence) down gradient of all topsoil stockpiles. 3. When clearing in shrub land and forested areas, the ground should be tilled and seeded with native grass species immediately after clearing activities are complete. 4. Apply erosion control measures. 5. To the extent possible, minimize activities during wet conditions. When activities	Confirmation and visual inspection of ROW clearing and mitigation measures during audit visits.

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
foundations. 5. Installation of tower structures 6. Installation of conductor wires 7. Transport, delivery of equipment and vehicle traffic to the tower work sites.			must occur in wet conditions, control water by using fabric, straw bales, and other measures to impede water flow and prevent erosion. 6. Utilize erosion mats (e.g. plastic temporary roads) in wet areas to prevent rutting and disturbance of habitat.	
	Impact on surface water due to ROW and access road clearings that increase sediment loads into receiving water bodies with water runoff	Negligible to Minor Adverse	1. Where clearing in shrub land and forested areas, the ground should be tilled and seeded with native grass species immediately after clearing activities are complete. 2. Place silt fence down gradient of all areas of exposed soil within ROW to capture sediment in runoff.	Confirmation and visual inspection of mitigation measures during audit visits.
	Mud could be carried off the site on vehicle tires and could result in sedimentation in offsite areas.	Negligible Adverse	Wash tires and undercarriage of construction vehicles prior to leaving construction zones.	Confirmation and visual inspection of mitigation measure during audit visits.
	Soil compaction, soil rutting, and dust generation on ROW and access roads.	Negligible Adverse	1. Use of weight distribution matting/thatching in wet/clay soils and in low spots to prevent rutting. 2. Spray water regularly over exposed soil areas where work is occurring during dry and windy periods. 3. Till and re-seed compacted areas of bare soil after construction activities are completed.	Confirmation and visual inspection of mitigation measures during audit visits.
	Blasting for tower foundations may remove vegetation, topsoil, and near surface rock making the soil susceptible to increased erosion and dust generation.	Negligible to Minor Adverse	1. Use low-yield down hole blasting techniques to minimize surface impacts. 2. Cover blasting areas to prevent dust escape. 3. The ground should be tilled and seeded with native grass species immediately after blasting activities are complete.(In case of blasting during construction).	Confirmation and visual inspection of mitigation measures during audit visits.
	Generation of fugitive dust	Negligible Adverse	1. Confine vehicles to demarcated roadways. 2. Restrict unnecessary traffic. 3. Supply workforce with dust masks. 4. Sprinkle roads with water during warm and dry (summer) periods to suppress dust. 5. Minimize size of material/spoil storage piles. 6. Utilize truck bed covers when hauling materials	Confirmation and visual inspection of mitigation measures during audit visits.
	Disruption of	Minor Adverse	1. Avoid excessive tree cuttings	Confirmation and visual

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
	surface water flow and impact on water quality conditions in nearby streams and creeks		around the ROW 2. Plant native grass along routes	inspection of mitigation measures during audit visits.
	Contamination of air from vehicle and other construction equipment emissions (bulldozers etc.)	Negligible Adverse	1. Implement regular vehicle maintenance and repair procedures at designated areas. 2. Utilize fuel efficient equipment and vehicles, to the extent required by Georgian regulations. 3. Restrict unnecessary traffic. 4. Utilize emission control devices such as catalytic converters, to the extent required by Georgian Regulations. 5. Implement regular vehicle maintenance and repair procedures, and only at designated areas.	1. This measure is to be confirmed at each audit visit. 2. This measure is to be confirmed at each audit visit. Vehicles are to comply with GoG regulations on fuel efficiency. 3. This measure is to be confirmed at each audit visit. In particular, through roads are not be created and local persons are not to use access roads as through roads. 4. This measure is to be confirmed at each audit visit. Vehicles are to comply with GoG regulations on emissions control. 5. This measure is to be confirmed at each audit visit.
	Risk of forest fires	Negligible to adverse	Remove all cut vegetation and slash from ROW during construction and ongoing maintenance. Dispose at composting facility.	Confirmation and visual inspection of mitigation measures during audit visits.
	Generation of noise	Negligible Adverse	1. Confine construction activities to typically 08:00 to 19:00 hours within 5 km of settlements. 2. Provide workforce with hearing protection as needed.	Confirmation and inspection of mitigation measures during audit visits.
	Local contamination of soil and waters of shallow aquifer with oily and chemical substances	Negligible Adverse	1. At temporary staging areas, establish a designated area for fuel, hydraulic oil, diesel and chemical storage (drums, small reservoirs etc.). 2. The area of storage should have an impervious base and impermeable bund walls, and be protected from precipitation. Capacity must be sufficient to contain full volume within a bund and secured area. 3. Store all fuel, oil and chemical storage in the designated secure area only. 4. Contractor to conduct regular inspections of construction vehicles to identify and repair leaks or damaged fuel/lubricant lines. 5. Repair vehicles only in specially designated maintenance areas.	Confirmation and visual inspection of mitigation measures during audit visits.
	Impacts on ecosytems, flora and	Negligible to Major	1. Avoid areas identified during the ecological assessment as	Confirmation and visual inspection of

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
	fauna		needing special protection 2. Reschedule construction to minimize impact on wildlife breeding sites. 3. Routing of access roads to avoid specific areas. 4. Conduct maintenance outside of wildlife breeding sites. 5. Monitor to look for and to report interference with breeding animals, or any injuries or mortality to species of concern. 6. Conform to chance finds procedures when special concern flora or fauna are encountered	mitigation measures during audit visits.
	Accidents and injuries to workers		1. Provide and require use of personal protective equipment (PPE) (head, hand, and foot protection) by all workers: 2. Provide safety training to all workers. 3. Establish and maintain a rapid response capability for first aid, such as establishing agreements with local emergency services or with private health care services. 4. Provide first aid kits at all work sites at all times, for instance, at Menji substation, Tskaltubo substation and at tower sites where work is underway. 5. All workers must possess up to date and valid Georgian certifications. Establish log books for first aid, fire, and emergency. Workers must present a valid and up to date certificate (stamp in the "passport") on the first day of employment.	Confirmation and visual inspection of mitigation measures during audit visits.
Construction workforce (estimated total number100-150) Diseases	Economic impacts (temporary employment) Spread of the disease	Minor Beneficial Minor	1. Report and record the permanent (that is, home) residence of the workers based on a. nationality (from within Georgia or international), and b. if from Georgia, which of the 11 generally recognized regions of Georgia is the person's permanent residence (home). 2. Pay wages at least average for the area 3. Provide adequate heating, showering and cooking facilities during construction	Confirmation and visual inspection of mitigation measures during audit visits.

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
			at the staging areas. 4. Conduct public awareness campaigns and spread information via meetings with public about precautionary measures for health and safety 5.	
	Risk of human trafficking, STDs, or other social impacts that could be associated directly or indirectly with large work crews	This was eliminated as an impact to be assessed in the ESS, given that proper procedures and training that would be in place.	Conduct public awareness campaigns and spread information via meetings with public about precautionary measures for health and safety	Confirmation and visual inspection of mitigation measures during audit visits.

6.1.4 Rehabilitation of Substations

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
Typical activities: • Cutting and grubbing of vegetation for staging area, and substation sites. • Vehicle traffic from transport and delivery of equipment. • Building staging and lay down areas. • Excavation for foundation. • Site earthwork and grading. • Installation of substation equipment Installationof gravel and stone substrate • Installation of perimeter fencing	Impacts from general earthwork activities: • Soil damage. • Loss of grassland. • Soil erosion • Disturbance of local habitat	Negligible to Minor Adverse	1. Store topsoil and subsoil before areas are excavated, with topsoil stripped and stockpiled separately. 2. Avoid damage to areas outside construction activities. 3. Segregate excavated soil into stockpiles dependent on material type. 4. Provide erosion control while stockpiled. 5. On completion, backfill material in the same sequence. 6. Compact and stabilize disturbed surfaces as soon as practicable. 7. Apply erosion control measures onsite. 8. Construct water collection system on-site. 9. Re-vegetate areas with native grass after completion of construction work.	Confirmation and visual inspection of mitigation measures during audit visits.
	Generation of fugitive dust.	Negligible Adverse	1. Minimize offsite hauling. 2. Confine vehicles to demarcated roadways. 3. Supply workforce with dust masks. 4. Sprinkle roads during warm and dry (summer) periods to suppress dust. 5. Utilize truck bed covers when hauling materials 6. Implement regular vehicle maintenance and repair procedures at designated areas. 7. Restrict unnecessary traffic.	Confirmation and visual inspection of mitigation measures during audit visits.
	Existing equipment with PCB (Polychlorinated biphenyl) may contaminate environment and cause harmful health effects	Negligible Adverse	1. Improve identification of equipment containing PCBs. 2. All spills, except minor leaks, should be reported. 3. Organize safe PCB storage and disposal.	Confirmation and visual inspection of mitigation measures during audit visits.
	Fugitive dust emissions from vehicles and other construction equipment (bulldozers etc.)	Negligible Adverse	1. Implement regular vehicle maintenance and repair procedures only at designated areas. 2. Utilize fuel efficient equipment and vehicles, to the extent required by Georgian regulations. 3. Restrict unnecessary traffic to and from the site; in	Confirmation and visual inspection of mitigation measures during audit visits.

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
			particular, no through local traffic on the access roads to the tower sites. 4. Utilize emission control devices such as catalytic converters, to the extent required by Georgian regulations. .	
	Sanitary and construction waste management	Negligible or no impact if mitigation measures applied	1. Develop a Waste Management and Handling Plan (WMHP) for the facility's construction period. To be submitted to the client (USAID) within 15 days of signing of the contract for review and approval. 2. Properly store and dispose construction, sanitary and oily waste. 3. Collect all solid, oily and chemical waste and store until transported to a designated, government approved waste disposal places. 4. Collect sanitary waste in septic tank. 5. Transport sanitary waste to the designated government approved areas off-site for further disposal. 6. Provide adequate facilities for disposal of garbage (bins, litter trays) 7. Provide training to the workforce in waste management. 8. Organize clean-ups of existing garbage in each temporary staging area.	Confirmation and visual inspection of mitigation measures during audit visits.
	Generation of noise	Negligible Adverse	1. Confine construction activities to typically 08:00 to 19:00 hours 2. Provide workforce with hearing protection, as and when required by regulations.	Confirmation and visual inspection of mitigation measures during audit visits.
	Local contamination of soil. Soil contamination can occur from the use, improper handling and spill of hazardous materials such as fuel, petroleum lubricants, insulating oils, wood preservatives, paints, and other toxic substances which could be used during construction.	Negligible Adverse	1. Store all fuel, oil and chemical storage in the designated secure area only. 2. Stockpile hazardous materials in leak-proof facilities with containment features. 3. Do not use PCB-containing insulating oils in transformers. 4. Use government approved, publicly available, non-toxic paints and preservatives. 5. Conduct regular inspections of construction vehicles to identify and repair leaks or damaged fuel lines and lubricate areas on machinery. 6. Contain, excavate, and containerize all spills of hazardous material and dispose in accordance with	Confirmation and visual inspection of mitigation measures during audit visits.

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
			GoG regulations. 7. Place diesel pumps and similar items on drip trays to collect minor spillages. 8. Check drip trays regularly and remove any accumulated oil. 9. Have available and provide supplies for cleanup of minor spills.	
	Health and safety issues during the construction activities	Negligible Adverse	1. Require the use of personal protective equipment (PPE) (head, hand, and foot protection) by all workers. 2. Provide safety training to all workers. 3. Establish and maintain a rapid response capability for first aid, such as compacts agreements with local emergency services or with private health care services. 4. Provide first aid kits at all work sites at all times, for istance at Menji substation, Tskaltubo substation, and at tower sites where work is underway.	Confirmation and visual inspection of mitigation measures during audit visits.
	Economic impact (temporary employment)	Minor Beneficial	1. Report and record the permanent (that is, home) residence of the workers based on a. nationality (from within Georgia or international), and b. if from Georgia, which of the 11 generally recognized regions of Georgia is the person's permanent residence (home). 2. Pay wages at least average for the area 3. Provide adequate heating, showering and cooking facilities during construction at the staging areas.	Confirmation and visual inspection of mitigation measures during audit visits.

6.1.5 Operation and Maintenance of the Transmission Lines, ROW and Substations

This section applies to GSE, after the lines and substations are commissioned, and after responsibility for the system is transferred from USAID to GSE.

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
Typical activities for transmission line and ROW O&M would include: • Energizing the transmission line • Maintenance site visits and inspections • Vegetation control in ROW • Tower repairs • Foundation repairs • Repair of damaged/downed wires.	• Fugitive dust and vehicleemissions from maintenance visits. • Transmission line maintenance activities involving trucks, lawn mowers, grass trimmers, and other equipment. Operation of such vehicles and equipment results in the emission of carbon monoxide, NOx, SO2, hydrocarbons, and particulate matter.	Minor Adverse	1. Restrict unnecessary traffic on access roads and no through traffic on access roads. 2. All exposed ground is reseeded or otherwise stabilized. 3. Implement regular vehicle maintenance and repair procedures. 4. Utilize fuel efficient equipment and vehicles, to the extent required by GoG regulations. 5. Utilize emission control devices such as catalytic converters, to the extent required by GoG regulations.	Confirmation and visual inspection of mitigation measures during audit visits.
	Disruption to overhead power lines and towers due to irregular maintenance of vegetation within the ROW.	Negligible Adverse	Implement an Integrated Vegetation Management Plan (IVMP) for the selective removal of tall-growing tree species and the encouragement of low-growing grasses and shrubs. The Contractor is to submit the IVMP to the Buyer within 15 days of contract signing for review and approval.	Confirmation and visual inspection of mitigation measures during audit visits.
	Soil erosion and water quality impacts: • periodic cutting of vegetation as part of normal right-of-way maintenance activities may make the soil more susceptible to erosion. • Right-of-way clearing also increase water runoff. This could be a long term and permanent impact along right-of way areas.	Negligible to Minor Adverse	Place silt fences down gradient of all areas of exposed soil within the ROW to capture sediment in runoff. Where there is cutting of shrub land and forested areas, the ground should be tilled and seeded with native grass species immediately after clearing activities are complete.	Confirmation and visual inspection of mitigation measures during audit visits.
	Forest fires due to accumulation of	Negligible Adverse	1. Thorough monitoring of ROW vegetation and periodic	Confirmation and visual inspection of mitigation

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
	underlying growth or slash from routine maintenance along the ROW.		clearings. 2. Remove blow down and other high hazard fuel accumulations. 3. Timely vegetation slashing. 4. Proper disposal of maintenance slash by trucks. 5. Planting and managing of fire resistant species (e.g. hardwoods) within the ROW 6. Establish a network of fire breaks of less flammable materials or cleared strips (strips that contain grasses only and not trees or shrubs) of land to slow progress of potential fires.	measures during audit visits. Check the log books of GSE.
	Soil contamination along the route with herbicides. Vegetation control techniques that use herbicides can introduce environmental contaminants into the soil and adjacent habitats.	Negligible to Minor Adverse	Control vegetation using manual and mechanical techniques which do not require the use of herbicides.	Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.
	Impacts on surface water quality due to increased soil erosion rates and sediment loads into the streams.	Minor Adverse	Avoid excessive vegetation clearings (trees and shrubs) around the power transmission lines. This is especially true for the towers located on the flood plains, stream terraces and hill slopes.	Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.
	Impacts on flora, fauna, and critical habitat.	Minor to Major Adverse	Protect the flora in accorddance with this EA, including: a. Avoiding areas identified during the ecological assessment as needing special protection b. Conducting maintenance outside of wildlife breeding sites. c. Monitoring to look for and to report interference with breeding animals, or any injuries or mortality (to species of concern). d. Conforming to the chance finds procedures when special concern flora or fauna are encountered	Confirmation and visual inspection of mitigation measures during audit visits.
	Avian collisions and electrocutions	Negligible to Minor Adverse	Mark overhead lines with bird deflectors or diverters to reduce collision risk if after operation it is learned and verified that bird collisions or bird executions are statistically significantly higher than for other GSE 220 kV TLs in the Samegrelo - Zemo Svaneti Region.	Confirmation and visual inspection of mitigation measures during audit visits.

6.1.6 Operation of Substations

This section applies to GSE, after the lines and substations are commissioned, and after responsibility for the system is transferred from USAID to GSE.

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
Typical activities would include: • Operation of substation equipment • Site visits for occasional service and maintenance • Vegetation control activities (mowing, weed cutting)	Air emissions from vehicle traffic and working	Negligible Adverse	1. Restrict unnecessary traffic. 2. All exposed ground is reseeded or otherwise stabilized 3. Implement regular vehicle maintenance and repair procedures. 4. Utilize fuel efficient equipment and vehicles, to the extent required by GoG regulations. 5. Utilize emission control devices such as catalytic converters, to the extent required by GoG regulations. 6. Ensure sulfur hexafluoride (SF6) insulating electrical switching equipment, cables, and transformers have a low leakage rate (less than 1%).	Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.
• On-site maintenance activities.	Contamination of soil and shallow aquifer with oil, diesel and other chemical materials accidental spills.	Negligible Adverse	1. Store all fuel, oil and chemical storage in the designated secure area only. 2. Stockpile hazardous materials in leak resistant facilities with containment features. 3. Do not use PCB-containing insulating oils in transformers. 4. Ensure sulfur hexafluoride (SF6) insulated electrical switching equipment, cables, and transformers have a low leakage rate (less than 1%). 5. Use government approved, publicly available, non-toxic paints and preservatives 6. Conduct regular inspections of construction vehicles to identify and repair leaks or damaged fuel/lubricant lines. 7. Contain, excavate, and containerize all spills of hazardous material and dispose of in accordance with GoG regulations. 8. Place diesel pumps and similar items on drip trays to collect minor spillages. 9. Check drip trays regularly and remove any accumulated oil. 10. Have on hand and provide supplies for the cleanup of minor spills.	Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.
	On-site waste generation, collection, storage and disposal	Negligible Adverse	1. Develop a waste management and handling plan for the substation operation	Confirmation and visual inspection of mitigation measures during audit visits.

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
			2. Reduce amount of waste to maximum extent possible 3. Collect all solid, oily and chemical waste and store until transported to a designated waste disposal places 4. Collect and store hazardous waste separately by trained personnel. 5. Collect sanitary waste in septic tank. 6. Transport sanitary waste to the designated places off-site for further disposal 7. Provide adequate facilities for disposal of garbage (bins, litter trays) 8. Provide training to workforce in waste management.	Check the log books of GSE.
ROW and substation operation and maintenance activities	Health and safety issues for maintenance workers and local residents include: • EMF • Live power lines • Working at tall heights on poles and structures • Electrocution • Electromagnetic interference • Exposure to chemicals	Negligible to Adverse	1. Measure the electric and the magnetic field strengths at the edges of the ROW on a periodic basis at a predetermined number of points along the ROW. Compare them to the GOG regulations. Take appropriate actions if either of the two limits (electric field or magnetic field) are exceeded. 2. Allow only trained and certified workers to install, maintain or repair electrical equipment. 3. Allow only trained workers to work at tall heights. 4. Ensure that live-wire work is conducted by trained personnel with strict adherence to specific safety and insulation standards. 5. Chemicals are to be handled in accordance with GoG and GSE regulations.	Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.
			1. To prevent electrocution, use signs and barriers (locks, doors, gates, and steel posts surrounding transmission towers) at all towers. 2. To prevent shocks, ground conducting objects (e.g. fences, metal clad buildings, and other metal structures) installed near (100 meters of the center line) of the transmission line. 3. Do not use PCBs in transformer oil. 4. Do not touch transformer oil or soil, which is suspected to contain PCBs.	Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.

6.1.7 Compliance and Social Mitigation Measures

Activity	Identified Environmental Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
General Permitting and USAID Regulatory Compliance	Non-compliance with national and international standards, non-compliance with requirements for stakeholder involvement in environmental conservation and the execution of an EA for power transmission lines and substation rehabilitation projects.	Ensure that all government and funding and co-funding agencies requirements and procedures relating to EA are complied with. This preliminary assessment should be completed prior to the construction stage and should verify that: 1. All feedback and comments from the Stakeholder Engagement Committee pertaining to the EA are addressed. 2. Resolve all issues associated with land use, property, and ROW acquisitions, including national requirements for compensation. 3. Complete of the analysis of project design and specifications and its cumulative impacts on environmental and socio-economic conditions. The analysis is to ensure the project is in line with best international practices and allows incorporation of appropriate measures to minimize, reduce, or avoid adverse socio-economic effects of the project and to enhance beneficial impacts. 4. Assurance that properly developed environmental and social mitigation and monitoring plan will be in compliance with USAID and Georgian regulations, and that they will be strictly followed. 5. The Contractor shall assign a Stakeholder Liaison Officer responsible for interacting with all communities and stakeholder groups. The Stakeholder Liaison Officer is to be on duty within 31 calendar days of the signing of the contract between USAID and the contractor. 6. Upon the Contractor's designating a Stakeholder Liaison Officer, the Contractor shall develop a detailed ongoing work plan and management strategy that will provide support and feedback as needed to the officer throughout the life of	1. Review correspondence and correspondence documentation from stakeholders. 2. GSE is to confirm that this land issues have been resolved. 3. Complete an acceptable US EA and Georgian EA. 4. This measure will be confirmed at the audit visits. 5. Conduct public hearings, of which two have already been held. 6. Complete an acceptable US EA and Georgian EA. 7. Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.

Activity	Identified Environmental Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
		the project, 7. The Stakeholder Liaison Officer will liase with communities to alert them to plans, including an estimated work schedule, placement of towers, and duration of disturbances. The Officer will invite feedback to improve project support from locals.	

6.1.8 Pre-Construction Phase, Routing

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
Power transmission line route and ROW planning	• Adverse impacts on communities, local farmers, herders and those households living near the proposed route. • Loss of economic benefits from land use due to new tower placements.		1. If it is impossible to avoid settlements, communities and cultivated areas, take and implement all necessary mitigation measures to minimize and mitigate the adverse impacts on social and economically important areas during construction and operation phases of the project. 2. Avoid construction during the growing and harvesting season for crops grown in the ROW as much as possible.	1. The route of the TL has been chosen to minimize and mitigate these risks. Servitude agreements, with financial compensation, are being negotiated by GSE with all of the land owners along the RoW 2. Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.
Access road planning	Loss of land under cultivation to access roads		For all new access roads to be constructed, plan their route and construction in order to minimize use of cultivated lands.	Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.
220kV overhead lines	Extended exposure to EMF by workers or households		1. GSE to prepare safety brochures regarding exposure to EMF, and implement measures to prevent excess exposure for humans and animals. 2. Print in all local languages. 3. Alert any local or impacted communities about negative impacts, including dust, noise of potentially disturbing activities and planned dates of activities in their areas. 4. Brief workers on the culturally appropriate methods for interacting with minority populations to minimize disturbing communities or giving offence to local populations. 5. Construct staging areas away from villages.	Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.

6.1.9 Construction Phase

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
Construction of base Camps	• Disturbances to communities near staging areas • Generation of fugitive dust • Generation of noise		1. Alert any local or impacted communities about impacts, including dust, noise of potentially disturbing activities and planned dates of activities in their areas. 2. Brief workers on the culturally appropriate methods for interacting with populations to minimize disturbing communities or giving offence to local populations. 3. Construct staging areas away from villages. 4. Provide communities nearby the activities with weekly work schedules to avoid dirt and damage to drying laundry, households and crops. 5. Confine construction activities to typically 08:00 to 19:00 hours, if at all possible.	Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.
	• Contamination of soil and surroundings with litter and construction debris • Local soil, surface water and groundwater contamination from oil, diesel and chemical spills		1. Whenever necessary inform herders in order to avoid these contaminated areas. 2. Provide portable sanitation facilities. 3. Collect and remove debris, trash, and garbage.	Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.
ROW clearing, construction of access roads and towers and conductoring of lines.	• Disturbances to farmers who have cultivated fields in ROW, in the path of access roads, or in tower locations. • Disturbances to communities		1. For any areas under the ROW that are under cultivation, avoid disturbing these areas during growing and harvesting seasons if possible. If not possible, fully compensate farmers for losses of actual crops at full fair market value for lost or damaged crops. 2. Inform local shepherds not to graze in these areas until native grass have been reestablished 3. Alert any local or impacted communities about impacts, including dust, noise of potentially disturbing activities and planned dates of activities in their areas. Brief workers on the culturally appropriate methods for interacting with minority populations, including in	Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.

Activity	Identified Environmental Impacts	Impacts	Mitigation Measure	Monitoring Indicators; or, Completed
			Muslim communities, to minimize disturbing communities or giving offense to local populations. 4. Provide nearby communities weekly work schedules on activities to avoid dirt and damage to drying laundry, households and crops. 5. Confine construction activities to daylight hours 6. Clear all cultivated fields and pastures of waste or garbage created by the project to avoid problems accidental ingestion by animals.	
Construction	Disturbances to cultural resources		1. Demarcate area around Shkhepi territory if needed to confine traffic and working areas. 2. Consult with Ministry of Culture before disturbing any cultural resources listed in this EA or discovered during construction.	Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.
Conductoring of lines across major roadways and railways	Disturbance of traffic patterns, delays of road and rail traffic		1. Coordinate with transportation ministry and local authorities to do conductoring at times that balance the needs of the local community and the construction schedule. 2. Provide signs and crossing guards during the conductoring to direct traffic and to explain the work being done across and above the road.	Confirmation and visual inspection of mitigation measures during audit visits. Check the log books of GSE.

7 ANNEX A: PROJECT SITE PHOTOGRAPHS

River Tsivi Crossing

River Tsivi Crossing

Area adjacent to the Menji Substation

Degraded Tea Plantation

8 ANNEX B: MINUTES OF SCOPING MEETINGS

Minutes of Scoping Meetings

Tskaltubo Senaki Transmission Line and Two Substations Tskaltubo and Menji Rehabilitation Project

May 23, 2011, Minutes of Public Consultation Meeting on Environmental Scoping Statement

Minutes were prepared by LLC Gergili and Tetra Tech

Public Consultation;
May 23, 2011; 2p.m

General Description

Short introduction: Tetra Tech in coordination with GSE and LLC Gergili has conducted Public Consultation rehabilitation/reconstruction of the transmission lines Tskaltubo –Senaki and two substations Menji and Tskaltubo. Public consultations where held in Tskaltubo, Khoni and Senaki. Prior to public consultation the information on Public Consultation meetings was disseminated on websites (www.gergili.ge; www.gse.gov.ge) and hard copies of the documents were delivered to the region.

Participants of the meetings were: Tetra Tech, LLC Gergili, Municipality Gamgebeli, Head of Sakrebulo, local nongovernmental organizations, representatives of mass media and local population.
Notes:

1. Announcement about Public Consultation Meeting was published on May 17, 2011.
2. The number of attendants exceeded more than 30.

The presentation was made by: [redacted] **Tetra Tech** In the preamble to presentation [redacted] spoke about the importance of Rehabilitation Project reviewed the environmental issues, social issues, alternatives, scope of EA etc. Discussed about the details of the project

The presentation continued in the mode of questions and answers. [redacted](Tetra tech) and Gergili gave responses to questions.

Tskaltubo:

Question: What is the width of alignment?

Answer: According to the information of GSE, the alignment is 30 meters.
Question: how will be standards after reconstruction of the line more precisely about electromagnetic impact?
Answer: GSE will operate the line in accordance of the standards and no major activities will be done under the electricity lines.
Question: You already mentioned but can you repeat what is the main purpose for rehabilitation/ reconstruction of the line?
Answer: Main purpose to provide constant electricity supply to west Georgia and Poti Industrial Zone.
Question: The emmployment of local population is one of the most critical problems in the region. Whom shall we apply to regarding emmployment matters?
Answer: All the inquiries related to emmployment shall be addressed to the construction company.

Khoni May 23, 2011;

Question: When does this Project starts?

Answer: Design work of the project has already been started. Cosntruction is estimated in Fall 2011.

Question: Who will operate the line?

Answer: Line will be operated in by GSE

Question: What about land parcels who will comensate it?
Answer: GSE is under the study of the land parcell issues along th eroute and will approach peolpe as sson as it is finished.

Senaki 5p.m
Question: What is the value of the project?

Answer: Cuurently we are in the design stage and cost of the project will be revieled at the later stage.

Question: What is the main purpose for rehabilitation/ reconstruction of the line?
Answer: Main purpose to provide constant electricity supply to west Georgia and Poti Industrial

Zone.

Question: What about cost of the electricity will that be reduced?

Answer: Well I think we cannot answer this question and hope the right entity that might know about issue is Georgian National Electricity Regulatory Agency.

Conclusion: The meeting with population passed in a friendly atmosphere. The most urgent request of the society was the employment of local population in construction works.

Photos of the prsentation:

Tskaltubo 11 a.m

Khoni 2p.m

Senaki 5p.m

9 ANNEX C: PUBLIC DISCLOSURE ANNOUNCEMENT

Announcement

Public Consultation of the Environmental Scoping Document for Rehabilitation of Senaki Transmission Lines and Reconstruction of Substations Menji & Tskaltubo

Date for Conducting Public Consultation Meetings May 23, 2011

Georgian Power and Gas Infrastructure Project (PGIP), in coordination with Georgian State Electrosystem (GSE) and Environmental Consultant Company LLC "Gergili", is pleased to disclose for public consultation the environmental scoping document for **Rehabilitation of Senaki 1,2 Transmission Lines and Reconstruction of Substations Menji and Tskaltubo.**

Consultation meetings will be held on May 23, 2011, at Tskaltubo District Municipality at

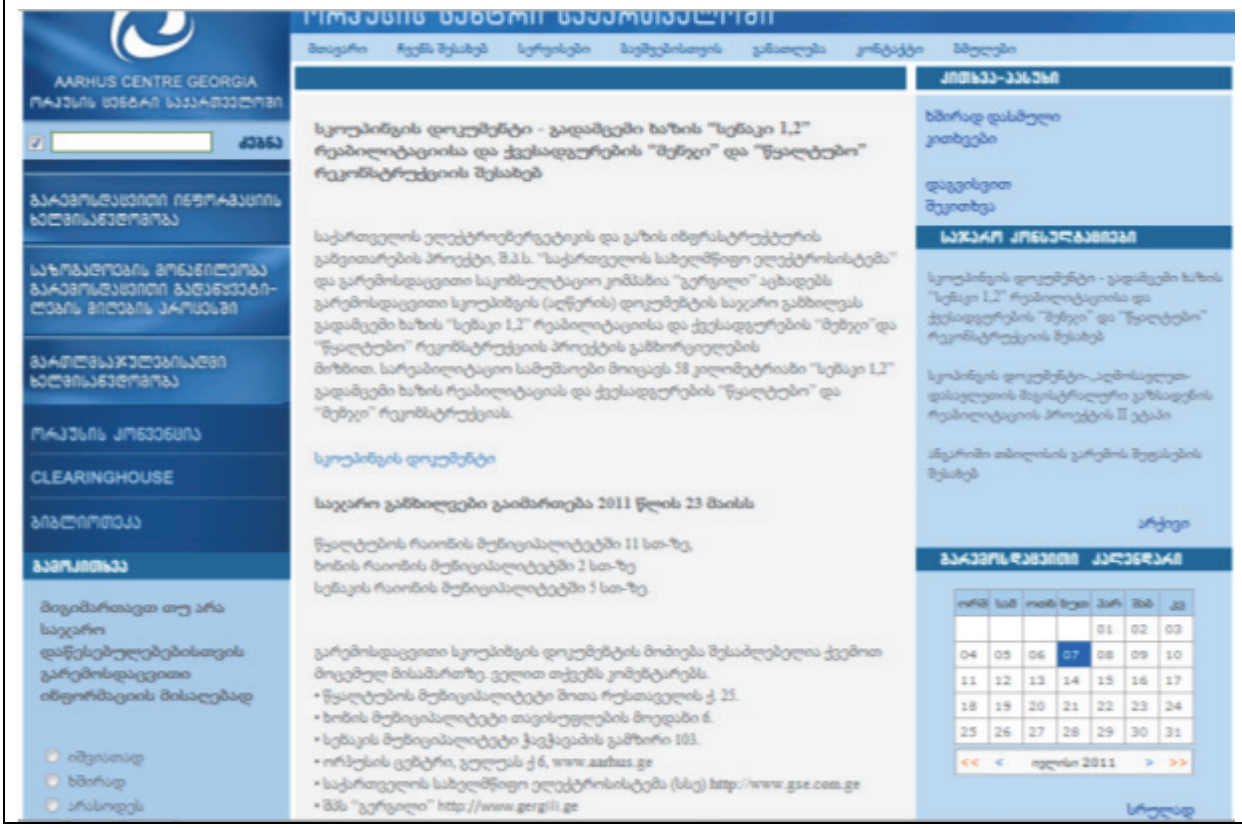
11:00a.m; Khoni District Municipality at **2:00p.m** and Senaki District Municipality at **5:00p.m.**

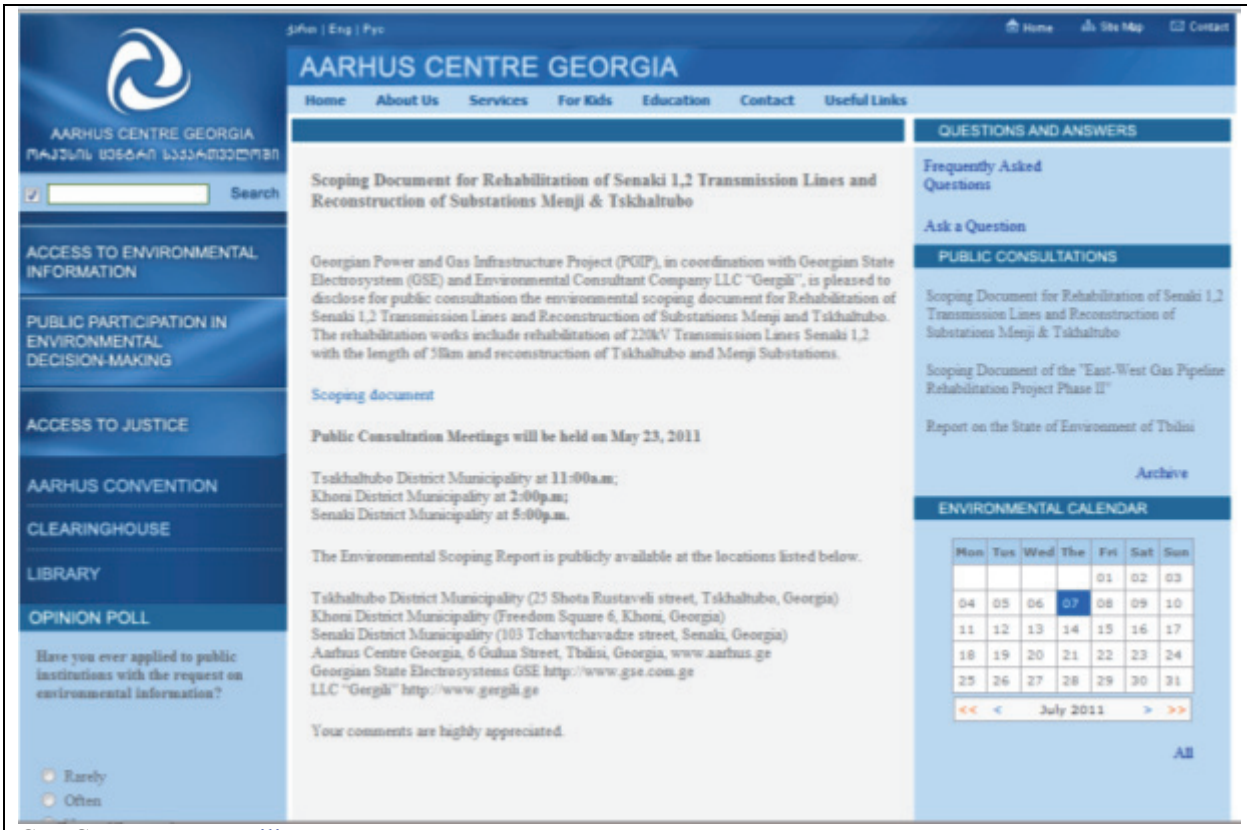
The rehabilitation works include rehabilitation of 220kV Transmission Lines Senaki 1,2 with the length of 58km and reconstruction of Tskaltubo and Menji Substations.

The Environmental Scoping Report is publicly available at the locations listed below.

Your comments are highly appreciated.

- Tskaltubo District Municipality (25 Shota Rustaveli street, Tskaltubo, Georgia)
- Khoni District Municipality (Freedom Square 6, Khoni, Georgia)
- Senaki District Municipality (103 Tchavtchavadze street, Senaki, Georgia)
- Aarhus Centre Georgia, 6 Gulua Street, Tbilisi, Georgia, www.aarhus.ge
- Georgian State Electrosystems GSE http://www.gse.com.ge
- LLC “Gergili” http://www.gergili.ge





GERGILI - www.gergili.ge
Aarhus Geo - http://www.aarhus.ge/index.php?page=15&lang=geo&content=594
Aarhus Eng - http://aarhus.ge/?page=15&lang=eng&content=595

10 ANNEX D: LETTER OF MINISTRY OF CULTURE ABOUT MONUMENTS LOCATED WITHIN THE TL REGION

N 17/08/2614 27.06.2011

To Mr. Sulkhan Zumburidze
Georgian State Electro System Rehabilitation Manager (Head of the Management Board)

Dear Mr. Zumburidze

Please be informed that, upon your request specified in letter (N 01/02-1941 23.06.2011) we are sending the list of cultural heritage located within administrative boundaries of the following municipalities: Senaki, Abasha, Martvili, (Samegrelo Upper Svaneti region) Khoni and Tskaltubo (Imereti region). (See annex.). According to current Georgia Legislation (Georgian Law on "Cultural Heritage", article 34; 35; 35) the above-mentioned cultural heritage has its individual protection zone - including the so called physical and visual protection areas.

Annex: 9 (nine) pages

Respectfully
First Deputy Minister David Tskhadadze

DCN: 2012-GEO-004

Annex

Abasha Rayon

Ordinal N	Name	Date of Construction	Location
1.	Church	Middle Ages	Village First Ontopo
2.	Church	Late Middle Ages	Village Sepieti
3.	Church Temple	VI c. Late Middle Ages	Village Sepieti areas
4.	Church	XVI c.	Village Tkviri

Martvili Rayon

Ordinal N	Name	Date of Construction	Location
1.	Martvili monastery 1. Temple with Dome 2. Church with Dome 3. columns 4. cells 5. other buildings	VII c. XI c. XI c. XI-XII c. Middle Ages	Martvili areas
2.	Abedati fortress church	Late middle ages	Village Abedati
3.	Wooden house	XIX-XIX c.	Village Abedati, V. Gagua premises
4.	Wooden House	1895	Village Bandza O. Gabunia's premises
5.	Wooden House	XIX-XX	Village Zemo Khuntsi, G. Beria's premises
6.	St. Nino Church	Developed in the Middle Ages	Village Zemo Khuntsi
7.	Christ Church	XIX c.	Village Tamakoni
8.	"Godobani" Church	Middle Ages	Village Kurzu, cemetery
9.	Fortress	Middle Ages	Village Kurzu
10.	Wooden House	XIX c.	Village Kurzu A. Kalandias' premises
11.	Premises belonging to G. Akhalaia	XX c.	Village KUrzu
12.	"Kvirike" Church	XIX c.	Village Nakhunavo
13.	Church of The Sigua Family	Late Middle Ages	Village Nakhunavo

14.	Premises belonging to N. Zarqua and K. Zarqua	XIX-XX	Village Nakhunavo
15.	St. Barbare Church ruins	Middle ages	Village Najakhavo

16.	Nogha Fortress Tower II	XVI c.	Village Nogha
17.	Belfry	Middle Ages	Village Nogha
18.	Tamakoni Jikha	Middle ages	Village Patara Tamakoni
19.	Leperchkhelave Church	Late middle ages	Village Patara Inchkhuri
20.	Jinantkari church	Middle ages	Village Patara Tamakoni
21.	The Archangel Church	Transitional period	Village Pirveli Gurdzemi
22.	Fortress ruins	Middle ages	Village Salkhino
23.	Salkhino Garden		Village Salkhino
24.	B. Chakhava's premises	XIX-XX	Village Sergieti
25.	Church	Late Middle Ages	Village Qvemo Khuntsi

Senaki Rayon

Ordinal N	Name	Date of Construction	Location
1.	Church of the Virgin Mary	XIX c.	Senaki, Kutaisi street
2.	Church "Jgimarioni"	Middle ages	Village Betlemi
3.	Tower	Middle ages	Village Betlemi
4.	Church of The Archangel	Middle ages	Village Gejeti
5.	Church	XIII c.	Village Eki
6.	St. Barbare Church	Middle ages	Village Teklati
7.	Church of The Archangel	Late middle ages	Village Ledzedzame
8.	Church	Middle ages	Village Nosiri
9.	Baths	Middle ages	Village Nosiri
10.	Noqalaqevi Old town ruins 1. the Upper fortress 2. the lower fortress 3. Church with dome 4. belfry 5. church 6. other buildings	Old Ages Old ages Old ages V c. Late middle ages Middle ages Middle ages	Village Noqalaqevi
11.	Tower	Middle ages	Village Sagugunavo
12.	"Jgimarioni" church	XIX c.	Village Potskho
13.	St. George Church	Middle ages	Village Middle Nosiri
14.	Shkhepi fortress complex	Middle ages	Village Old Senaki

15.	Church with dome	XIX c.	Village Old Senaki, cemetery
16.	Castle Hall	Middle ages	Village Old Senaki
17.	Tower	Middle ages	Village Old Senaki
18.	St. George Church	XIX c.	Village Old Senaki
19.	Church of Christ	XIII-XIV c.	Khorsha community
20.	Church of The Archangel	Late middle ages	Khorsha community

Khoni Rayon

Ordinal N	Name	Date of Construction	Location
1.	Garden of Khoni		Khoni
2.	St. George Church 1.church 2. belfry 3. Fence	XI c. Late Middle ages Late Middle ages	
3.	Church of Christ	XIX c.	Khoni
4.	Church of the Archangel	XIX c.	Khoni
5.	Church	Late Middle ages	Village Gaghma Nogha
6.	Church	XIX c.	Village Gordi, cemetery
7.	Church	XIX c.	Village Gochajikhaishi
8.	Gubi Fortress	Late Middle ages	Village Gubi
9.	Church ruins “Shuaguli”	XIX c.	Village Gubi
10.	Church of the Archangel	Middle ages	Village Upper Gordi
11.	St. George Church of the Dadianis	XVIII c.	Village Upper Gordi,
12.	The Queen’s Spring	XIX c.	Village Upper Gordi, Dadianis’ Forest park
13.	Ruins of the Veli fortress	Late Middle Ages	Village Upper Gordi
14.	Dadiani Palace	XIX c.	Village Upper Gordi
15.	Church of the Savior	Late Middle ages	Village Upper Kinchkha
16.	St. George of Tareshi	Middle ages	Village Upper Kinchkha
17.	Church of the Savior, ruins	Middle ages	Village Upper Kinchkha, Satsisqvilo district
18.	“Satsisqvilo” church ruins	Late middle ages	Village Upper Kinchkha
19.	Kibula town ruins	Middle ages	Village upper Kinchkha, Kibula district
20.	Ruins of St. George church	Late Middle ages	Village Upper Kinchkha
21.	Church ruins	XIX c.	Village Kontuati
22.	Matkhoji fortress	Early Middle ages	Village Matkhoji
23.	Church of Archangel Gabriel	XIX c.	Village Matkhoji
24.	St. Nino Convent	XIX c.	Village Matkhoji
25.	Church ruins	XVIII c.	Village Nakhakhulevi
26.	Church of the Savior	XIX c.	Village Patara Kukhi

27.	Church of the Savior	XIX –XX c.	Village Patara Jikhaishi
28.	St. George Church	XIX c.	Village Patara Jikhaishi, cemetery
29.	Ruins of Kvirike and Ivlita Church	XIX c.	Village Satsulukidzeo
30.	Church of the Virgin	Transitional period	Village Suchkha
31.	Mechia Fortress ruins	Late Middle Ages	Village Qveda Gordi
32.	St. George church	XIX c.	Village Qveda Gordi
33.	Garden of Gorda		Village Qveda Gordi
34.	Church with dome	1884	Village Qutiri
35.	Obeji church ruins	Late Middle ages	Village Khidi
36.	Popiusi (Grandfather's)bridge piers	Middle ages	Village Khidi

Tskaltubo Rayon

Ordinal N	Name	Date of Construction	Location
1.	St. George church	1866	Tskaltubo, II district, cemetery
2.	St. George church	Late Middle ages	Village Banoja, cemetery
3.	Geguti church	XVI c.	Village Geguti areas
4.	Church of the Savior	XIX-XX c.	Village Geguti
5.	Tower of the Iashvilis	Late Middle ages	Village Geguti areas
6.	Castle Hall 1. Church of the Palace 2. other buildings	 Middle ages XVI c.	Village Geguti areas
7.	Church	XIX c.	Village Gvishtibi
8.	Tower of the Asatianis	Late Middle ages	Village Gumbati areas
9.	Church	1888	Village Gumbra, cemetery
10.	Derchi Church of the Baptist	Developed in the Middle ages	Village Derchi
11.	Zarati Church of St. Kirile	Developed in the middle ages	Village Zarati
12.	St. George church	Developed in the middle ages	Village Zarati, cemetery
13.	Tower ruins	Late Middle ages	Village Zarati, T. Svanadze's premises
14.	Tower ruins	Middle ages	Village Zarati, L. Dzotsenidze's premises

15.	St. George Church	XX c. the beginning	Village Zeda Meskheti, cemetery
16.	Church of the Savior	Late Middle ages	Village Maghlaki, cemetery
17.	Church ruins	Middle ages	Village Mukhiani, cemetery
18.	Church	XIX c.	Village Namokhvani, cemetery
19.	St. George church	XIX-XX c.	Village Opurchkheti
20.	St. George church	Late Middle ages	Village Opshkviti, cemetery
21.	Church of the Virgin	XIX c.	Village Opshkviti
22.	Church	Late Middle ages	Village Patriketi, cemetery
23.	Church of the Virgin	XIX c.	Village Zhoneti, cemetery
24.	Church ruins	Middle ages	Village Zhoneti, adjacent to the church of the Virgin
25.	Church of the Savior	Late Middle ages	Village Rioni
26.	Church ruins	Middle ages	Village Rioni, cemetery
27.	Ruins of the fortress	Middle ages	Village Rioni, cemetery
28.	Ruins of the fortress	Middle ages	Village Rioni areas, “Avalianis Gora”
29.	Church of the Archangel	Late Middle ages	Village Sakulia
30.	Trinity Church	Early Middle ages	Village Sormoni areas
31.	Trinity church	XIX-XX c.	Village Sormoni, cemetery
32.	Tower ruins	Middle ages	Village Sormoni, V. Dzotsenidze’s premises
33.	Ruins of The Agiashvili Fortress	Late Middle ages	Village Tkachari
34.	St. Kvirike Church	1907	Village Tkachari, cemetery
35.	Qashveti Church	XIX c.	Village Partskhanakanevi
36.	St. George Church	XIX c.	Village Partskhanakanevi, cemetery
37.	Ruins of Qashveti church	Middle ages	Village Partskhanakanevi
38.	Wooden church	XIX-XX c.	Village Qveda Meskheti, cemetery

39.	Trinity Church	Late Middle ages	Village Qveda Meskheti, cemetery
40.	Wooden Church	XX c. the beginning	Village Qvitiri, cemetery
41.	Church of the Virgin	XIX c.	Village Qvitiri, cemetery
42.	I MIll	XIX c. the end	Village Qvilishori areas, near the cave
43.	II MIll	XIX c. the end	Village Qvilishori areas, near the cave
44.	III MIll	XIX c. the end	Village Qvilishori areas, near the cave
45.	Church	Late Middle ages	Village Qvilishori
46.	Ruins of the fortress	Middle ages	Village Qvilishori areas, near the cave
47.	"Yellow" church	XIX-XX c.	Village Kumistavi
48.	"Tsikhis Gverdi" church	Late Middle ages	Village Chuneshi, on the mountain, old cemetery
49.	"Jvari" church	Late Middle ages	Village Tskhunkuri
50.	Belfry	Middle ages	Village Tskhunkuri
51.	Church "Dedaghvtisa"	Late Middle ages	Village Tskhunkuri, Meskhebisubani
50.	Belfry	Middle ages	Village Tskhunkuri
51.	Church "Dedaghvtisa"	Late Middle ages	Village Tskhunkuri, Meskhebisubani
52.			
53.	St. George church	Late Middle ages	Village Cholevi, cemetery
54.	Tower ruins	Late Middle ages	Village Cholevi, cemetery
55.	Ruins of the church	Middle ages	Village Cholevi
56.	Church	XIX c.	Village Khomuli
57.	The architectural complex of "Gogia" Caslte hall	VI-VII c. restoration in XVII c.	Village Khomuli
58.	St. George church	Late Middle ages	Village Khomuli
59.	St. George church	Late Middle ages	Village Jimastaro

Annex of the order N 3/31 issued by The Minister of Culture and Monument Protection of Georgia, on February 21, 2011 (excerpt)

1.	Church of the Savior , village Chashleti	Tskaltubo Municipality	Architecture	XI c. changed in the XIV XV c.

DCN: 2012-GEO-004

11 ANNEX E: LOCATION OF THE TELECOMMUNICATION SYSTEMS WITHIN THE REGION

N 06/1364-11 04.07.2011

To Mr. Sulkhan Zumburidze
Georgian State Electro System Rehabilitation Manager (Head of the Management Board)

Information on location of communications transmission equipment
(Response to your letter N 01/02-1707, of June 6, 2011)

Dear Mr. Zumburidze

On the basis of graphic images provided by you, we have conventionally circumscribed the areas, where rehabilitation works of 220kv PTL "Senaki 1,2" and substations "Menji" and "Tskaltubo" is going to be carried out.

All the sites you are interested in are located within the boundaries of conventional rectangle. Angle Coordinates of the rectangle are: N42.333333, E41.966667 (the left upper angle) and N42.250000, E042.616667 (the bottom right angle).

According to our information, receiving and transmitting stations of mobile communication cellular network are located within the above-mentioned rectangle, in compliance with the following coordinates:

	N	E
1	42.25131	42.58236
2	42.25194	42.18
3	42.25361	42.17958
4	42.25725	41.98653

	N	E
5	42.25803	42.50192
6	42.25811	42.09622
7	42.25811	42.09622
8	42.26111	42.34389

	N	E
9	42.26131	42.61508
10	42.26389	42.05194
11	42.26636	42.07011
12	42.26986	42.06344
13	42.27173	42.03709
14	42.28039	42.24103
15	42.28694	42.01306
16	42.28838	42.33695
17	42.28994	42.05775
18	42.29042	42.16358
19	42.29464	42.01461

	N	E
20	42.29725	42.22775
21	42.29867	42.39636
22	42.30964	42.04522
23	42.31389	42.445
24	42.31511	42.15756
25	42.32411	42.42211
26	42.32836	42.60236
27	42.32889	42.12
28	42.33003	42.11761
29	42.33281	42.12606

As for broadcasting and other metric/decimetric transmitters, they are located on the following Geographical points:

	N	E
1	42.257250	41.986528
2	42.271731	42.037089
3	42.309639	42.045222
4	42.289942	42.057750
5	42.266361	42.070111
6	42.258111	42.096217
7	42.290417	42.163581
8	42.280389	42.241028
9	42.298667	42.396361
10	42.324111	42.422111
11	42.324167	42.422417
12	42.258028	42.501917
13	42.328361	42.602361
14	42.261306	42.615081

Respectfully
Acting Commission Chairman

K. Kvitaishvili

DCN: 2012-GEO-004

The Georgia Power and Gas Infrastructure Project ('PGIP' or 'Project') provides in-country professional engineering and other technical services to support power and gas transmission improvements being undertaken by USAID on behalf of the Government of Georgia. Activities performed under the PGIP will complement and reinforce the activities, project management, and engineering expertise of USAID/Caucasus.

USAID will be undertaking work from 2010 to 2013 in the energy sector in collaboration with the Georgian Oil and Gas Company ('GOGC') and the Georgia State Electrosystem ('GSE') to upgrade, replace, and install critical selected gas and power transmission infrastructure. These companies are state-owned entities charged with the import and transit, and in the case of GSE, dispatch of electricity throughout the country.

The activities under this Project will support USAID's objective of promoting energy security through greater access to electricity and natural gas supplies households in west Georgia, promote the development of the Poti Free Industrial Zone (FIZ) on the Black Sea, and secure power exports through in-country reliability related infrastructure improvements. The activities assigned are managed by Tetra Tech and support USAID's objective of fostering sustainable development.

The PGIP project includes the following infrastructure projects:

- Construction of a new 31 kilometer, 700 mm gas pipeline from Senaki to the Poti FIZ;
- Construction of a new 76 kilometer, 700 mm gas pipeline from Kutaisi to Senaki;
- Replacement of 58 kilometers of 220 kV transmission lines (referred to as Senaki I and II) which were dismantled in 1992 during Georgia's civil war; and,
- Restoration of the power substations in Tskaltubo and Menji to support the Senaki I and II 220 kV transmission lines.

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