APPENDIX L

Biodiversity Action Plan

Biodiversity Action Plan

Section F4 of the Khevi-Ubisa-Shorapani-Argveta Road (E60 Highway) Republic of Georgia.

Table of Contents

1.	Introduction	5
	Project Description	5
	Why is the Project BAP Needed?	7
	Structure of this report	
2.	Scope of the F4 BAP9	
	Aims and Objectives of the BAP	9
	Formulation of the Project BAP	10
	Study Area	11
3.	Legal and Regulatory Framework	
•	Legal and Regulatory Requirements	12
	National Legislative and Policy Framework	12
	Planning and Permitting Requirements	14
	Third Party Requirements	
	Asian Development Bank (ADR) Standards	
	International Finance Corporation (IFC) Standards and Guidance	
4.	Biodiversity Baseline 19	
	General Approach and Methodology	
	Habitat	
	Mammais	
	Amphibians	
	Insects	
	Avi Fauna	39
	Fish	43
	State Forest Fund	
	Protected Areas	
5.	Priorities for Biodiversity Conservation	
	5.1 Selection criteria	47
	5.2 Priorities	
	5.2.1 Habitats	
	5.2.2 Species	
6.	BAP Actions	
	Overview	48
	Action Plan for Forest Habitat and Notable Plant Species	
	Current Factors Affecting the Forest Habitats in the Study Area	
	Action Plan Objectives and Actions	
	Current Factors Affecting Rivers and Associated Species	
	Action Plan Objectives and Actions	52
	6.4 Action Plan for Protected and Threatened Terrestrial Mammal and Reptile S	pecies

6.4.2 Action Plan Objectives and Actions	
7. BAP Implementation, Monitoring and Reporting	
7.1 Mitigation Ranking	
7.2 Implementation of the BAP	
7.3 Monitoring, Evaluation and Reporting	
7.3.1 Overview	
7.3.2 Monitoring during Construction	
7.3.3 Post-construction Monitoring	
7.3.4 Reporting	

1. Introduction

<u>Overview</u>

The Government of Georgia is endeavoring to make Georgia a regional and logistics hub and more attractive for businesses. The East West Highway (EWH), stretching 410 km from Sarpi on the Black Sea, at the border with Turkey, through the center of the country to the capital Tbilisi and on to the border with Azerbaijan, is the main inter-regional and international route between western and eastern Georgia, as well as its neighboring countries. Representing about 2% of Georgia's road network and one fourth of its international roads, the EWH serves 8,000 to 10,000 vehicles per day and carries over 60% of the country's international trade. The EWH will be an integral part of one of the six key CAREC corridors providing the shortest transit link to connect Central Asia with Europe and East Asia.

In light of the traffic growth on EWH, the high percentage of truck traffic, and the difficult terrain and resulting geometric profiles (which is resulting in high accident rates), capacity expansion of the current 2-lane mountainous section between Chumateleti and Argveta is crucial to realizing full potential of the EWH with improvements to the highway either completed or underway on each side of this section.

Therefore, the Government has requested the Asian Development Bank (ADB) and several other development partners to finance the remaining bottleneck sections (Chumateleti - Argveta) on the EWH. A feasibility study financed under a World Bank project for the Chumateleti Argveta section (comprising four sections F1 through F4) of the EWH was completed in 2015. The detailed design of Section F1, F2 and F3 has been completed and construction is commencing. Detailed design of sections F4 is now on-going and this report forms the EIA for detailed design phase of section F4.

Project Description

The Project involves construction of a new road section of the E-60 highway located in Imereti Region of central Georgia. Section F4 forms the Shoropani – Argveta portion of the Khevi-Ubisa-Shorapani-Argveta section of the E-60. The length of the Project road is as follows:

- Right lane (TA meaning Tbilisi Argveta direction) 14.778 km;
- Left lane (AT meaning Argveta Tbilisi direction) 14.726 km.



Figure 1: Road Location Map

The Projects geometric design standards have been selected based on traffic flow, road category and relief to ensure safe and unimpeded traffic flow. The road design is based on Georgian National Standard SST 72: 2009 "Standard on Geometrical and Structural Requirements for the Public Motor Roads of Georgia" and TEM (Trans-European North-South Motorway) Standards.

The main technical parameters adopted in the detailed design are as follows:

- Design speed 100 km/h;
- Number of traffic lanes 4;
- Width of traffic lane 3.75 m;
- Width of each carriageway 7.5 m;
- Width of paved shoulder (emergency lane) 2.5 m;
- Width of verge 1.0 m;
- Width of central reserve- 5.0 m;
- Width of paved shoulder at the central reserve 1.0 m;
- Total width of each paved platform 11.0 m;
- Width of road bed 27.0 m;
- Carriageway cross-fall on straight sections 2.5%;
- Minimum radius of horizontal curve 400 m;
- Maximum longitudinal gradient 4%;
- Minimum convex curve 15 000 m;

• Minimum concaved curve - 15 000 m.

Five long span bridges and one short span bridge will be constructed during the project works. The total length of the five bridges is 4,912 meters, the longest of which is 941 meters. The bridges are grouped into the following main typologies:

- Steel-concrete bridges bridges 1,2,4: maximum span length up to 60 m for bridges 1 and 2 and up to 72 meters for bridges 4-AT and 4-TA.
- Precast concrete bridges bridges 3 and 5: maximum span up to 34m.

Six tunnels will be constructed with double tubes with length from 399 m to 1193m.

To construct the roadbed in the project section concrete retaining walls and reinforced concrete support structures will be required on several sections due to the difficult relief conditions of the project section. Reinforced concrete retaining walls are required at the beginning of the project section from:

- KM 0.00 to KM 0.25
- KM 8.63 to KM 8.71
- KM 8.84 to KM 8.94

There are four interchanges planned in F4 Section.

The following types of culverts will be constructed:

- Underpasses for rural roads, which are construction of cast in situ reinforced concrete structures of closed contours cross sections 6.0x4.5 m - 6 units for passing rural roads is envisaged in the design.
- Cattle passes, which ensure cattle cross the project road. Construction of cast in situ reinforced concrete structures of closed contours cross sections 4.0x2.5 m - 4 units is envisaged in the design.
- Culverts, for which cast in situ reinforced concrete culverts cross section 2.0x2.5 m 17 units, 4.0x2.5m - 2 units is envisaged in the design to provide water discharge from ravines and canals.

Eight underpasses will be constructed using reinforced concrete culverts. One overpass will be constructed at km 11+854 with a length of 40 meters.

Two different pavement structures will be used:

- Concrete pavement structure for the motorway and interchanges; and
- Asphalt pavement structure for all Slip Roads and all Minor Roads and bridges.

Why is the Project BAP Needed?

A Biodiversity Action Plan (BAP) is a plan which includes a set of actions that lead to the conservation or enhancement of biodiversity for a specific site or project.

The BAP is needed to ensure that the Project:

- Implements the mitigation, compensation and biodiversity offsetting measures within the Project EIA (IRD/SPEA 2019);
- Complies with national legislation/policy requirements; and
- Complies with international environmental requirements and best practice, including Asian Development Bank (ADB) Safeguard Policy Statement and International Finance Corporation (IFC) Performance Standard 6 (PS6)

Structure of this report

This report is structured as follows:

- Chapter 2 presents the aim and general objectives of the BAP, along with the steps followed in the formulation of the BAP and the study area for the BAP;
- Chapter 3 summarizes the legislative and policy frameworks at international and national levels together with the Project EIA process and its key findings with regard to biodiversity;
- Chapter 4 describes the biodiversity baseline and includes information on nature conservation areas, habitats, flora and fauna within the study area;
- Chapter 5 lists the priorities for conservation and the selection criteria;
- Chapter 6 includes four action plans, each with objectives, targets and actions; and
- Chapter 7 presents information on the mitigation ranking, BAP implementation, monitoring and reporting.

2. Scope of the F4 BAP

Aims and Objectives of the BAP

The aim of the BAP is to achieve no net biodiversity loss as a result of the Project by ensuring that the biodiversity is protected and enhanced where possible. The BAP has been developed in consultation with biodiversity experts and confirms that appropriate measures are in place to be successfully implemented.

The objectives of the BAP are to:

- Review existing biodiversity baseline information and legislative/policy frameworks for the Study Area and identify gaps;
- Identify priorities and actions for biodiversity conservation, in consultation with biodiversity experts; and
- Establish a monitoring and evaluation program for biodiversity allowing for the success of the BAP interventions to be assessed.

This BAP includes both long-term biodiversity conservation actions and on-site mitigation measures linked to the construction and operation activities of the Project. The biodiversity baseline, conservation actions and mitigation in this BAP supplement the information in the Project EIA and EMP (IRD/SPEA 2019). Additional conservation opportunities/actions have been identified during the BAP process, following a comprehensive desktop review and consultation with biodiversity experts. The conservation objectives and actions in this BAP have been developed to ensure the systematic implementation of the mitigation hierarchy i.e. avoid, reduce (minimize), remedy (restore) and offset. The concept of the mitigation hierarchy is outlined in Figure 2. This will allow for the careful management of risk and the best possible outcomes for the project and local communities, without compromising the health, function and integrity of the ecological system.

In addition to the actions linked to the mitigation hierarchy, this BAP includes Additional Conservation Actions (ACA), which are actions to enhance the biodiversity of the Study Area, irrespective of the developments taking place there.



The conservation actions have been established with the aim of achieving 'no net loss' to biodiversity in accordance with IFC PS6 (IFC, 2012a, 2012b). IFC PS6 requires evidence that the mitigation hierarchy has been applied, that avoidance is prioritized, and that offsets are measurable and only applied as a last resort where residual impacts are unavoidable.

Formulation of the Project BAP

The development of the BAP follows the IFC Guidance Note 6 (IFC, 2012b).

It is important to recognize that a BAP is not just the production of a single document which details what actions are needed for the conservation and management of biodiversity. A BAP is a process from which a BAP document is formulated through the review of previous studies. The EIA is part of this process in that the ecological assessments of the EIA provide the baseline upon which the BAP objectives and conservation priorities are based. In accordance with best practice, A BAP should include eight specific tasks:

- Task 1: Determination of the legal, regulatory, planning, permitting & third-party requirements
- Task 2: Desktop assessment of the project
- Task 3: Baseline survey of the biodiversity
- Task 4: Biodiversity impact assessment
- Task 5: Preparation of the BAP
- Task 5.1 Establishment of priorities for conservation
- Task 5.2 Identification of conservation actions
- Task 6: Implementation of the BAP

- Task 7: Monitoring, evaluation and improvement
- Task 8: Reporting, communication and verification of BAP performance

Tasks 1 to 4 were dealt with as part of the Project EIA (IRD/SPEA 2019). However, Tasks 1 to 4 have been reviewed in more detail and updated in line with the requirements of the BAP and IFC PS6 (IFC, 2012a, 2012b).

Study Area

The Study Area for this BAP includes:

- The Project buffer (comprising road construction area, construction camps, laydown areas, etc).
- Access roads.
- Spoil disposal areas.

Maps of these areas, including the Project buffer, are provided in **Appendix A**.

3. Legal and Regulatory Framework

Legal and Regulatory Requirements

National Legislative and Policy Framework

In Georgia, The Ministry of Environment Protection and Agriculture (MoEPA) is responsible for regulating the natural environment. MoEPA participates in the development environmental state policy and implements all policies designed for the protection and conservation of the environment and for the sustainable use and management of Georgia's natural resources. This includes controlling activities that have a potential adverse impact on the environment and natural resources and issuing environmental licenses and permits.

Georgian legislation comprises the Constitution, environmental laws, international agreements, subordinate legislation, normative acts, presidential orders and governmental decrees, ministerial orders, instructions and regulations. Along with the national regulations, Georgia is signatory to a number of international conventions, including those related to environmental protection.

The National Biodiversity Strategy and Action Plan (NBSAP) for Georgia (2005) sets out the goals, objectives and policies for the protection and conservation of biodiversity in Georgia. The NBSAP sets nine strategic goals with the vision that Georgia *"will be a country where biological diversity is sustained and rehabilitated within a political, social and economic context that favours the wise use of natural resources and adequate benefit sharing"*. The strategic goals of the NBSAP are the following:

- a) To develop a protected areas system to ensure conservation and sustainable use of biological resources.
- b) To maintain and restore Georgia's habitats, species and genetic diversity through in-situ, ex-situ and inter-situ conservation measures, and through sustainable use of biological resources.
- c) To conserve Georgian agrobiodiversity through ensuring its sustainable use and by promoting of ex-situ and in-situ conservation measures.
- d) To promote sustainable hunting and fishing through adequate planning, restoration and protection of key biological resource.
- e) To develop a biodiversity monitoring system and an active and integrated biodiversity database to ensure sustainable use and conservation of biological resources.
- f) To protect both the human population and biodiversity from potential threats from genetically modified organisms (biotechnology), through the strengthening the law and through increasing public involvement in decision making.
- g) To raise public awareness of biodiversity issues and to encourage public participation in the decision making process.

To ensure appropriate financial and economic programs are in place in order to support effective conservation of biodiversity, and to ensure the delivery of the BAP.

To further improve national legislation (and associated institutions) relating to biodiversity conservation, through the creation of new, and elaboration of existing laws and regulations, and through ensuring harmonization to international legal responsibilities.

The Project has considered these strategic goals and will help achieve the following goals: B, D, E and G. The other goals are either not relevant to this project or RD has no control or influence to achieve these.

Georgian environmental legislation is based on existing international concepts and criteria. The key pieces of legislation regarding biodiversity are:

- Law of Georgia on Protection of the Environment (framework law)
- Law of the General Rules for the Protection of Wild Plants and Animals
- Law of Georgia on Protected Areas
- Law of Georgia on Wildlife
- Law of Georgia on Red List and Red Book
- Forest Code of Georgia.

The *Law of Georgia on Protection of the Environment* regulates legal relationship between the bodies of the state authority and physical persons/legal entities in the scope of environmental protection and consumption of natural resources on all Georgian territory including its territorial waters, airspace, continental shelf and special economic zones. The law concerns environmental education, environmental management, economic sanctions, licensing, standards, environmental impact assessment and related issues. The law considers various aspects of ecosystem protection, protected areas, global and regional environmental management, protection of the ozone layer, biodiversity and the Black Sea, as well as discussing international cooperation aspects. The main goals of the law are promotion of biological diversity, conservation of the country-specific, rare, endemic and endangered species of flora and fauna, marine environmental protection and provision of ecological balance. Law defines "*biological diversity conservation principle*", meaning that an activity should not lead to irreversible degradation of biodiversity.

The *Law of the General Rules for the Protection of Wild Plants and Animals* defines general rules for wildlife and plant protection:

- To maintain self-reproduction of wild plant and animal resources and biodiversity conservation, their extraction from the environment is strictly limited and is a subject to licensing;
- Any activities that could damage wildlife, plants, habitats, reproduction areas and migration routes are prohibited;
- Endangered wild animals and plants are registered in the "Red List" and "Red Book" of Georgia; and
- Any kind of activity regarding wild animals and plants, registered in the "Red List" and "Red Book" of Georgia are prohibited, including: hunting, trade, catching, cutting, mowing, except in special cases, which decreases the plants and animals number, deteriorates their habitats and living conditions.

The *Law of Georgia on Protected Areas* gives a definition of protected areas (including national parks, reserves, State Preserves and multiple use areas) and sets frameworks of activities, permitted in those areas. Eligible activities are determined according to the area designation, territory legislation, specific provisions and protected area management plans, as well as in accordance with the requirements of international agreements and conventions signed by Georgia. It defines limits of the natural resource use within national parks and other protected areas. Generally, following activities are prohibited in the protected areas:

• To damage or modify natural ecosystems

- To destroy natural resources due to use or other purposes
- To seize, damage or disturb natural ecosystems and species
- To pollute the environment
- To introduce and multiply alien and exotic species of living organisms
- To import into the territory explosive or poisonous materials.

The *Law of Georgia on Wildlife* provides protection and restoration of the wildlife and its habitats, conservation of species diversity and genetic resources, sustainability and creating conditions for sustainable development, taking into account interests of future generations; legislative provision of the state regulation, regarding animal protection and animal wildlife use.

The *Law of Georgia on Red List and Red Book* (2003) regulates the Red List of Georgia and Red Book of Georgia, in relation to endangered species protection and their use, with the exception of issues related to aspects of international trade in endangered animals and plants. There are 137 species protected under the Laws in Georgia. Together with species protected by international conventions, the number increases to 200. Most of these are listed in the International Red List (Red Data List of IUCN), Red List of Georgia and in the Conventions' appendices.

The *Forest Code of Georgia* regulations relate to functions and use of forest, including protection, management of water catchment basin, wood production, etc. It allows for private ownership of forest and commercial woodcutting. According to the law, the Forest Department of Georgia does not undertake commercial woodcutting itself, but controls and manages these operations by granting this function to private enterprises. However, the Forest Department carries responsibility for maintenance woodcutting and forest management. According to the Code, the Ministry of Environment Protection and Natural Resources delegated to the Department a right to issue woodcutting licenses. The Forest Code sets categories of protected forests, including those regulating soil and catchment basins, riparian and sub-alpine forest zones, floristic species of the Red List, etc. The Forest Code is a framework law and requires execution of detailed regulations.

At present Georgia has no fisheries law. Recently the Ministry of Agriculture (MoA) started to prepare a new law on fisheries for Georgia. Governmental approval of this law is expected to take place in coming years, after which a number of regulations under the law will still need to be produced.

Planning and Permitting Requirements

A detailed ecological assessment was completed for the Project as part of the EIA (IRD/SPEA 2019). The EIA identified a number of mitigation and compensation measures which were necessary to ensure that there would be no significant loss in biodiversity. It has been agreed that a BAP is needed to ensure that mitigation and compensation measures are fully and properly implemented to meet conservation goals and objectives. This BAP supplements and updates the information included in the Project EIA to reflect the refinement and development of the Project design, the additional biodiversity baseline information collected since August 2017, and to include further assessment mitigation and conservation actions which are required to comply with IFC PS6 (IFC, 2012a, 2012b).

A review of the likely impacts presented in the Project EIA has been undertaken and used to:

• Determine whether the BAP is necessary and which features it should be applied to;

- Determine the level of impact and risk associated with the impacts;
- Determine the associated mitigation, monitoring and evaluation activities needed to address those impacts; and
- Determine the conservation actions.

Box 1 below includes a summary of the likely significant impacts of the Project as identified in the Project EIA (IRD/SPEA 2019). The table presents sensitive habitats and protected species that have been identified to occur within the Project Area, which may be affected by the project and the types of impacts that may occur.

Additional surveys to be undertaken prior to site clearance of each construction site and during the construction period will provide further details on whether these impacts will occur as well as quantification of impact. The construction management measures as well as mitigation measures that will be implemented throughout the project to avoid and minimize these impacts are summarized within Chapter 6 BAP Actions, further details on construction management measures are detailed within the Project EIA / EMP (IRD/SPEA 2019) and the Contractors Specific Environmental Management Plan (SEMP).

Details of impact magnitude and significance are provided in the Ecological Resources chapter of the EIA (IRD/SPEA 2019).

Box 1: Potential Impacts to Biodiversity, Project EIA (IRD/SPEA, 2019)

The main concerns for impacts on ecological receptors are disturbances caused by site clearance/preparation, the spread of invasive species and contamination of feeding, breeding and resting habitats. Another concern is poaching due to a lack of regulation.

Site Clearance - The main effects of site clearance/preparation and movement of equipment include loss of habitat. The ecological receptors most affected include those that have limited mobility such as terrestrial flora, reptiles and amphibians. Loss of habitat can also affect more mobile species which lose breeding, nesting and feeding sites. The spread of invasive plant species is facilitated by disturbances such as site clearance and this results in a risk to the native, endemic and relict flora.

The removal of vegetation, including up-rooting of shrubs and cutting of trees, will result in loss of plants, contributing to a decline in their numbers, as well as loss of habitat for species of mammals, birds, insects and herpetofauna that they provide. Fauna with limited mobility, such as reptiles, are at a greater risk of direct mortality due to Project- related activities such as movement of equipment.

Site clearance/preparation and movement of equipment results in the removal of top soil which can negative influence several soil functions which are relevant in nature and environmental protection, e.g. carbon storage, and a decrease in biological activity.

Reptiles and amphibians have limited ranges and are unable to travel long distances unlike birds and mammals. As a result any individuals found within the Project area are at risk of either being killed by Project-related activities, or having suitable habitat destroyed and perishing as a result of their inability to re-locate.

Loss of habitat results in the loss of breeding, feeding and nesting sites for all species including highly mobile ones.

A number of trees will need to be cut within the Project area, both on private land and within State Forest Fund areas. Other trees (potentially including Georgian red-listed species) are located adjacent to the boundary of the site and may be damaged accidentally by construction works.

The Project road has been designed in such a way that will be no significant fragmentation of habitat during the operational phase of the Project. The majority of the roads alignment traverses either bridges or tunnels, meaning that wildlife can easily pass above the road, or under it to access the Rikotula and Dzirula rivers. However, during the construction there may be some minor, short term fragmentation of habitat caused by access roads and other temporary facilities.

Pollution and Waste Generation - Pollution and improper disposal of waste, generated during construction activities, poses a threat to surrounding fauna. The ecological receptors at risk are not only those that have limited mobility but also more mobile receptors, such as fish and bird fauna which pass through the Project area. Improper waste disposal can result in dumping on vegetation and contamination of soil which can result spread of contaminants into the ecosystem. Water bodies can also be contaminated. Both land and water pollution can result in contamination of the food chain. Pollution of water channels can put at risk both aquatic and terrestrial ecosystems. Pollution from noise and dust from construction activities will result in presently suitable habitat nearby becoming uninhabitable. It can also cause loss of suitable foraging and breeding sites.

Pollution of the Dzirula river can result in contamination of sites that may currently be suitable habitat for feeding and breeding of fish species.

Work Sites in and around Rivers – A number of bridges will be constructed across the Dzirula river. Works involve the construction of bridge abutments and bridge piers which in many instances will be undertaken in the river itself or on the river banks. Temporary impacts on fish may result from sedimentation and water turbidity in the immediate vicinity of the construction work area (especially around the bridge construction zones), and the potential for minor introduction of pollutants from construction operations.

Light Pollution - Light pollution may have impact on bats. Since these species are nocturnal light may disrupt bat commuting routes or deter bats from feeding areas. Besides the light may cause delay in emerging from the roosts in the evening and reduce foraging ability. On the other hand light can be beneficial for insectivorous species, since light attracts insects. However, it can also make them more vulnerable to predation by nocturnal birds such as owls.

Lack of Regulation - Staff involved on-site, such as workers and site managers, can engage in poaching and illegal exploitation of wildlife. This can result in the targeting of species of conservation importance including those currently under legal protection from hunting and exploitation.

Impacts on Ecosystems – Ecosystems can be divided into terrestrial and aquatic ecosystems.

- (i) The impact on terrestrial ecosystems will be limited, with the main one being due to loss of habitat from construction of the Project.
 - (ii) The spread of invasive species, however, if not prevented, will have an

impact on the terrestrial ecosystem, especially on the composition of native flora. Under disturbed conditions invasive species will be able out-compete native flora and alter the plant community composition permanently.

(iii) Irresponsible waste disposal will result in impacts on both terrestrial and aquatic ecosystems. Dumping on soil will reduce soil quality and inhibit biological activity, whilst dumping in water bodies will reduce water quality, which will impact the aquatic ecosystem. Contamination of both ecosystems will result in adverse impacts on the food chain for both terrestrial and aquatic organisms.

Impacts on Wildlife Habitat - Impacts on wildlife habitat include habitat loss and pollution from noise, dust and irresponsible dumping of waste.

- (i) Site clearance carried out for the Project will result in loss of habitat that is presently being used by wildlife.
- (ii) Construction activities will result in generation of noise and dust which will drive wildlife away from areas surrounding the Project site.
- (iii) Improper waste disposal will result in pollution which will contaminate soil and water resulting in a reduction in quality of habitat available for wildlife.

Regarding aquatic habitat, the actual area in the river to be lost from bridge piers or retaining walls will be minimal compared to the wider aquatic habitat available in the Dzirula River, well below 1% of the habitat available. While habitat loss will cause local impacts to aquatic flora /fauna as rivers are dynamic systems it is expected that the river will make a full recovery following construction.

Protected Species - The following species IUCN Red-list Species (VU, NT, EN, CR) and Georgian Red list species have been identified that are, or may be present within the Project area:

- (i) Testudo graeca Linnaeus Mediterranean turtle (IUCN / GRL VU)
- (ii) Emys orbicularis European Pond Turtle (IUCN NT)
- (iii) Sciurus anomalus Gmelin Caucasian Squirrel (GRL VU)
- (iv) Lutra lutra Linnaeus Eurasian Otter (GRL VU)
- (v) Capoeta Sieboldi Colchic Nase (GRL VU)

Site clearance activities, pollution and waste generation can have significant negative impacts to these species and therefore requires careful mitigation. However, review of the habitat along the alignment indicates it is not optimum for existence of the Caucasian squirrel. Therefore, construction and subsequent presence (operation) of the highway is not anticipated to change the population trend.

Third Party Requirements

<u>Overview</u>

The Project is required to meet the international standards of the ADB and the IFC, which is part of the World Bank Group. The international environmental and social safeguard policies of these organizations are outlined below.

Asian Development Bank (ADB) Standards

The ADB Safeguards Policy Statement (SPS) 2009 sets out policy principles and outlines the delivery process for ADBs safeguard policy in relation to environmental safeguards. The ADB has adopted a set of specific safeguard requirements that borrowers/clients are required to meet in addressing environmental and social impacts and risks. ADB staff will ensure that borrowers/clients comply with these requirements during project preparation and implementation.

The safeguard policies are operational policies that seek to avoid, minimize or mitigate the adverse environmental and social impacts of projects including protecting the rights of those likely to be affected or marginalized by the development process. ADBs safeguard policy framework in the SPS consists of three operational policies on the environment, indigenous people and involuntary resettlement. ADB has developed Operational Procedures to be followed in relation to the SPS policies and these are included in the ADB Operations Manual.

Requirements for assessing and addressing biodiversity effects of projects are set out within ADB Safeguard Requirements 1: Environment, Section D8 'Biodiversity Conservation and Sustainable Natural Resource Management'. This document is included as an appendix to the SPS.

Section D8 requires the environmental assessment process to focus on the major threats to biodiversity and for the borrower/client to identify measures to avoid, minimize, or mitigate potentially adverse impacts and risks and, as a last resort, propose compensatory measures, such as biodiversity offsets, to achieve no net loss or a net gain of the affected biodiversity. Obligations on the borrower/client differ depending on whether the habitat is classified as modified, natural or critical.

International Finance Corporation (IFC) Standards and Guidance

The IFC PS6 (IFC, 2012a) and Guidance Note 6 (IFC, 2012b) has been used on the Project as best practice and international standard. In accordance with IFC PS6, habitats are divided into modified, natural and critical habitats.

A BAP is required for all projects located in critical habitat (IFC, 2012a) and is recommended for projects that have the potential to significantly impact natural habitat (IFC, 2012b). The EIA has highlighted the potential presence of natural habitats within the zone of influence of the Project (IRD/SPEA 2019).

4. Biodiversity Baseline

General Approach and Methodology

Works included desk top data gathering and field works for verification of available information and additional data gathering. Field surveys were carried out on August 8-9, 2017; September 22-23, 2017 and 1-2 March 2018. In addition to that results of the field survey in the area of interest implemented for feasibility stage of the project (April 2015).

Flora - Following to desk top data gathering and analysis site 4 site visit have been carried out. Collection of the floristic data on the study area included covered two components: 1) collection of the data on the vegetation diversity in the study area and 2) field sampling of the vegetation of the study corridor(s) for obtaining precise empirical data. For identification of the plant species was used determinats and checklists of the flora of Georgia (Ketzkhoveli & Gagnidze, 1971-2011; Czerepanov, 1995; Gagnidze, 2005). Information on the species distribution in the local habitats was obtained from the primary and secondary sources of information (Ketzkhoveli, 1960; Doluchanov, 2010, Akhalkatsi, Tarkhnishvili, 2012; Nakhutsrishvili, 2013, survey reports carried out by the team in the region under other assignments). Validity of the taxonomic statuses of the identified plant taxa was verified using the widely accessible plant taxonomic database "The Plant List" (The Plant List Vers. 1, 2010). Threat categories for the identified plant taxa were determined according the categories and criteria of International Union for Conservation of Nature (IUCN) guidelines (IUCN, 2003) and The Red List of Georgia (2006). Particular attention was paid to identification of any protected species in the project impact area. (Note: inventory of the trees diameter >8cm and <8cm is in process)

For the vegetation study 1x1m, 5x5m, 10x10m, 25x25m sampling plots were selected depending on the type of vegetation (forest, shrubs, wetland area, meadow) and the size of the area.

Plots were sampled in every type of existing habitat. Along with identification of diversity individual coverage scale in the total projecting coverage was determined. Braun-Blanquet cover-abundance scale was used for assessment.

Biodiversity - Following desk top data gathering and analysis four site visits have been carried out. The surveys were carried out in August 8-9, 2017; September 22-23, 2017; March 1-2, 2018 and April 22-23, 2018. The aim of the study was to identify of animal species within the study area; to reveal significant habitats for inhabitant species; to determine possible impact on animal biodiversity on construction and operation phases and to develop impact mitigation measures. Species protected under Georgian legislation and international treaties (included in the Red List and species having other conservation status), species bearing special significance for local population have been paid particular attention to.

Walkover method has been used during the survey, along the species on transect, all observed species were visually recorded and identified. In addition, with registration of the physical presence - traces, excrements, holes, burrows, feathers, fur, etc. were registered.

The surveyed corridor width was ranging from 50 to 2500m depending on location and potential species available. The surveys were carried out in different periods of the day. The peak activity periods (such as April for squirrels; end of March (peak of activity, reproduction

period, from mid March until mid June) - for herps) were taken into account while survey planning.

The species composition of birds was determined by voice if it was not possible to observe them visually.

Reptiles and amphibians were studied in transects, shelters and water bodies – checked. The fact that activity of the reptiles depends on weather was taken into account. Keeping in mind that the species start to 'appear' end of March (Peak of activity is from mid-March until mid-June which is the reproduction period. In July and August, they can be registered only in the morning and late evening when it is not too hot.)

Recording of adult phase of large invertebrates (butterflies, bugs, dragonflies, bees, grasshoppers, spiders, mollusks) was visually carried out on transects. Research methodology comprises the following activities: catching and identification of insects; turning over the stones and soil layer; checking of plants and plant residues; photographing; shaking off the insects on an awning and checking pond bottom - sieving.

Aquatic fauna - In addition to the desk top work the ichthyofauna study, undertaken in April 2018 included:

- Visual audits for identification of habitats suitable for fish species expected to be found in the stream (geomorphology of the substrate, general hydrological data, hypsometry, landform, landscape-visual features);
- (ii) Field surveys:
 - (a) Control catches with cast net, trammel net and kick net,
 - (b) Determination of length, weight, gender, maturity stage, fattening coefficient, meristic and plastic characteristics, digestive tract content;
 - (c) Collection of scales for identification of age, growth and growth rate;
 - (d) Study of food base hydroflora and hydrofauna; identification of macroinvertebrates and insects used for feeding, assessment of periphyton composition. Registration of perythytone and invertebrates within the wetted perimeter of the stream. Examination of stoned in the riverbed/wetted perimeter;
 - (e) On-site measurements determination of suspended solids; dissolved oxygen (using filed tester Oxi 330i); water and air temperature; pH;
- (iii) Interview of the local population and amateur fishermen with at least 5-10 years of fishing experience); and
- (iv) Laboratory processing of the obtained material (identification of age, growth and growth rate based on scales collected during the field survey (Note catch, and release principle was complied with).

A survey of state forest fund areas was also undertaken, and an inventory of species prepared along with a shape file of the state forest fund within the Project corridor.

Sources of Baseline Data:

(i) See **Appendix M** of Project EIA (IRD/SPEA 2019).

Protected Areas and IBAs - Maps and data relating to Important Bird Areas (IBAs) and protected areas were collected and reviewed.

Sources of Data:

- (i) Birdlife International <u>http://datazone.birdlife.org/site/mapsearch</u>)
- (ii) Protected Plant <u>https://www.protectedplanet.net/borjomi-strict-nature-reserve</u>

(iii) Agency of Protected Areas of Georgia - <u>http://apa.gov.ge/en/</u>

<u>Habitat</u>

Habitats in the project area were studied in 100m wide strip. The survey (undertaken in August 8-9 and September 22-23, 2017) revealed that the project corridor crosses mainly transformed (modified) habitats. The main habitats identified in the area of interest are described in the tables below.

Table 1: 62GE04 Code of Georgia: Vegetation of urban and rural areas/ EUNIS code I1 -	Arable
land and market gardens	

General	Vegetation of village settlements and cultivable land is extremely interesting from
description	the point of view of plants of economic importance. In this pabitat there are
description	the point of view of plants of economic importance. In this habitat there are
	various species of aborigine, invasive and adventive cosmopolitan plants related
	to wild relatives of cultural plants and those used in traditional (people's) and
	scientific medicine, including, Chicory - Cichorium intybus, meliot - Melilotus
	officinalis, yarrow - Achillea milllefolium, agrimony – Agrimonia eupatoria,
	creeping couch-grass - Agropyron repens, white briony - Bryonia dioica,
	shepherd's purse - Capsella bursa-pastoris, henbane - Hyoscyamus niger,
	mother of nettle - Lamium album, forest mallow - Malva sylvestris, mint - Mentha
	arvensis, great plantain - Plantago major, chickweed - Stellaria media, dandelion
	- Taraxacum officinale, nettle - Urtica dioica, etc. These plants are distributed on
	the territories of the city and village settlements, roadsides and transformed
	habitats. Most of them, as pioneer plants, create primary successions on eroded
	slopes as a result of industrial activities and construction works.
Species	Plants: Achillea millefolium, Agrimonia eupatoria, Agropyron repens, A. fatua,
•	Beta corolliflora, Bryonia dioica, Capsella bursa pastoris, Chelidonium
	majus.Cichorium intybus, Coriandrum sativum, Cornus mas, Corylus avellana,
	Cuscuta europaea. Cvdonia oblonga. Ficus carica. Fragaria vesca. Hvoscvamus
	niger. Juglans regia. Lamium album. Lathvrus spp., Onobrychis spp., Linum
	austriacum. Malus oriantalis. Malva sylvestris. Medicago spp., Melilotus
	officinalis Mentha spp Mespilus germanica Morus alba Plantago major Prunus
	spp Punica granatum Pyrus salicifolia Raphanus rapinastrum Rubus spp
	Saturaia spicioara. Sataria viridis Solanum nigrum Stallaria madia. Taravacum
	officinale Tussilago farfara Urtica dioica Vicia spp
	Animale: common vola (Microtus arvalis) stanna mouse (Anodomus
	fulvinactus) lizarde (Lacerta modia Lacerta), steppe illouse (Apouellius
	macrichamic) groop tood (Pufo viridic) jockdow (Convue manadulo) grow
	(Convus coronoc cornix) storling (Sturnus vulgoria)
O omeon on all ¹	(Corvus coronae cornix), staning (Sturnus vulgaris).
Corresponding	None
categories	
Associated	None
habitat	

Table 2: 91E0* Code of Georgia: Alluvial forests/EUNIS code G1.21 Riverine Fraxinus -Alnus woodland, wet at high but not at low water. PAL. CLASS.: 44.3, 44.2 and 44.13

General	Riverside forests are developed both in the forest zone and places without the
description	forest, where it grows as a narrow line along the river-bed. In the forest zone the
	riparian forest is less distinguished from the structure of the bordering forest.
	However, it always has a characteristic composition of species. Common alder
	forest is frequently grown in the riparian forest but it is not as typical as in the
	marshy forest. Holcus lanatus, Paspalum paspaloides, Briza minor, Pycreus

	colchicus, Poa trivialis, Polygonum persicaria, etc. are characteristic from herbaceous species.
	 Sub-types: 91E0 *01. Floodplain forest in Abkhazia, the wide bed of rivers is periodically covered with water, which causes washing away of the vegetation existing there. However, after a certain period they will again return to the initial conditions. Mainly, such places are covered by annual plants, such as, <i>Aira capillaris</i>. 91E0*02 River silt vegetation - Silt banks are covered with bushes which consist of species of hawthorn and oriental hornbeam. Buckthorn and Jerusalem thorn are rare.
Species	Plants: Aira capillaris, Alnus barbata, Asparagus verticillatus, Calamagrostis glauca, Carpinus orientalis, C Cyperus fuscus, Eleocharis palustris, Epilobium palustre, Eupatorium cannabinum, Fraxinus oxycarpa, Galium articulatum, Juncus articulatus, Mentha aquatica, Populus tremula, Pycreus flavescens, Salix spp, Senecio grandidentatus, Smilax excelsa, Staphylea pinnata.
	Animals: social vole (<i>Microtus socialis</i>). Amphibians – green toad (<i>Bufo viridis</i>), lake and Asia Minor frog (<i>Rana ridibunda, R. macrocnemis</i>), common treefrog (<i>Hyla savignyi</i>), green and common toads (<i>Bufo viridis, B. (bufo) verrucosissimus</i>), parsley frog (<i>Pelodytes caucasicus</i>); reptiles – ring and dice snakes (<i>Natrix natrix, N. tesselata</i>), sand lizard (<i>Lacera agilis</i>), meadow lizard (<i>Darevskia praticola</i>). Birds as in surrounding forest habitats.
Corresponding categories	United Kingdom classification: "W5 Alnus glutinosa-Carex paniculata woodland", "W6 Alnus glutinosa-Urtica dioica woodland)" and "W7 Alnus glutinosa-Fraxinus excelsior- Lysimachia nemorum woodland".
	German classification: "43040401 Weichholzauenwald mit weitgehend ungertörter Überflutungsdynamik", "43040402 Weichholzauenwald ohne Überflutung", "430403 Schwarzerlenwald (an Fließgewässern)", "430402 Eschenwald (an Fließgewässern)", "430401 Grauerlenauenwald (montan, Alpenvorland, Alpen).
	Nordic classification: "2234 Fraxinus excelsior-typ" and "224 Alskog".
Associated habitat	Forests of this type border with moist meadows and floodplain forests.

Table 3: 323 GE Code of Georgia: Alpine rivers and their ligneous vegetation/EUNIS code C3.62 Unvegetated river gravel banks

General	There are 4 sub-types of this habitat:
description	323GE-01. On river banks covered with silt or mud thin scrub can be found – hawthorn .(<i>Crataegus kyrtostyla</i>), oriental hornbeam (<i>Carpinus orientalis</i>) and Jerusalem thorn (<i>Paliurus spina-christi</i>).
	323GE-02. The sandy bank of the riparian is covered with vegetation of thick undergrowth type. <i>Agrostis verticillata, Calamagrostis glauca, Juncus articulatus, J. bufonius, Pulicaria uliginosa,</i> etc. can be found from the grasses.
	323GE-03. Riverside rock vegetation is under the influence of floods during which it can completely disappear and then revive again. Mainly the following annual plants can be found: <i>Carex capillaris, Agrostis verticillata, Chamaenerion hirsutum, Verbascum gnaphalodes.</i> However, grasses and perennial dicotyledons given below also take part in creating this community: <i>Poa glauca, Cyperus fuscus, Pycreus flavescens, Heleocharis palustris, Fimbristylis</i>

	 bisumbellata, Juncus articulatus, J. tenageia; as for dycotyledons - Pulicaria dysenterica, Mentha aquatica, Eupatorium cannabinum. 323GE-04. Boggy places on the banks of rivers, streams and narrow mountain valleys are covered with triangular rush (<i>Juncus bufonius</i>), which expel primary hydrophillic vegetation: <i>Glyceria plicata, Carex remota, Alopecurus arundinaceus</i>. The following are named together with triangular rush: <i>Deschampsia caespitosa, Iris sibirica, Filipendula ulmaria</i>, etc.
Species	Plants: Agrostis verticillata, Alopecurus arundinaceus, Beckmannia eruciformis, Calamagrostis arundinacea, Calamagrostis glauca, Carex capillaris, Carex remota, Carpinus orientalis, Chamaenerion hirsutum, Cladium mariscus, Crataegus kyrtostyla, Deschampsia caespitosa, Eupatorium cannabinum, Filipendula ulmaria, Fimbristylis bisumbellata, Glyceria plicata, Heleocharis palustris, Iris carthaliniae, Iris sibirica, Juncus articulatus, J. bufonius, J. tenageia, Mentha aquatica, Paliurus spina-christi, Poa glauca, Pulicaria dysenterica, Pulicaria uliginosa, Pycreus flavescens, Sparganium microcarpum, Typha minima, Verbascum gnaphalodes.
	Animals: Fish - Salmo trutta; Amphibians and reptiles – Bufo viridis, Rana macrocnemis, Natrix natrix; mammals – Arvicola terrestris, Microtus (Terricola) spp; birds – Motacilla alba, M. flava, M. cinerea.
Corresponding categories	None
Associated habitat	Grasses marshes

Table 4: 9160GE Code of Georgia: Oak or oak-hornbeam forests (*Quercitum -Carpinion betuli*)/ EUNIS code G1.A1 Quercus - Fraxinus - Carpinus betulus woodland on eutrophic and mesotrophic soils. 9160 Sub-atlantic and middle European oak or oak-hornbeam forests - *Carpinion betuli* PAL, CLASS.: 41.24

	nornbeam forests - Carpinion betuil PAL. CLASS.: 41.24
General description	Oak forests in west Georgia it's distributed at the height of 1500-1800 m a.s.l. (Svaneti). The following species can be found together with the oak: <i>Carpinus betulus, C. orientalis, Acer laetum, Sorbus torminalis, Zelkova carpinifolia, Ostrya carpinifolia.</i>
	4 types of oak forests are differentiated. Two of them are found in the project area.
	9160GE-02 Oak-oriental hornbeam <i>(Carpinus orientalis)</i> forest <i>(Iberica-Quercetum-Carpinion orientale)</i> in west Georgia is distributed at the height from 350 to 700-800 meters. 3 types of oak forests are differentiated: 1. With the oak-oriental hornbeam - sedge <i>(Carex buschiorum)</i> xerophytic cover
	 (Carpineto-Quercetum-xerocaricosum) With the oak- oriental hornbeam -meadow grass (Poa nemoralis) cover (Carpineto-Quercetum- poosum) With the oak- oriental hornbeam - false brome (Brachypodium sylvaticum)
	cover (<i>Carpineto-Quercetum -brachypodiosum</i>)
	9160GE-03 Oak-hornbeam forest (<i>Quercetum-Carpinion betulii</i>) is distributed at the altitude of 600-1100 meters a.s.l. Tree species found: <i>Quercus iberica, Carpinus betulus, C. orientalis, Sorbus torminalis, Acer laetum, Picea orientalis, Abies nordmaniana.</i> Bushes - <i>Cornus mas, Corylus avellana, Swida australis, Chamaecytisus caucasica, Lonicera caucasica, Mespilus germanica.</i> Herbaceous plants - <i>Festuca drymeja, Clinopodium vulgare, Veronica peduncularis, Polygonatum glaberrimum, Campanula rapunculoides, Dactylis glomerata.</i> Oak-hornbeamforest with the sedge understory is characteristic to Georgia.

Species	Plants: Quercus iberica, Abies nordmanniana, A. platanoides, Campanula rapunculoides, Carex transsilvanica, Carpinus betulus, Clinopodium vulgare, Cornus mas, Corylus avellana, Cotinus coggygria, Cytisus caucasicus, Dactylis glomerata, Dianthus imereticus, Dioscorea caucasica, Dorycnium graecum, Festuca drymeja, Hypericum xylosteifolium, Hypochaeris radiata, Laser trilobum, Ligustrum vulgare, Lonicera caucasica, L. caprifolium, Mespilus germanica, Orobus laxiflorus, Peucedanum caucasicum, Physospermum cornubiense, Poa nemoralis, Polygonatum glaberrimum, Primula sibthorpii, Rhododendron luteum, Ribes biebersteinii, Rosa canina, Ruscus ponticus, Smilax excelsa, Sorbus caucasigena, Sorbus torminalis, Swida australis, Trachystemon orientalis.
	Animals: woodpeckers (Dendrocopus major, D. minor, D. medius, D. syriacus, Dryocopus martius, Picus viridis), owls (Otus scops, Aegolius funereus, Strix aluco, Bubo bubo), nightjars (Caprimulgus europaeus), cuckoo (Cuculus canoris), firecrest (Regulus ingicapillus), blackbirds and trushes (Turdus spp.), whitetroats (Sylvia spp.), tits (Parus spp., Aegithalos caudatus), nuthatches and tree-creepers (Sitta spp., Certhia europaea), bullfinch (Pyrrhula pyrrhula), wren (Troglodytes troglodytes), dipper (Cinclus cinclus). Typical amphibians are Asia Minor frog (Rana macrocnemis), common treefrog (Hyla arborea); newts (Ommatotriton ophryticus, Triturus karelinii, Lissotriton vulgaris). Reptiles – slow worm (Anguis fragilis), Artvin lizard (Darevskia derjugini), meadow lizard (Darevskia praticola); Transaucasian viper (Vipera transcaucasiana); ring snake (Natrix natrix). At the rock faces in the mountain forest belt typical reptiles are rock lizards with local distributions (Darevskia rudis, D. portschinskii), smooth snake (Coronella austriaca). Small mammals are small and yellow-necked mice (Sylvaemus flavicollis, S. uralensis), and a number of endemic species: Chionomys roberti, Sorex raddei, S. volnuchini, Neomys teres, Crocidura leucodon, Talpa caucasica, Sciurus anomalus. Typical insects are butterflies of families Satyridae and Lycaenidae, near brooks – ground beetles of genus Pterostichus, endemic large land snail Helix buchi, high diversity of soil invertebrates.
Corresponding categories	91G0 * Pannonic woods with <i>Quercus petraea</i> and <i>Carpinus betulus</i> PAL.CLASS.: 41.2B, 41.266, 41.267 German classification: "430703 Stieleichen-Hainbuchenwald feuchter bis frischer
	Standorte". Nordic classification: "2223 <i>Fagus sylvatica-Mercurialis perennis-Allium ursinum-</i> typ".
Associated habitat	None

Table 5: Code of Georgia: 9110 Xero-thermophyte oak forest Palaearctic classification:41.7A

General	Xero-thermophyte oak forest can be found in the lower zone of east and west
description	Georgia, southern slopes, where Georgian oak (Quercus iberica) is mixed with
	the oriental hornbeam (Carpinus orientalis). It is distributed 500-1100 meters
	above the sea level, grows in dry and sometimes limestone soil. The understory
	usually is weakly developed and is mainly represented by the cornel and cotynus.
	Hawthorn (Crataegus monogyna,), spindle (Euonymus europaea, E. verrucosa),
	Swida australis, medlar (Mespilus germanica) and oriental fleabane (Lonicera
	orientalis) are rare. Herbal cover and sedge are very well developed.
Species	Plants: Quercus iberica, Carpinus orientalis, Acer campestre, Buglossoides
	purpurocaerulea(=Aegonichon purpurocaeruleum), Carex michelii, Cornus mas,
	Cotinus coggygria, Crataegus monogyna, Dactylis glomerata, Geum urbanum,
	Euonymus europaea, E. verrucosa, Lathryrus aphaca, Lonicera orientalis,
	Mespilus germanica, Polygonatum multiflorum, Prunus spinosa, Pulmonaria

	dacica, Pyrus salicifolia, Rhamnus cathartica, Sorbus torminalis, Tanacetum vulgare, Ulmus minor, Vincetoxicum hirundinaria.	
Corresponding categories	Corresponding 9110 * Euro-Siberian steppic woods with <i>Quercus</i> spp. categories	
	Palaearctic classification:41.7A	
Associated habitat	This type of habitat as well as in Europe, is heavily fragmented by the intrusion of the invasive species <i>Robinia pseudoacacia</i> .	

Table 6: EUNIS code: G3.4F European Pinus sylvestris reforestation (Note: There is no respective Georgian code)

General	Pinus sylvestris plantations inside or near the present or recent natural nemoral
description	and Mediterranean European range of the species. Other and very artificial Pinus
	sylvestris plantations are included under unit G3.F (G3.F - Highly artificial
	coniferous plantations)

The Project corridor has been divided into into four conventional sections in order to further describe the habitat present. The following figures illustrate habitat in these four sections and provide a detailed description of the habitat found in each portion.



Figure 3: Habitat Map, Section 1 and 2

91E0* Code of Georgia: Alluvial forests

9110 * Euro-Siberian steppic woods with Quercus spp. 323 GE Code of Georgia: Alpine rivers and their ligneous vegetation G3.F - Highly artificial coniferous plantations (EUNIS)

vegetation



G3.F - Highly artificial coniferous plantations (EUNIS)

Figure 4: Habitat Map, Section 2 and 3

Figure 5: Habitat Map, Section 4



62GE04 Code of Georgia: Vegetation of urban and rural areas 9160GE Code of Georgia: - Oak or oak-hornbeam forests (*Quercitum -Carpinion betuli*) 91E0* Code of Georgia: Alluvial forests 91I0 * Euro-Siberian steppic woods with Quercus spp. 323 GE Code of Georgia: Alpine rivers and their ligneous vegetation

G3.F - Highly artificial coniferous plantations (EUNIS)





Note: Forest fund area is shaded in red. Figure 54: Forest fund in the project region (insertion on the right – unit 1 area)

Conventional unit 1 is the only section of alignment where natural, though slightly modified habitat is observed. 70% of the Oak and oak-hombeam habitat registered within the 100m corridor of alignment are in limits of this unit. However, it is worth to mention that because of two tunnels and a bridge - impact on this habitat will be limited to the RoW area mainly. By age – plants in the forest zone are young, mid –age, seldom mature. Forest belongs to low density group (0.4-0.5). Crown density - 45-50%. Timber category – mainly s firewood (G category), party semi-timber (B category). The benefit of the dentified in habitat 9160GE, in the area directly affected by the project. Of them >8cm diameter common yew (*Taxus baccata*) – 1 unit, chestnut (*Castanea sativa*) – 85 units, zelcova (*Zelkova carpinofolia*). 77 units, walnut (*Juglans regia*) – 3 units.

The habitat is natural (moderately modified), sensitivity - high.



The Study Area does not meet the criteria for Critical Habitat because based on field survey, literature review and consultation it does not have high biodiversity value and does not support any of the qualifying interests as outlined in the table below. It is not located in a legally protected area or an area officially proposed for protection.

Critical, Natural and Modified Habitat

Critical habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.¹

As mentioned above, the main part of alignment is located within agricultural and urban areas, classified as low sensitivity modified habitat. According to the project construction of 6 tunnels

^{1. &}lt;sup>1</sup> IFC Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources. January, 2012

is planned which eliminates impacts to habitat in the areas above the tunnels (but not at the portals).

Information about the acreage of the habitats in the project corridor and their percentage of the total area (with exclusion of the tunnels) is presented in the following table.

	Code	ha affecte d	% of total area in 100m corridor	ha affected (without tunnels)	% of total area in 100m corridor (without	Note		
					tunnels)			
1	62GE04 Code of Georgia: Vegetation of urban and rural areas	199.7	70.8	166.0	79.6	Agricultural/M odified		
2	9160GE Code of Georgia: - Oak or oak-hornbeam forests (<i>Quercitum -</i> <i>Carpinion betuli</i>)	56.0	19.8	27.8	13.3	Natural		
3	91E0* Code of Georgia: Alluvial forests	8.1	2.9	8.0	3.8	Modified		
4	91I0 * Euro-Siberian steppic woods with Quercus spp.	12.8	4.6	1.2	0.6	Modified		
5	323 GE Code of Georgia: Alpine rivers and their ligneous vegetation	4.6	1.6	4.6	2.2	Modified		
7	G3.F - Highly artificial coniferous plantations (EUNIS)	0.9	0.3	1.1	0.5	Modified		
	Total	282.1	100	208.6	100			
	Total Natural Habitat Affected	56.0		27.8				

Table 7: Habitats in the project area

<u>Mammals</u>

Information available from references (primary and secondary data sources) have been used as a basis for description of the area. According to available information there are two species (Caucasian squirrel and Eurasian otter) considered as vulnerable in Georgia (Georgian Red List) that may be found within the Project area. The Otter is also included in the IUCN red list as near threatened (NT).

During the site visit the list of species listed above was taken as guidance. The objective of the survey was to double check available information on the site. Particular attention was paid to detection of the species listed under protected category. Therefore, specific focus was on the study of the habitats suitable for these mammals.

Otter (Lutra lutra) is known to be found in Kvirila river, however the sources does not provide any information on community structure and number of individuals in the area of interest. The Otter is a river associated species mainly met in slow flowing sections of the streams/rivers. It isn't uncommon for them to travel great distances on land or through the water. This can be up to 26 km³. However, it is important to remember that otters home range differs from their territory. The actual territory that is distinctly their own is very small. Otters mark their habitat with droppings. So, they can be registered by smell (smell of fresh cut hay). Generally, the otters are not afraid of people and can be met in the limits of residential areas. The aquatic habitats of otters are extremely vulnerable to man-made changes. Canalization of rivers, removal of bank side vegetation, dam construction, draining of wetlands, aquaculture activities and associated man-made impacts on aquatic systems are all unfavorable to otter population. The bridge locations areas (**Figure 6**) have been checked with particular care. No presence of otter has been registered in this portion of the Project road during site surveys. However, they are known to be present in other portions of the river upstream.



Figure 6: Areas Checked for the Presence of Otters

Caucasian squirrel (Sciurus anomalus) can be met in the deciduous forest. Their nests are usually found in the tree hollows, under rocks, inside heaps of stones, and in residential areas, such as graveyards and abandoned cattle sheds. They are diurnal, are not active in winter. The peak of activity is in summer, Caucasian squirrels become most active during the early morning to morning and during the two hours before sunset in early summer. Like other tree squirrels,

they are territorial. The animal marks territories with urine and faeces. The marks are renewed several times every day. There is no information available regarding home range. Caucasian squirrels are herbivorous; they eat seeds and fruits and therefore, likely have an important influence on the forest ecosystem as seed dispersers. The main hazard for this species is Siberian/red squirrel - invasive species. During the site visit the trees within the RoW of the new alignment (with exclusion of the areas where tunnels are planned) have been checked. Neither burrows, nor squirrels have been registered in the studied area. The review of the habitat along the alignment is not optimum for existence of the Caucasian squirrel. Therefore, construction and subsequent presence (operation) of the highway will not change the population trend.

Bats (order Chiroptera) are considered as vulnerable group. They are rather limited in selection of nesting shelters. Favourable shelters are hollow trees, caves and abandoned buildings. All species of bats observed in Georgia are included in the Annex II of Bonn Convention and protected by the agreement of EUROBATS. Based on this agreement, Georgia is mandatory to protect all bats inhabiting within the project area and in its vicinities.

Lesser horseshoe bat (*Rhinolophus hipposideros***Bechstein)** It forages close to ground within and along the edges of broadleaf deciduous woodland, which represents its primary foraging habitat, but also in riparian vegetation, Mediterranean and sub-mediterranean shrubland. Its prey consists mainly of midges, moths and craneflies. Foraging activities take place nearly exclusively within woodland areas, while open areas are avoided. Habitat loss and fragmentation may therefore reduce the amount of suitable habitats for the Lesser Horseshoe Bat and pose a threat to this species. Summer roosts (breeding colonies) are found in natural and artificial underground sites in the southern part of the range, and in attics and buildings in the northern part of it. In winter it hibernates in underground sites (including cellars, small caves and burrows). A sedentary species, winter and summer roosts are usually found within 5-10 km (longest distance recorded 153 km). Recommended conservation measures include protecting maternity roosting sites, hibernation caves and foraging habitats.

Particoloured bat (Vespertilio murinus) forages in open areas over various habitat types (forest, semi-desert, urban, steppe, agricultural land). It feeds on moths and beetles. Summer roosts tend to be situated in houses or other buildings; also rarely hollow trees, nest boxes, or rock crevices. Winter roost sites include rock fissures, often (as a substitute) crevices in tall buildings (including, or especially, in cities), occasionally tree holes or cellars. Winter roosts are usually in colder sites that are exposed to temperature changes. Migrations of up to 1,780 km have been recorded, although the species is sedentary in a large part of its range. This nocturnal species appears late in the evening, sleeping in narrow crevices during the day. It lives in small colonies and often single individuals are sighted. It hibernates throughout the winter. Young are born in June/July, generally two at a time, and are stuck onto the chest of the mother during flight.

Common pipistrelle (*Pipistrellus pipistrellus* Schreber) forages in a variety of habitats including open woodland and woodland edges, Mediterranean shrublands, semi-desert, farmland, rural gardens and urban areas. It feeds on small moths and flies. Summer roosts are mainly found in buildings and trees, and individuals frequently change roost site through the maternity period. Most winter roost sites are located in crevices in buildings, although cracks in cliffs and caves and possibly holes in trees may also be used. It is not especially migratory in most of its range, but movements of up to 1,123 km have been recorded. In at least parts of its range it seems to benefit from urbanization.

Indirect and short-term impact is expected on the above-mentioned species. Indirect impact means damage of the section of the ecosystem, which is significant for animals for receiving

energy in the form of the food; also, replacement of migration corridors is necessary as without this the background stress for fauna representatives, living in the neighboring habitats will increase.

During the transect surveys within the studied corridor no mammals have been observed. Only traces of activity of the European pine marten have been registered.

Nº	Latin name	Common name	t of ia	_	Other protection	Number of section
			Red Lis Georg	IUCN		
1	Erinaceus concolor Martin.	Southern whitebreasted Hedgehog		LC		1/2/3/4/5/
2	Suncus etruscus Savi.	Pygmy whitetoothed shrew		LC	Appendix III of the Bern Convention.	1/2/3/
3	Rhinolophus hipposideros Bechstein.	Lesser horseshoe bat		LC	Bonn Convention (Eurobats); Bern Convention; Annex II (and IV) of EU Habitats and Species; Some habitat protection through Natura 2000	1/2/3
4	Pipistrellus pipistrellus Schreber.	Common pipistrelle		LC	Bonn Convention (Eurobats); Bern Convention in parts of its range where these apply, and is included in Annex IV of the EU Habitats and Species Directive.	1/2/3/
5	Eptesicus serotinus Schreber.	Serotine		LC	Bonn Convention (Eurobats); Bern Convention in parts of range where these apply. It is included in Annex IV of EU Habitats and Species Directive, and there is some habitat protection through Natura 2000.	1/2/3
6	Vespertilio murinus Linnaeus.	Particoloured bat		LC	Bonn Convention (Eurobats); Bern Convention, in parts of its range where these apply. It is included in Annex IV of EU Habitats and Species Directive	1/2/3//5/
7	Dryomys nitedula Pallas.	Forest dormouse		LC	Bern Convention (Appendix III); EU Habitats and Species Directive (Annex IV), in parts of its range where these apply.	1/2/3/
8	Arvicola terrestris Linnaeus.	Eurasian water vole		LC		4
9	Microtus arvalis Pallas.	Common vole		LC		1/2/3/4/5/
.10	Terricola	Nazarov pine		LC		1/2/3/

Table 8: Mammals, identified within the project area based on literary sources

Nº	Latin name	Common name	ed List of Georgia	IUCN	Other protection	Number of section
			R			
	nasarovi Shidlovsky.	voie				
11	Sylvaemus uralensis Pallas.	Pygmy wood mouse				1/2/3/
12	Mus musculus Linnaeus.	House mouse		LC		1/3/4/5/
13	Sciurus anomalus Gmelin.	Caucasian squirrel	VU	LC	EU Habitats Directive (92/43) IV 21/05/92; Bern Convention II 01/03/02, in parts of its range where these apply. Occurs in protected areas. Population monitoring is recommended, particularly in parts of the range where declines have been noted.	1/2/3
14	Lutra lutra Linnaeus.	Eurasian otter, Common otter	VU	NT	Appendix I of CITES, Appendix II of the Bern Convention, Annexes II and IV of the EU Habitats and Species Directives.	4
15	Mustela nivalis Linnaeus.	Least weasel		LC	Appendix III of the Bern Convention.	1/2/3/4/5
16	Felis silvestris Shreber.	Wild cat		LC	CITES Appendix II (http://www.cites.org/eng/app/app endices.php); is fully protected across most of its range in Europe and Asia, but only some of its African range; is listed on the EU Habitats and Species Directive (Annex IV) as a "European protected species of animal"; listed in Appendix II of the Bern Convention. It is classed as threatened at the national level in many European range states (IUCN 2007).	1/2/3/
17	Canis aureus Linnaeus.	Golden jackal		LC		1/2/3/4
18	Vulpes vulpes Linnaeus.	Red fox		LC		1/2/3/4
19	Canis lupus	Wolf		LC	Bern, CITES Appendix II	1/2/3/
20	Sus scrofa Linnaeus.	Eurasian wild boar		LC		1/2/3/
21	Martes martes	European pine marten		LC	Appendix III of the Bern Convention and Annex V of the European Union Habitats Directive, and it occurs in a	1/2/3/

N≌	Latin name	Common name	Red List of Georgia	IUCN	Other protection	Number of section
					number of protected areas across its range.	

VU = Vulnerable; LC = Least Concern; NT = Near Threatened

Reptiles

According to the literary sources, 8 species of reptiles are known to be present in the Project area, out of which 2 are lizards, 2 – turtles and 4 – snakes (see **Table 9**). From reptiles worth to mention is endemic lizard met in the Mtkvari valley. The only Red-Listed species that is recorded on the nearby territory of the Project area is the Mediterranean turtle.

Table 9: Reptiles,	known within the	project area based	I on literary sources
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Nº	Latin name	Common name	Georgian Red List	IUCN	Other protection	Section N
1.	<i>Testudo graeca</i> Linnaeus	Mediterranean Tortoise	VU	VU	-	1/4/
2	Emys orbicularis	European Pond Turtle	LC	NT	-	4
3.	Natrix natrix Linnaeus.	Ring snake	LC	LR/LC	Bern Convention	4/5
4.	Natrix tessellate Laurenti.	Dice snake	LC	LC	Bern Convention	4/5
5.	<i>Coronella austriaca</i> Laurenti.	Smooth snake	LC	LC	Bern Convention	1/2/
6.	Xerotyphlops vermicularis Strauch.	Blind Snakes	DD	LC	-	1/2/3/
7.	Darevskia derjugini	Artwin Lizard	LC	LC	Bern Convention	1/2/3/
8.	Darevskia rudis	Spiny-Tailed Lizard	LC	LC	Bern Convention	1/2/3/
9.	Anguis fragilis	Caucasian Slow Worm	LC	LC	Bern Convention	2/

VU = Vulnerable; NT = Near Threatened and LC = Least Concern, LR = Low risk, DD-Data Deficient

Due to the fact that it was extremely hot during the surveys, activity of reptiles was low as they were avoiding overheating. During the site survey only the Artwin lizard has been registered.



Figure 7: Darevska derhugini (coordinates 346891.28; 4660857.92)



Figure 8: Pelophylax ridibundus (coordinates 340072.18; 4662963.5)

Amphibians

According to the literary sources, the main amphibian species present in the area include:

N⁰	Latin name	Common	Georgian	IUCN	Other	Section
		name	Red List		protection	Ν
1.	Hyla arborea	European Tree	LC	LC	Bern	4/5/
	Linnaeus	Frog			Convention	
2.	Pelophylax	Lake frog	LC	LC	Bern	4/5
	ridibundus Pallas.	_			Convention	
3.	Rana macrocnemis	Longlegged	LC	LC	Bern	3/4/
	camerani	Wood Frog			Convention	
	Boulenger.					

Table 10: Amphibians, known within the project area based on literary sources

LC = Least Concern

During the site survey the listed species have one individual Lake frog has been registered near Shoropani crossing (see **Figure 8** above).

Insects

The insects know to be present in the project area are listed in the table below.

Table 11: Insects known within the project area based on literary sources

N⁰	Latin Name	Common name	Georgian Red List	IUCN	Section N
1.	Mylabris quadripunctata	Four-spotted blister beetle	NE	NE	1/2/3/5/6/
2.	Dorcus parallelipipedus	Lesser stag beetle	NE	NE	1/2/3/
3.	Libellula depressa	Broad-bodied chaser	NE	NE	2/
4.	Morimus verecundus	Longhorn beetle	NE	NE	2/3
5.	Pieris napi	Green-veined white butterfly	NE	NE	1/2/3/5
6.	Pieris rapae	European cabbage butterfly	NE	NE	1/2/3/4/5
7.	Plebeius argus	Silver-studded blue butterfly	NE	NE	1/2/3/4/5/
8.	Nimphalis antiopa	Mourning-cloak butterfly	NE	NE	1/2/3/4/5/6/

Nº	Latin Name	Common name	Georgian Red List	IUCN	Section N
9.	Lampyris noctiluca	Glow-worm	NE	NE	1/2/3/4/5/
10.	Geotrupes spiniger	Dumbledor beetle	NE	NE	1/2/3/5/
11.	Purpuricenus budensis	Red long-horned Beetle	NE	NE	1/2/3/4/
12.	Polyommatus amandus	Amanda's blue butterfly	NE	NE	5/6
13.	Polyommatus corydonius	False chalkhill blue butterfly	NE	NE	1/2/3/4/5/6/
14.	Polyommatus thersites	Chapman's blue butterfly	NE	NE	1/2/3/4/5/6/
15.	Cercopis intermedia	Froghopper	NE	NE	1/2/3/4/5/6/
16.	Vanessa atalanta	Red admiral butterfly	NE	NE	1/2/3/4/5/6/
17.	Vanessa cardui	Painted lady butterfly	NE	NE	3/4/5/6/
18.	Ischnura elegans	Blue-tailed damselfly	NE	NE	3/4/
19.	Panorpa connexa	Scorpionfly	NE	NE	4/5/
20.	Apis melifera	European honey bee	NE	NE	4/5
21.	Bombus lapidarius	Red-tailed bumblebee,	NE	NE	4/5/
22.	Aphis urticata	Dark green nettle aphid	NE	NE	1/2/3/
23.	Pieris brassicae	Cabbage butterfly	NE	NE	1/3/5/6
24.	Pyrrhocoris apterus	Firebug	NE	NE	1/2/3/4/5/6/
25.	Lymantria dispar	Gypsy moth	NE	NE	1/2/3/
26.	Gryllus campestris	Field cricket	NE	NE	4/5/
27.	Decticus verrucivorus	Wart-biter	NE	NE	4/5/6/
28.	Tettigonia viridissima	Great green bush-cricket	NE	NE	5/6/

NE = not evaluated

Within the project area Red cricket, blue railed damselfly have been met. No butterflies were registered.



Figure 9: Gryllus campestris (coordinates 337730.19; 4664604.82)



Figure 10: Ischura elegans (coordinates 339946.92; 4662915.10)

The spiders know to be present in the project area are listed below.

Table 12: Insects, known within the project area based on literary sources

Nº	Latin name	Common name	Georgian Red List	IUICN	Section No.
1.	Misumena vatia	Goldenrod crab spider	NE	NE	1/2/3/
2.	Pisaura mirabilis	Nursery web spider	NE	NE	1/2/3/
3.	Alopecosa schmidti	Wolf spiders	NE	NE	1/2/3/
4.	Micrommata virescens	Green huntsman spider	NE	NE	1/2/3/4/5
5.	Agelena labyrynthica	Eurasian grass spiders	NE	NE	1/2/3/
6.	Asianellus festivus	Jumping spiders	NE	NE	1/2/3/
7.	Araniella dispcliata	Orb-weaver spider	NE	NE	1/2/3/
8.	Dysdera crocata	Sowbug hunter	NE	NE	1/2/3/

Section F4 of the Khevi-Ubisa-Shorapani-Argveta Road (E60 Highway) Environmental Impact Assessment

9.	Phialeus chrysops	Jumping spiders	NE	NE	3/4/5/
10.	Argiope lobata	Silver-faced	NE	NE	1/2/3/
11.	Menemerus semilimbatus	Jumping spiders	NE	NE	1/2/3/4/
12.	Pardosa hortensis	Wolf spiders	NE	NE	1/2/3/4/
13.	Larinioides cornutus	Furrow orb spider	NE	NE	1/2/3/4/5
· · —					

NE = not evaluated

During the walkover several spider species have been registered as noted by the figures below.





Figure 11: Pisaura mirabilis (coordinates 347288.84; 4660981.14)

Figure 12: Pardosa hortensis (coordinates 344707.22; 4662074.4)



Figure 13: Asinelllus festivus (coordinates 345050/30; 4661910.7)

The round worms, bristle worms and beetles know to be present in the project area are listed below.

Table 13: Round Worms (Nematodes), known within the project area based on literary sources.

N⁰	Scientific Name	English	Georgian	National	International Red List
		Name	Name	Red List	
1.	Tripylina arenicola	-	-	NE	NE
2.	Plectus annulatus	-	-	NE	NE
3.	Anaplectus granulosus	-	-	NE	NE
4.	Mesodorylaimus bastiani	-	-	NE	NE
5.	Eudorylaimus acutus	-	-	NE	NE
7.	Pungentus silvestris	-	-	NE	NE
8.	Enchodelus microdorus	-	-	NE	NE

9.	Bursilla monhystera	-	-	NE	NE
	and accelerate of				

NE = not evaluated

Table 14: Bristle Worms (Polychaetes), known within the project area based on literary sources

			-		
N⁰	Scientific Name	English	Georgian	National	International Red List
		Name	Name	Red List	
1.	Aelosoma hemprichi	-	-	NE	NE
2.	Stylaria lacustris	-	-	NE	NE
3.	Aulophorus furcatus	-	-	NE	NE
4.	Specaria josinae	-	-	NE	NE
5.	Ophidonais serpentine	-	-	NE	NE
6.	Potamotrix bedoti	-	-	NE	NE
9.	Lumbricus terrestris	-	-	NE	NE
10.	Dendrodriloides grandis	-	-	NE	NE
11.	Eiseniella tetraedra	-	-	NE	NE
13.	Helodrilus cartlicus	-	-	NE	NE

Table 15: Oribatida, known within the project area based on literary sources

N⁰	Scientific Name	English	Georgian	National	International Red List
		Name	Name	Red List	
1.	Epilohmannia cylindrica	-	-	NE	NE
2.	Rhysotritia ardua	-	-	NE	NE
5.	Tectocepheus velatus	-	-	NE	NE
6.	Oppiella fallax	-	-	NE	NE
7.	Quadroppia	-	-	NE	NE
	quadricarinata				
8.	Suctobelbella falcate	-	-	NE	NE
9.	Achipteria nitens	-	-	NE	NE
10.	Sphaerozetes piriformis	-	-	NE	NE
12.	Chamobates cuspidatus	-	-	NE	NE

<u>Avi Fauna</u>

The majority of birds found on the study area are presented by forest, shrubbery and other species, birds related to rocky places and waterfowls. The list of bird species potentially available in the project area (based on the desk top analysis of available data) is given in **Table 16** below. None of these species are protected. The territory is not significant habitat for birds and does not include priority habitats for avian species (see



Figure 14: Significant Bird Habitat in Georgia

Zestaphoni municipality Study area

Table 16: Birds within the study area, known according to literary sources

#	Latin name	Common name	Georgian Red List	Season	IUCN	Other protection	Section
1.	Motacilla alba	White Wagtail	-	YR-R, M	LC	Bern Convention	1/2/3/4/5/6
2.	Apus apus	Common Swift	-	BB, M	LC	Bern Convention	1/2/3/4/5/6
3.	Merops apiaster	European Bee-eater	-	BB, M	LC		1/2/3/4/5/6
4.	Corvus cornix	Hooded Crow	-	YR-R	LC		1/2/3/4/5/6
5.	Garrulus glandarius	Eurasian Jay	-	YR-R	LC		1/2/3/4/5/6
6.	Turdus merula	Eurasian Blackbird	-	YR-R	LC	Bern Convention	1/2/3/4/5/6

#	Latin name	Common	Georgian	Season	IUCN	Other	Section
		name	Red List			protection	
7.	Delichon urbicum	House-Martin	-	BB, M	LC	Bern Convention	1/2/3/4/5/6
8.	Sturnus vulgaris	Common Starling	-	YR-R, M	LC		1/2/3/4/5/6
10.	Columba livia	Rock Dove	-	YR-R	LC		1/2/3/4/5/6
11	Columba	Stock Dove	-	YR-R			1/2/3/4/5/6
	oenas						
12.	Columba palumbus	Wood-Pigeon	-	YR-R	LC		1/2/3/4/5/6
13.	Hirundo rustica	Barn Swallow	-	BB, M	LC	Bern Convention	1/2/3/4/5/6
15.	Oriolus oriolus	Golden Oriole	-	BB, M	LC	Bern Convention	1/2/3/4/5/6
16.	Turdus viscivorus	Mistle Thrush	-	YR-R, M	LC	Bern Convention	1/2/3/4/5/6
17.	Erithacus rubecula	European Robin	-	YR-R	LC	Bern Convention	1/2/3/4/5/6
18.	Fringilla	Chaffinch	-	YR-R, M	LC	Bern	1/2/3/4/5/6
19.	Cuculus	Common	-	BB, M	LC	Bern	1/2/3/4/5/6
20.	Phoenicurus	Common	-	BB, M	LC	Bern	1/2/3/4/5/6
21.	Passer	House	-	YR-R	LC	Convention	1/2/3/4/5/6
22.	Carduelis	European	-	YR-R, M	LC	Bern	1/2/3/4/5/6
23.	Carduelis	Greenfinch	-	YR-R, M	LC	Bern	1/2/3/4/5/6
25.	Parus major	Great Tit	-	YR-R	LC	Bern	1/2/3/4/5/6
26.	Lanius collurio	Red-backed	-	BB, M	LC	Bern	1/2/3/4/5/6
38.	Turdus	Song Thrush	-	YR-R, M	LC	Bern	1/2/3/4/5/6
30.	Aegithalos	Long-tailed Tit	-	YR-R, M	LC	Bern	1/2/3/4/5/6
36.	Falco	Common	-	YR-R. M	LC	Bonn	1/2/3/4/5/6
	tinnunculus	Kestrel				Convention, Bern	
27	Putoo hutoo	Common				Bopp	1/2/2/4/5/6
57.	Duleo Duleo	Buzzard			10	Convention, Bern	1/2/3/4/3/0
38.	Phalacrocorax carbo	Great Cormorant	-	YR-R, M	LC	Convolution	4
39.	Ardea cinerea	Grey Heron	-	YR-R	LC	Bonn Convention, Bern Convention	4
41.	Egretta garzetta	Little Egret	-	YR-R	LC		4
42.	Nycticorax nycticorax	Night-Heron	-	BB, M	LC	Bonn Convention, Bern Convention	4
44.	Tadorna	Ruddy	-	YR-R	LC		4
	ferruginea	Shelduck					

#	Latin name	Common name	Georgian Red List	Season	IUCN	Other protection	Section
45.	Anas platyrhynchos	Mallard	-	YR-R, M	LC	Bonn Convention, Bern Convention	4
46.	Milvus migrans	Black Kite	-	YR-R, M	LC	Bonn Convention, Bern Convention	1/2/3/4/5/6
47.	Accipiter nisus	Sparrowhawk	-	YR-R, M	LC	Bonn Convention, Bern Convention	1/2/3/4/5/6
48.	Accipiter gentilis	Goshawk	-	YR-R, M	LC	Bonn Convention, Bern Convention	1/2/3/4/5/6
51.	Charadrius dubius	Little Ringed Plover	-	YR-R, M	LC	Bonn Convention, Bern Convention	4
52.	Larus ridibundus	Black-headed Gull	-	YR-R, M	LC		4
55.	Upupa epops	Common Hoopoe	-	BB, M	LC	Bern Convention	1/2/3/4/5/6
57.	Corvus frugilegus	Rook	-	YR-R, M	LC		1/2/3/4/5/6
60.	Luscinia megarhynchos	Luscinia megarhynchos	-	BB, M	LC		1/2/3/4/5/6
61.	Phylloscopus collybita	Common Chiffchaff	-	BB, M	LC		2/

YR-R = nests and reproduces in the area, can be found all year round; YR-V = visitor to these areas. It does not reproduce but is here throughout the year. BB = visits the area only for reproduction M = Migratory; it can get to the area during migration (in autumn and spring) LC = Least Concern.

Table 17: Birds, observed within the project area during the survey

#	Latin name	Common name	Georgian	Season	IUCN	Other	Section
			Red List			protection	
1.	Motacilla alba	White Wagtail	-	YR-R, M	LC	Bern	1/2/3
						Convention	
2.	Apus apus	Common Swift	-	BB, M	LC	Bern	1/3/4/5
						Convention	
3.	Merops apiaster	European Bee-	-	BB, M	LC	-	2/3/
		eater					
4.	Charadrius	Little Ringed	-	YR-R, M	LC	Bonn	4
	dubius	Plover				Convention,	
						Bern	
						Convention	
5.	Larus	Black-headed	-	YR-R, M	LC	Bern	4
	ridibundus	Gull				Convention	
6.	Corvus cornix	Hooded Crow	-	YR-R	LC	-	3/4/5/6
7.	Garrulus	Eurasian Jay	-	YR-R	LC	-	2/3/4/5
	glandarius						
8.	Turdus merula	Eurasian	-	YR-R	LC	Bern	1/2/3/4
		Blackbird				Convention	
9.	Delichon	House-Martin	-	BB, M	LC	Bern	2/3/4/
	urbicum					Convention	
11.	Upupa epops	Common	-	BB, M	LC	Bern	2/3/4/5
		Ноорое				Convention	

#	Latin name	Common name	Georgian Red List	Season	IUCN	Other protection	Section
14.	Luscinia megarhynchos	Luscinia megarhynchos	-	BB, M	LC	-	1/2/3/
15.	Turdus viscivorus	Mistle Thrush	-	YR-R, M	LC	Bern Convention	1/2/3
16.	Erithacus rubecula	European Robin	-	YR-R	LC	Bern Convention	2/
17.	Fringilla coelebs	Chaffinch	-	YR-R, M	LC	Bern Convention	1/3/
19.	Phoenicurus phoenicurus	Common Redstart	-	BB, M	LC	Bern Convention	1/2/3
20.	Passer domesticus	House Sparrow	-	YR-R	LC	-	1/3/5/6/
21.	Carduelis carduelis	European Goldfinch	-	YR-R, M	LC	Bern Convention	1/2/3/
24.	Parus major	Great Tit	-	YR-R	LC	Bern Convention	2/3/5
25.	Lanius collurio	Red-backed Shrike	-	BB, M	LC	Bern Convention	2/3
26.	Phylloscopus collybita	Common Chiffchaff	-	BB, M	LC		2/
27.	Turdus philomelos	Song Thrush	-	YR-R, M	LC	Bern Convention	2/3

YR-R = nests and reproduces in the area, can be found all year round.; YR-V = visitor to these areas. It does not reproduce but is here throughout the year. BB = visits the area only for reproduction; M = Migratory; it can get to the area during migration (in autumn and spring)

LC = Least Concern.

<u>Fish</u>

<u>General</u>

A fish study has been undertaken on the sites where construction of bridges/river crossings is planned. The objective of the survey was to:

- Study and assess the baseline environmental condition within the project section;
- Survey of hidrobionts, in particular, ichthyofauna living in the project area;
- Development of mitigation measures, taking into account the impact factors.

The study was prepared based on existing literature sources and the results of field study conducted from 18.07.2017 to 28.07.2017. In the field research information was also collected from the local population and amateur fishermen.

<u>Methodology</u>

The ichtyofauna study included desk top study, visual audits, field surveys, anamnesis (interview of the local population and amateur fishermen) and laboratory processing of the obtained material. The research methodology is fully coincided with the methods used in international practice.

Fish stock status has been judged upon based on the following data:

- general mass of fish caught in the recent years;
- quantitative ratio of age groups;
- age of reaching the first and overall puberty of the population;
- direct influence of fish growth rate versus maturity;

Desktop Study

Work plan, survey route, locations for control catches and hydrochemical-hydrobiological

sampling have been selected. A questionnaire for the local population and amateur fishermen was prepared.

Visual Audit

The visual audit to identify habitats for ichthyofauna species (geomorphology of the river bed in question, general hydrological characteristics, habitat hipsometria, relief, the river bottom hipsometria, visual - landscape background) has been carried out. Based on these data species theoretically present in the study area have been identified.

Field study

The field study method included:

- biological analysis of fish (length; weight; gender, maturity stage; collection, fattening coefficient, meristic and plastic characteristics, the digestive tract content);
- collection, labeling and preservation of scales for subsequent lab analysis;
- study of food base hydroflora and hydrofauna; identification of macroinvertebrates and insects used for feeding;
- study of the status of living environment of both fish and invertebrates;
- determination of suspended solids; dissolved oxygen (using filed tester Oxi 330i); water and air temperature; pH measurements - on-site;
- sampling of water for lab analysis;
- assessment of species composition of zoobenthos and protozoa periphyton species composition and biomass.

For control catches cast nets (weight 7.0 kg, mesh size 14 mm) were used. The catches were performed in control points selected along 50 m and 100 m sections. Sports-amateur fishing tools were used during the study. (No special permit or license was required). Research parameters include research of all biotic and abiotic factors related to the ecological niche.

During the survey catch and release principle was kept to. Every fish in the catch was registered in a special field log.

Interviews

The interview of local population and amateur fishermen was carried out to highlight the full picture of the Kvirila River and the Dzirula River ichthyofauna species composition. For this purpose, amateur fishermen with at least 5-10 years of fishing experience have been selected. The questionnaire was drawn up so to reduce the risk of false information (overestimation/bragging). Information confirmed by three or more respondents was assumed as reliable. During the entire study period, 5 fishermen were interviewed. (For results see **Table 20: Results of the interview of local population.**).

Laboratory Research

Study of age, growth and growth rate were identified through laboratory analysis of fish scales collected during the field survey.

The following tables indicate the fish species found in both rivers.

Table 18: List of fish species available in the rivers in the project area

Туре	Kvirila River	Dzirula River
Brown trout (Salmo trutta morfa fario Linnaes, 1758)	+	-
Colchic barbel (Barbus tauricus rionica Kamensky, 1899)	+	+
Chub (Leuciscus leuciscus Linnaeus, 1758)	+	+

Туре	Kvirila River	Dzirula River
Colchic chondrostoma (Chondrostoma colchicum Derjugin, 1899	+	+
Colchic khramulya (Capoeta sieboldi Steindachner, 1864)	+	+
monkey goby (Neogobius fluviatilis, Pallas 1814)	+	+
Spined loach (Cobitis taenia Linnaeus, 1758)	+	+
Common bleak (Alburnus alburnus, Linnaeus, 1758)	+	+

Table 19: Species found as the result of fishing in the project area

Common name	Latin name
Colchic khramulya	Capoeta sieboldi Steindachner, 1864
Common dace	Leuciscus leuciscus Linnaeus, 1758

Five fishermen were interviewed within the framework of the baseline survey: Amiran Gegetashvili; Beso Kalandadze; Misha Macharashvili; Tengo Kapanadze; Giorgi Tsertsvadze. **Table 20** provides a list of the questions asked and the answers received during the interview.

Table 20: Results of the interview of local population.

#	Question	Interview results
1	What species of fish are spread in Kvirila and the Dzirula Rivers?	Mainly: trout (only in the head of Kvirila), barbel, chub, chondrostoma, khramulya, goby, cobitis, albunus.
2	Which fishing equipment do the local	The places are good for the throw nets and for fishing-
	fishermen prefer?	rods, thus, it is hard to say which is of higher priority.
3	How many fishes can a skilled fisherman catch in 6 hours?	It depends on the situation, sometimes you may not catch at all, or sometimes you can easily catch 10-20 fish.
4	What local fishermen use as a squid when fishing with a fishing rod?	Mostly, earthworms as well as worms found under the stones.
5	Is fishing for personal consumption or for sale?	Just for personal consumption.
6	How often are the facts of poaching and how are they fighting against them?	Poachers appear either at night or very early so that no one can notice them. There are sanctions for poaching, thus, people try not to poach.
7	Which restrictive measures do the poachers use?	They use mainly electrofishing devices.
8	Do you remember the case of catching a mature fish (with a hard roe) and was there a brown trout among them?	Seldom. The trout spawn can be seen in the head of the rivers, and the rest fish lay their eggs in spring and summer.
9	Can you describe the hard roe?	In autumn-winter period the trout roe is quite large, tasty, of orange colour, or sometimes red. Some mentioned that khramulya roe is toxic, therefore they do not eat it. The roe of the other fish is used.
10	Have you ever seen alevins with a yolk sac or a yellow shining spawn?	The trout alevins can be seen before the spring floods, but in the head of rivers. In the project area alevins of the other fish spawning in spring and summer period can be seen near the banks.
11	How popular is the project section for fishermen?	Fairly popular. One can see 2-3 fishermen on the edge of the river. In the section after Dzirula - Kvirila confluence, turbidity of water is high.Fish avoid the turbd water, therefore fishin in that area is pointless. The main fishing sites are in the Dzirula before the Dzirula-Kvirila confluence.
12	When does fish spawn in the project area?	Fish spawns in spring and summer.

The following species have been found in the catch during the study in the Dzirula River:

Colchic khramulya (Capoeta Steindachner, 1864) - 2 units.	sieboldi	
Common Dace (Leuciscus Linnaeus, 1758)- 1 unit.	leuciscus	

On the bottom of the Dzirula River, in the project area, colonies of invertebrate species (food base for fish) have been registered. Hydroflora, represented by perythiton, the main food base for khramulya was found. Hydroflora and hydrofauna of the Kvirila River is sparce. This is conditioned by high concentration of suspended solids. In this section fish was not registered.

State Forest Fund

The Project area has been surveyed to determine the extent of the SFF that will be affected by the Project. All of these species identified in the SFF inventory were located in Habitat Area 1. The following Georgian red-listed species were identified in the SFF in habitat 1; Zelkova, Chestnut, Bladder Nut, Yew Tree, Circassian walnut. The full list of the trees to be de-listed is presented in **Appendix G** of the EIA along with a map of the area.

Information relating to the compensation for tree cutting according to national legislation and ADB requirements is outlined in **Section G.6.1** of the EIA.

Protected Areas

The nearest protected area to the Project road is the Ajameti Managed Reserve, which is located approximately 5 kilometers south west of the end point of the road (km14.7).

The nearest Important Bird Area (IBA) to the Project road is the Adjara-Imereti Ridge more than twenty kilometers south of the Project road which overlaps with the Borjomi Nature Reserve. The IBA comprises populations of the following IBA trigger species:

- Caucasian Grouse Lyrurus mlokosiewiczi (IUCN Category NT)
- Corncrake Crex crex (IUCN Category LC)
- Great Snipe Gallinago media (IUCN Category NT)
- Eastern Imperial Eagle Aquila heliaca (IUCN Category VU)

5. Priorities for Biodiversity Conservation

5.1 Selection criteria

A BAP needs to focus on species and habitats that need special management rather than dealing with all the biodiversity in the Study Area. As part of the Project BAP, the priorities for biodiversity conservation have been selected based on; a) the global, national and/or regional conservation importance of some species and habitats in the Study Area – this category includes rare, restricted-range and threatened species in Georgia (Georgian Red List) or globally (IUCN Red List), as well as the habitats where these species occur; and b) the predicted impacts of the Project onto the above features.

5.2 Priorities

5.2.1 Habitats

The following habitat types of high and medium conservation value have been selected as priorities for conservation in this BAP:

• Oak-hornbeam forest - Carpinus caucasica, Quercus petraea ssp. dschorochensis and/or Quercus hartwissiana;

5.2.2 Species

The species listed below have been identified as priorities for conservation as part of this BAP. None of these species are restricted to the Study Area; they are known or likely to occur in other parts of Georgia.

Plant species of conservation importance in Adjara, Georgia and Caucasus - The following plant species of conservation importance in Georgia and Caucasus occur within the Study Area and are priority species in this BAP:

- Zelkova Georgia Red List.
- Chestnut Georgia Red List.
- Bladder Nut Georgia Red List
- Yew Tree Georgia Red List
- Circassian walnut Georgia Red List

Mammal species of Georgian and/or global conservation importance

- Eurasian otter (Lutra lutra), listed as 'vulnerable' on the IUCN Red List and the Red List of Georgia. The otter is rare and threatened in the Study Area due to a low supply of food and conflict with commercial fisheries.
- Caucasian squirrel (Sciurus anomalus) 'vulnerable' on the Red List of Georgia.
- All bat species.

Globally and nationally threatened species of reptiles and amphibians

- Mediterranean turtle (Testudo graeca Linnaeus) listed as 'vulnerable' on the IUCN Red List and the Red List of Georgia.
- Emys orbicularis European Pond Turtle listed as 'near threatened' on the IUCN Red List.

Fish species of national conservation importance

• Colchic Nase - Capoeta Sieboldi - 'vulnerable' on the Red List of Georgia.

6. BAP Actions

<u>Overview</u>

This chapter sets out all the proposed actions structured from the perspective of biodiversity conservation.

Conservation objectives and actions have been developed for each priority biodiversity feature or groups of features to ensure the systematic implementation of the mitigation hierarchy i.e. avoid, reduce (minimize), remedy (restore) and offset. The concept of the mitigation hierarchy is outlined in Figure 2. This will allow for the careful management of risk and the best possible outcomes for the Project and local communities, without compromising the health, function and integrity of the ecological system.

The conservation actions have been established with the aim of achieving 'no net loss' to biodiversity in accordance with IFC PS6 (IFC, 2012a). IFC PS6 requires evidence that the mitigation hierarchy has been applied, that avoidance is prioritized, and that offsets are measurable and only applied as a last resort where residual impacts are unavoidable.

A summary of the objectives is provided in Table 21 below, with details of the actions in the following sections.

Action	Action Plan for Forest Habitats and Notable Plant Species						
A1	Protect the natural forest habitats and the populations of notable plant species						
	during construction of the Project						
A2	Replant affected forest and enhance forest habitat within the Study Area						
Action	Action Plan for Rivers and Associated Species						
B1	Protect river habitat and associated species during construction and operation of						
	the Project						
Action	Plan for Protected and Threatened Terrestrial Mammal and Reptile Species						
C1	Protect terrestrial mammals and reptiles during construction of the Project						
C2	Protect Otter During Construction of the Project						
C3	Protect Caucasian Squirrel During Construction of the Project						
C4	Protect Turtles During Construction of the Project						

Table 21: Summary of BAP Conservation Objectives

Action Plan for Forest Habitat and Notable Plant Species

Current Factors Affecting the Forest Habitats in the Study Area

The forests and associated species in the Study Area are affected by illegal felling, development, landslides and fragmentation.

The Project's impacts on the forest habitats are likely to be significant in the absence of mitigation. The successful implementation of the actions below will ensure 'no net loss' on forest habitat.

Action Plan Objectives and Actions

Objective A1: Protect the natural forest habitats and the populations of notable plant species during construction of the Project

Action A1.1: Inform construction staff on the importance of natural forest habitats and notable plant species

Target: All construction and operation staff to be aware of the importance of forest habitats and notable plant species within the Study Area

Indicator: Number of staff and contractors reached through toolbox talks and training. Number of leaflets, office posters, wildlife photo competition etc.

Mitigation	Avoid	Reduce	Remedy	Offset	Additional		
Hierarchy					Actions		
Start: Start of construction							
End: End of construction							
Frequency: During staff induction, continuous during construction							

All construction staff will be informed about the areas supporting natural and sensitive forest habitats, protected, threatened and endemic species, and why these features are important. The Contractors Environmental Officer will prepare and give this information as part of the staff inductions and will display relevant information, maps, photographs and posters in the site offices.

Action A1.2: Prepare habitat maps for the Project sites using aerial photography and high resolution satellite imagery

Target: Obtain high resolution satellite images for all Project sites and prepare habitat maps before construction.

Indicator: Habitat maps prepared and issued to RD/Engineer one month before construction and amendments incorporated into the plan before actual start of construction.

Mitigation Hierarchy	Avoid	Reduce	Remedy	Offset	Additional Actions			
Start: At least 2 months before start of construction								
End: One mon	End: One month before start of construction							

Frequency: Complete at least one month before start of construction

Action A1.3: construction	Avoid or	minimize lo	ss/degradation	of natural	habitat	during Proj	ect
Target: No net loss or significant degradation of natural habitat within the Study Area as a result of							
construction ac	tivities						
Indicator: Area	a and percent	tage of natural l	habitat affected b	y construction			
Mitigation	Avoid	Reduce	Remedy	Offse	t	Additional	
Hierarchy						Actions	
Start: Project design							
End: End of construction							
Frequency: De	sign stage ar	d continuous d	uring constructior	ו			

The habitat maps to be prepared for the Project site will be used to refine the siting of facilities in order to avoid the most valuable habitat areas and locations known to support protected and threatened plants species.

Action A1.4: Undertake pre-construction surveys and mitigation to minimize impacts on						
natural habitats and protected and threatened plants						
Target: Target	Target: Targeted botanic surveys before construction to identify and map the habitats and locations					
of protected/th	reatened plant sp	ecies on each wol	rk site			
Indicator: Rep	oort on habitats a	and locations of p	protected/threaten	ed plant species	to be issued to	
Engineer / RD	within prior to the	start of construct	ion in the specific	work sites.		
Mitigation	Avoid	Reduce	Remedy	Offset	Additional	
Hierarchy					Actions	
Start: Pre-construction						
End: One month prior to start of construction at the specific work site						
Frequency: Co	mplete at least or	e month before s	tart of construction	n		

Botanical surveys of the areas to be directly affected by construction will be carried out before the start of construction (but within the vegetation season i.e. June to August) to identify and map the habitats, plant communities and the locations of protected, threatened and invasive plant species. This information can be used in the ground truthing of the habitat classification (Action A1.2).

Before start of construction, saplings of protected shrubs and trees (<2 m) directly affected by construction will be trans-located to suitable areas outside the footprint of the Project. The following protected trees and shrubs have been recorded in the Study Area and will be considered for translocation of saplings if affected and where feasible:

- Zelkova Georgia Red List.
- Chestnut Georgia Red List.
- Bladder Nut Georgia Red List
- Yew Tree Georgia Red List
- Circassian walnut Georgia Red List

Action A1.5: Prepare and implement a habitat/soil removal and re-instatement plan

Target: Habitat reinstatement plant (HRP) to follow clear and best practice guidance to minimize adverse impacts

Indicator: HRP prepared and issued to RD and Engineer one month before construction and amendments incorporated into the plan before actual start of construction

Mitigation Hierarchy	Avoid	Reduce	Remedy	Offset	Additional Actions

Start: Preparation of HRP at least 2 months before start of construction; start implementation of HRP at start of construction

End: Complete preparation one month before start of construction. End implementation at end of construction (this excludes the long-term post-construction monitoring).

Frequency: Complete at least one month before start of construction and implement during construction

A habitat re-instatement plan (HRP) will be produced by the Contractor before the start of construction. The HRP will set out the minimum requirements for such activities, and will detail how reinstatement activities should be carried out. The reinstatement plan will include 10-year post construction monitoring; along with remediation actions if unsuccessful (this is covered by Action B1.6 below).

The HRP will be reviewed by a qualified ecologist. The following aspects and measures will be included as a minimum in the HRP:

- Vegetation clearance and soil stripping
 - Translocation or seed collection for protected plants.
 - Vegetation is to be cut down and cut material will be removed before soil stripping.
 - Use hand cutting where possible, avoiding the use of heavy equipment such as bulldozers, especially on steep slopes and ecologically sensitive areas.

- Soil handling and storage
 - Store top soil separately from subsoil or other materials. Top soil and subsoil will be stored in demarcated areas and will be clearly labelled to prevent mixing of different materials and to allow reinstatement in the correct order (temporary sites only) or to re-use these materials on other sites.
 - The seed/root-bearing topsoil will be formed into a shallow mound not higher than 1.5 m in height. The subsoil will be stored separately in the same way.
 - Any weeds on the soil mounds will be controlled by strimming.
 - To maintain the germination capacity of the seed bank, the top soil storage will not exceed 15 weeks if this material is used for reinstatement.
- Soil reinstatement and habitat restoration
 - Soils will be reinstated after construction in the temporary sites (workforce accommodation camps, storage yards, access roads). Soil reinstatement will be carried out to ensure the top soil is returned to the surface in line with international standards and best practice. Following top soil reinstatement, erosion control measures will be implemented on steep slopes. This may take the form of either the use of a nursery crop or the use of biodegradable erosion control geotextile blankets. Post-project restoration of any damaged natural habitats will be implemented to ensure no net loss in long- term.

Action A1.6: Long-term monitoring of reinstated habitats and translocated plants

Target: 75% establishment success of reinstated habitats and translocated plants after 10 years, compared to baseline

Indicator: Percentage of establishment success. Report on habitat reinstatement and translocation including recommendations for any remediation actions to be issued to RD/Engineer within 4 weeks of each site visit

Mitigation	Avoid	Reduce	Remedy	Offset	Additional		
Hierarchy					Actions		
Start: One year after construction							
End: 10 years from start of monitoring							
Frequency: Every two years							
End: 10 years fr Frequency: Eve	om start of monito ry two years	oring					

The reinstated habitats will be monitored annually for 10 years to ensure successful establishment. A partnership between RD and MoEPA will be established and MoEPA will undertake the post-construction monitoring of the reinstated habitats. A report will be prepared after each monitoring visit and recommendations on any remediation measures required will be given.

Objective A2: Replant affected forest and enhance forest habitat within the Study Area

Action A2.1: Project	Implement fores	t creation schem	ne to offset for fo	prest habitat loss	caused by the		
Target: No ne	t loss or forest de	gradation as a res	sult of the Project				
Indicator: Ar	ea of forest habit	at lost or degrade	ed 10 years after	construction, after	r implementation		
of forest creati	on scheme						
Mitigation	Avoid	Reduce	Remedy	Offset	Additional		
Hierarchy					Actions		
Start: Planting in 2013							
End: Planting	End: Planting by 2016; monitoring until 2025						
Frequency: Mo	onitoring of plante	d forest annually					

Due to the permanent loss of natural forest habitats, offsetting through the creation of similar habitats is also required to reduce the long-term impacts. Although there will be a delay before the new habitats become of equal conservation value, the habitat creation is an important

component in offsetting the overall impacts of the Project on biodiversity.

The forest creation scheme will include the planting of 28 ha of oak or oak-hornbeam forest (9160GE Code of Georgia) to be undertaken by the Contractor. This is based on the total area of natural habitat which is likely to be permanently lost under the Project.

The areas to be planted with oak or oak-hornbeam forest will be established following discussions and negotiations with the National Forestry Agency (NFA).

The planted forest will be managed by the NFA, with support provided by RD in the next 10 years after planting. The planted forest will be subjected to monitoring and maintenance activities to ensure the forest habitat is established successfully. Maintenance will be required for five years and will involve two visits per year to replace any dead or affected trees, control the weeds, provide protection against pests etc. The monitoring will continue for 10 years and will involve an annual visit by a qualified botanist to record species composition and habitat structure in the planted forest.

As an additional conservation action, RD will also examine the possibility of providing support for the establishment of tree nurseries at local schools, where children can learn to identify and grow native and endemic tree species, and monitor the life cycle of trees and the influences of factors such as climate change, altitude, diseases etc.

Action Plan for Rivers and Associated Species

Current Factors Affecting Rivers and Associated Species

The rivers are currently already impacted to some extent by untreated sewage discharges and pollution from agricultural areas.

Eurasian otter is rare and threatened in Georgia.

In the absence of mitigation, the Project's impacts on river habitats and species are likely to be vary between adverse moderate and adverse major. The successful implementation of the actions below will ensure a reduction of the impacts to a level which is not significant (i.e. adverse minor).

Action Plan Objectives and Actions

Objective B1: Protect river habitat and associated species during construction and operation of the Project

Action B1 1: Inform construction staff on the importance of river habitats and associated									
species									
Target: All co	Target: All construction and operation staff to be aware of the importance of river habitats and								
associated spe	cies within the St	udy Area							
Indicator: Nur	nber of staff and	contractors reach	hed through toolb	oox talks and trai	ning. Number of				
leaflets, office	oosters, wildlife pl	noto competition e	etC.						
Mitigation	Avoid	Reduce	Remedy	Offset	Additional				
Hierarchy					Actions				
Start: Start of c	Start: Start of construction								
End: End of co	nstruction								

Frequency: During staff induction and continuous during construction

All construction staff will be informed about the areas supporting natural and sensitive habitats, protected, threatened and endemic species, and why these features are important. The Contractor Environmental, Health and Safety Officer will prepare

and give this information as part of the staff inductions and will display relevant information, maps, photographs and posters in the site offices.

Action B1.2: construction	Avoid or minin	nize loss/degrad	lation/pollution	of river l	habitat during	Project		
Target: No deg	Target: No degradation of river habitat owing to construction activities							
Indicator: Nun	nber of reported e	nvironmental inci	dents					
Mitigation	Avoid	Reduce	Remedy	Offset	Additic	onal		
Hierarchy					Action	S		
Start: Prior to s	start of Construction	on						
End: End of construction								
Frequency: Co	ntinuous during c	onstruction						

The following measures will be implemented to minimise adverse impacts during construction: Site plans will be devised to ensure that, insofar as possible, all temporary construction facilities are located at least 100 meters away from any surface water course. If determined warranted by the Engineer, the Contractor will provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from the Contractors camp sites. If so requested, the Contractor will ensure that all vehicles are properly cleaned (bodies and tires are free of sand and mud) prior to leaving the site areas. The Contractor will provide necessary cleaning facilities on site and ensure that no water or debris from such cleaning operations is deposited off-site.

Bridge Construction - Concerning bridge construction works, the Contractor will:

- (i) Divert the water flow near the bridge piers.
- (ii) Provide coffer dams, silt fences, sediment barriers or other devices to prevent migration of silt during construction within streams.
- (iii) Perform dewatering and cleaning of cofferdams to prevent siltation by pumping from cofferdams to a settling basin or a containment unit.
- (iv) Carry out bridge construction works without interrupting the traffic on the Project Road with the provision of suitable diversions.
- (v) Ensure no waste materials are dumped in the river, including re-enforced concrete debris.
- (vi) Place generators more than 20 meters from the river.
- (vii) Ensure that no concrete waste is dumped in the river.
- (viii) Carefully collect all polystyrene (from expansion joints) so that it does not litter the local environment.
- (ix) Ensure that no hazardous liquids are placed within 10 meters of the river.
- (x) Provide portable toilets at bridge construction sites to prevent defecation by workers into the river.
- (xi) Ensure that workers are provided with correct PPE including harnesses.
- (xii) During piling works ensure that pumped water is filtered through a silt trap before being discharged to the river.
- (xiii) Provide areas where concrete mixers can wash out leftover concrete without polluting the environment. This may be in the form of a lined settling pond at each bridge site. Drivers will be informed of these locations and the requirements to use these settling ponds on a routine basis by the Engineer. Dried waste from the settling ponds can be used as backfill for culverts, etc.

Drainage and Flooding - During the construction phase the Contractor will be required to construct, maintain, remove and reinstate as necessary temporary drainage works and take all other precautions necessary for the avoidance of damage to properties and land by flooding and silt washed down from the works. Should any operation being performed by the Contractor interrupt existing irrigation systems, the Contractors will restore the irrigation appurtenances to their original working conditions within 24 hours of being notified of the interruption. The Contractor will also be responsible for ensuring that no construction materials

or construction waste block existing drainage channels within the Project corridor. The Engineer will be responsible for routine monitoring of drainage channels to ensure they remain free of waste and debris.

Action B1.3: Raise awareness of the local communities on the importance of protected amphibian, fish and otter species

Target: Reduce threat to protected amphibian, fish and otter species by providing information, leaflets, posters and workshops

Indicator: Numbers of fishermen and fish farmers taught sustainable practices and numbers of fishing facilities created on the new reservoirs.

Mitigation Hierarchy	Avoid	Reduce	Remedy	Offset	Additional Actions
Start: 2021					

End: 2024

Frequency: Continuous during this period

RD will provide support to raise awareness of the local communities about the importance of conserving the threatened species of fish and otter, sustainable fish farming, avoidance of poison/electrofishing or dynamite, and preventing the spread of invasive species of fish. RD's involvement can include support for the production and delivery of information, leaflets, posters, workshops in at least five villages in the Study Area.

<u>6.4 Action Plan for Protected and Threatened Terrestrial Mammal and Reptile Species</u>

6.4.2 Action Plan Objectives and Actions

Objective C1: Protect terrestrial mammals and reptiles during construction of the Project

Action C1.1: I	Action C1.1: Inform construction staff on the importance of river habitats and associated							
species								
Target: All co	Target: All construction and operation staff to be aware of the importance of river habitats and							
associated spe	cies within the Stu	udy Area						
Indicator: Nur	nber of staff and	contractors react	hed through tool	box talks and tra	ining. Number of			
leaflets, office	oosters, wildlife ph	noto competition e	etc.		-			
Mitigation	Avoid	Reduce	Remedy	Offset	Additional			
Hierarchy Actions								
Start: Start of construction								
End: End of co	nstruction							

Frequency: During staff induction and continuous during construction

All construction staff will be informed about the areas supporting threatened and endemic species, and why these features are important. The Contractors Environmental Officer will prepare and give this information as part of the staff inductions and will display relevant information, maps, photographs and posters in the site offices.



The time excavations and trenches are left open will be minimised to avoid mammals and reptiles being entrapped and injured. Protection of deep excavations will be provided overnight or when not actively worked.

Action C1.3: Minimize habitat loss/damage and off-road vehicle movement								
Target: Construction and vehicle movement will be avoided in sensitive habitats and key areas for priority species								
Indicator: Are	ea and condition o	of sensitive habita	t					
Mitigation Hierarchy	Avoid	Reduce	Remedy	Offset	Additional Actions			
Start: Start of construction								
End: End of construction								
Frequency: Co	ntinuous during c	onstruction						

The land take for permanent and temporary project structures and the need to clear vegetation will be minimized. Vehicle movements within Project area will be strictly monitored and controlled and drivers will be required to follow designated routes only.

Action C1.4: Active control of hunting and poaching ban								
Target: No hu	Target: No hunting or poaching by Contractor staff in the Project area and surroundings during							
construction ar	nd operation							
Indicator: Rep	orted incidents of	staff violating the	hunting ban to C	ontractors EHSO				
Mitigation	Avoid	Reduce	Remedy	Offset	Additional			
Hierarchy					Actions			
Start: Start of construction End:								
End of operation								
Frequency: Co	ntinuous							

All construction and operation staff will be required to follow company rules and code of conduct. To ensure the national legislation prohibiting hunting and poaching of protected species is not breached; additional measures will be implemented to protect the mammals and reptiles within the Project area and surroundings. All staff of construction and service organizations will be under an obligation not to undertake poaching or hunting throughout the whole area of the development.

Any member of staff found in violation of the hunting ban will be subject to company disciplinary action, in addition to the fine under the national law.

Action C1.5: Minimize noise and artificial lighting at night during construction							
Target: No dis	turbance to bat sp	ecies through noi	se or light pollutio	on			
Indicator: Evic	dence of provision	s for minimizing li	ght and noise pra	nctices during con	struction		
Mitigation	Avoid	Reduce	Remedy	Offset	Additional		
Hierarchy					Actions		
Start: Start of construction							
End: End of construction							
Frequency: Co	ntinuous during co	onstruction					

Avoiding or minimizing the artificial lighting at night is particularly important for bats. Any artificial lighting required should be pointed downwards to minimize light spill.

Best practice noise reduction measures will be implemented during construction and these will include:

• Avoidance of unnecessary revving of engines and switch off equipment when not required;

- Vehicles and equipment will be properly maintained to meet the manufacturers' noise rating levels. Any silencers or bearings which become defective would be replaced as soon as possible;
- Using reverse warning systems incorporating broadband noise where practicable;
- Using enclosures for noisy plant such as pumps or generators;
- Limiting the use of particularly noisy plant or vehicles where practicable; and
- Plant and vehicles will be operated with noise control hoods closed.

Action C1.6: Undertake pre-construction surveys for bats

Target: Targeted bat surveys to identify bat activity and roost locations, and inform mitigation measures for the same

Indicator: Report on bat activity and roost locations including recommendations for mitigation (should it be required) to be issued to RD/Engineer within 4 weeks of each site visit

Mitigation	Avoid	Reduce	Remedy	Offset	Additional	
Hierarchy					Actions	
Start: Two months before start of construction						

End: One month prior to start of construction

Frequency: Complete at least one month before start of construction (surveys May-September)

The mature trees to be felled as part of the Project will be subjected to pre-construction bat surveys, which may include inspection from the ground or by climbing, and activity surveys (emergence/re-entry) undertaken at dusk and dawn. Bat activity surveys can only be undertaken between May and September, but inspection of the trees for bat roosts can happen any time of the year.

Similar inspections and/or activity surveys for bats will be undertaken for any rock crevices and caves which are likely to be affected by tunneling.

Should any bat roosts be found in areas to be affected by construction, then mitigation measures will be applied. The mitigation may require the removal of the bats by a qualified ecologist and the installation of artificial roosting facilities for bats.

Objective C2: Protect Otter During Construction of the Project

Action C1.2: Ensure Otter are Protected from construction activities						
Target: Otter	hahitat identified	I pre-construction	and mitigation	measures imr	lemented through	
raiget. Ollor			and miligation	measures imp	nemented through	
method statem	ents					
Indicator: Nun	nber of otter holts	identified and mit	igation measures	implemented.		
Mitigation	Avoid	Reduce	Remedy	Offset	Additional	
Hierarchy					Actions	
Thoratony	-				Actions	
Start: Start of construction						
End: End of construction						
Frequency: Du	ring staff inductior	n and continuous	during construction	on		

Prior to the start of construction in river beds, or close to river embankments (within 10 meters), the Contractor shall undertake a site survey (using a local ecologist) to ensure that there are no otter holts in these areas. If holts are found in these areas the Contractor will prepare a method statement for the management of these areas which will be sent to the Engineer for review and approval. The method statement should included at least the following measures:

- Marking the areas where otters are registered.
- Implementation of works so to retains otter habitats in the water body and bank where feasible.
- Constructing artificial holts to replace those that will be damaged or removed.

- Implementation of works at daylight to allow a separation of human activity from the main peaks of otter activity (dawn/dusk).
- Implementation of pollution prevention measures (soil and water) such as arrangement of temporary surface water run-off control system consisting of settling ponds and drainage ditches, as well as other measures for soil, water, vegetation/flora and fauna impact mitigation listed in the EIA.
- Avoiding significant change in lighting. This can be achieved by retaining the bank-side vegetation. In case necessary, additional planting along the bank-top to provide further screening to reduce light impact. Note: This will also work during operation. In addition to planting, to reduce impact during operation of the road location of the poles on design and construction stage should be selected so to be at a distance from the riverbed.
- Arranging barriers in the sensitive areas to avoid accidental road kills (using otter-proof fences to stop otters getting into development sites) Note: The otter fence shall consist of a post, mesh and wire and ply board. The posts shall be ≥ 1.5m high, spaced at 2m intervals. Netting shall be mounted onto the supporting wire (welded wire mesh (2.0mm wire)) gauge 50x50mm and 2000mm wide. The mesh shall be buried to 300mm and at top turned out at 45 degrees to the outrigger line. This mesh will thus be resistant to animal activity from the river side. On the upper slope side of the fence 10mm ply boards (1500 wide) shall be nailed to the support posts to provide damage protection and screening.
- Tool-box briefings to contractors prior to those works commencing.

If live otters are encountered contractor is to cease work and contact the ecologist who will then liaise with the appropriate regulatory officers to discuss the encounter and how best to proceed from that point.

Objective C3: Protect Caucasian Squirrel During Construction of the Project

Action C3.1: Ensure Squirrels are Protected from construction activities							
Target: Habita	Target: Habitat identified pre-construction and mitigation measures implemented.						
Indicator: No s	squirrei nabitat ne	gatively impacted					
Mitigation Hierarchy	Mitigation Avoid Reduce Remedy Offset Additional Actions						
Start: Start of construction							
End: End of construction							
Frequency: Du	ring staff inductior	n and continuous	during constructio	on			

Although squirrels are not anticipated to be found in the Project area, as a precaution measure the construction contractor must be aware of the need to follow requirements listed below:

- Checking all mature trees scheduled removal and other potential nest areas for the presence of dreys. (Survey must be done shortly before operations to locate active dreys).
- Before commencing of works, obtaining evidence that the drey (if any) is no longer in use.
- Felling and removal of trees in a manner that minimises the likelihood of killing adult squirrels.
- Implementation of works in the period when likelihood of encountering dependent young is the least.
- Max preservation of vegetation keeping to the boundaries of the RoW and worksites; fencing of sensitive areas bordering the RoW to reduce the risk of impact and land take required for vehicular movements and construction works.
- Adoption of best practices to avoid light pollution, emissions/dust, ensure compliance with good waste management practices.
- It should be taken into consideration that the degree of disturbance is likely to be greatest for dreys where young squirrels are present.
- If the area around the drey tree is cleared it is likely that the drey will no longer be suitable. Adults can move readily but young squirrels may not be old enough to move. If mother

moves them herself it is rather stressful and sometimes risky process.

- It should be taken into consideration that the degree of disturbance is likely to be greatest for dreys where young squirrels are present.
- If the area around the drey tree is cleared it is likely that the drey will no longer be suitable. Adults can move readily but young squirrels may not be old enough to move. If mother moves them herself it is rather stressful and sometimes risky process.

Objective C3: Protect Turtles During Construction of the Project

Action C3.1: Ensure Turtles are Protected from construction activities								
Target: Identifi	ied turtles are rem	oved from site to	a suitable habitat					
Indicator: Nun	nber of turtles suc	cessfully moved.						
Mitigation	Avoid Reduce Remedy Offset Additional							
Hierarchy	Hierarchy Actions							
Start: Start of construction								
End: End of construction								
Frequency: During staff induction and continuous during construction								

If turtles are found within the work site, individuals must be removed to a safe distance (not less than 50m) from the works area. Eggs/hatchlings must be placed in a box (Note: sand substrata in the box must be provided) and moved to suitable nearby habitat where a nest will be created.

7. BAP Implementation, Monitoring and Reporting

7.1 Mitigation Ranking

IFC PS6 requires verification that the mitigation hierarchy has been applied, and that as much effort as possible is given to avoidance, and that offsets are measurable and only employed as a last resort where residual impacts are unavoidable. The elements of the mitigation hierarchy can be defined as follows:

- Avoid: measures taken to avoid creating adverse impacts from the outset, such as the sensitive spatial or temporal placement of elements of infrastructure, in order to completely avoid impacts on certain components of biodiversity.
- *Reduce*: measures taken to reduce or minimise the duration, intensity and / or extent of impacts (including direct, indirect and cumulative impacts, as appropriate) that cannot be completely avoided, as far as is practically feasible.
- Remedy: measures taken to rehabilitate degraded ecosystems or restore/reinstate cleared ecosystems following exposure to impacts that cannot be completely avoided and/ or reduced/minimised.
- Offset: measures taken to compensate (offset) any residual significant, adverse impacts that cannot be avoided, reduced and / or rehabilitated or restored, in order to achieve no net loss or a net gain of biodiversity. Offsets can take the form of positive management interventions such as restoration of degraded habitat, arrested degradation or averted risk, and protecting areas where there is imminent or projected loss of biodiversity.

In accordance with the mitigation hierarchy, the mitigation measures detailed in Chapter 6 have been classified as Avoid, Reduce, Remedy and Offset. Arranging the measures in this manner is intended to assist in the planning of project activities by prioritising the order in which the measures should be considered.

7.2 Implementation of the BAP

The summary tables in Section 6 present what actions will be implemented, when this will happen and who is responsible for the implementation. Additional information on the implementation and coordination of the BAP is provided in this section.

Before the start of construction, the Contractor will employ an Environmental Officer (EO) who will have most of the responsibilities for implementing the BAP and the associated ecological mitigation and monitoring measures as outlined in the Project EIA (IRD/SPEA 2019) and his SEMP.

The EO will have the overall responsibility to ensure an effective implementation of the protection and enhancement of biodiversity during construction of the Project. The responsibilities of the EO are:

- To inform, explain and where necessary enforce the biodiversity legislation, policies and lender requirements associated with the Project.
- To enforce the ban on all hunting across the Project area, raise awareness of the importance of the ban across all employees.
- To undertake patrols across the Project area and oversee and provide guidance on activities which may affect the biodiversity features within the Project area.
- To undertake and arrange for the clear demarcation and signage which may prohibit entry to ecologically sensitive areas.
- To provide advice to contractors regarding the ecological sensitivities within the Project area, and if necessary supervise contractors to ensure that they adhere to environmental requirements to avoid or minimise disturbance to habitats, flora and fauna.

- To ensure the implementation of best practice guidelines on the prevention and management of alien invasive species.
- To develop working relations with local community groups, land-owners, land-managers and business interests by maintaining close liaison with local individuals and communities.
- To provide advice to RD and Contractor staff, as necessary, in relation to the conservation and management of wildlife areas.

7.3 Monitoring, Evaluation and Reporting

7.3.1 Overview

Key to a successful BAP is the continuous monitoring of its actions and evaluation of their effectiveness in meeting the BAP conservation objectives. These monitoring activities need to be undertaken during construction and post construction. This section deals with the monitoring and evaluation of the BAP actions.

7.3.2 Monitoring during Construction

For the construction phase the monitoring activities will include:

- Daily monitoring of construction areas for general disturbance of habitats and fauna through encroachment, noise and extent of working area;
- Monthly audit of construction areas to monitor temporary working area size, number and extent of temporary access routes, construction vehicle use of specified access routes, levels of noise and light disturbance;
- Weekly monitoring of hunting activities across the project areas during construction. The EO will check with the site manager, environmental officer and environmental engineer whether they are aware of breaches of the hunting ban, and will carry our random checks in the field.
- Monitoring of vegetation for endangered species and breeding birds, burrowing mammals, reptiles and amphibians one day before vegetation clearance;
- Bi-weekly checks of any open excavations to release any entrapped animals; and
- Monthly monitoring of the presence and extent of invasive species on the Project sites. Most of the monitoring activities above will be undertaken by the EO and any required ecologists.

7.3.3 Post-construction Monitoring

The BAP includes a 10-year post-construction monitoring programme of reinstated or created habitat.

7.3.4 Reporting

In summary, the Contractors will have internal reporting responsibilities, which will include reporting the daily site inspections in the site diary; using the inspection checklist to report weekly site inspections; and prepare monthly HSE reports to RD. The SEMP is a live document and will be updated if/when required.