Environmental Impact Assessment (Draft)

Draft Environmental Impact Assessment
April 2019
Project Number: 5100160001-1GE

Poti-Grigoleti-Kobuleti Bypass: Poti-Grigoleti Road Section (Lot 2, Stage 1)

(Main Report)

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Abbreviations and Acronyms

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ACC	Automatic Counts
ADB	Asian Development Bank
AIS	Alien Invasive Species
AP	Affected Person
BAP	Biodiversity Action Plan
CAREC	Central Asia Regional Economic Cooperation
CCTV	Closed-Circuit Television
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLS	Core Labour standards
CPS	Country Partnership Strategy
CR	Critically Endangered
EA	Executing Agency
EAC	Environmental Assessment Code
EBRD	European Bank for Reconstruction and Development
EHS	Environmental, Health, and Safety
EHS Guidelines	Environmental, Health, and Safety Guidelines
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EMP	Environmental Management Plan
EN	Endangered Species
ESIA	Environmental and Social Impact Assessment
ESO	Environment and Social Officer
EU	European Union
FHWA	Federal Highway Administration
FHWG	Fisheries Hydroacoustic Working Group
GDP	Gross Domestic Product
GEL	Georgian Lari
GHG	Greenhouse Gas
GOAC	Georgian Oil and Gas Corporation
GoG	Government of Georgia
GRC	Grievance Redress Commission
GRM	Grievance Redress Mechanism
H&S	Health and Safety
HGV	Heavy Good Vehicles
HPP	Hydroelectric Power Plant
HSE	Health, Safety, and Environment
Hz	Hertz
IAS	Invasive Alien Species
IBA	Important Bird Area
IDP	Internally Displaced Person
IEE	Initial Environmental Examination

IFC	International Finance Corporation
IFI	International Financial Institution
ILO	International Labor Organization
IUCN	International Union for Conservation of Nature
JICA	Japan International Cooperation Agency
kFW	German government-owned development bank (Kreditanstalt für Wiederaufbau)
LAR	Land Acquisition and Resettlement
LARP	Land Acquisition and Resettlement Plan
LC	Least Concern
LGRM	Local Grievance Redress Mechanism
MCA	Multi-Criteria Analysis
MCC	Manual Classification
MoED	Ministry of Economic Development
MoEPA	Ministry of Environment Protection and Agriculture
MoESD	Ministry of Economy and Sustainable Development
MRDI	Ministry of Regional Development and Infrastructure
NGO	Non-Governmental Organization
NT	Near Threatened
O/D	Original Destination
OHS	Occupation Health and Safety
PAP	Project Affected Person
pk	Kilometric point, milepost parker
PMU	Program Management Unit
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
RD	Roads Department of Georgia
ROW	Right-Of-Way
SEMP	Specific Environmental Management Plan
SEP	Stakeholder Engagement Plan
SFF	State Forest Fund
SPS	Safeguard Policy Statement
TEM	Trans-European North-South Motorway
TOR	Terms of Reference
UNEP	United Nations Environment Program
UNFCCC	UN Framework Convention on Climate Change
USAID	United States Agency for International Development
USD	United States Dollar
VU	Vulnerable
WHO	World Health Organization
WWF	World Wildlife Foundation

Currency Equivalents

1 US$ = 2.66 (GEL) - as of 25th January 2019
($ refers in this report to US-Dollars)

Weights and Measures

mm	Millimeter
As	Arsenic
Cadmium	Cd
Chrome	Cr6+
Cl	Chlorine
cm	Centimeter
CO	Carbon Monoxide
CO2	Carbon Dioxide
COD	Chemical Oxygen Demand
dB	Decibel(s)
dBA	A-Weighted Decibel(s)
dB_{PEAK}	Peak sound pressure level (PEAK) – The largest absolute value of the instantaneous maximum overpressure or underpressure observed during each pulse
Fe	Iron
ha	Hectare
Hz	Hertz
km	Kilometer
km/h	Kilometers Per Hour
Km^2	Square Kilometer
l	Liter
Ldn	Day night average noise level
Leaq	Equivalent Continuous Level
m	Meter
m^2	Square Meter
m^3	Cubic Meter
m^3/d	Cubic Meter Per Day
m^3/h	Cubic Meters Per Hour
m^3/s	Cubic Meters Per Second
m^3/s	Cubic Meter Per Second
MAC	Maximum Allowable Concentrations
mg	Milligram
mg/kg	Milligram Per Kilogram
mg/l	Milligram Per Liter
mg/m3	Milligram Per Cubic Meter
MPC	Maximum Permissible Concentrations
N	Nitrogen
NH^3	Ammonia
NO_2	Nitrogen Dioxide

NO_3	Nitrate
NO_x	Nitrogen Oxides
Pb	Lead
pH	Potential of Hydrogen
PM	Particulate Matter
PM10 and PM2.5	Particulate Matter of 2.5 micron or 10 micron size
POPs	Persistent Organic Pollutants
ppb	Parts Per Billion
PPM	Parts Per Million
RMS	Root Mean Square
SEL	Sound exposure level is a measure of the total sound energy that a fish would be exposed to for each individual pile strike which can help to determine the potential for injury to fishes.
$SEL_{CUMULATIVE}$	Cumulative SEL is determined by adding up the sound energy associated with all pile strikes that occur over a given day
So_2	sulfur dioxide
SPL	Sound pressure level an expression of the sound pressure using the decibel (dB) scale and the standard reference pressures of 1 micro-Pascal (µPa) for water and biological tissues.
t	Ton
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
TTS	Temporary threshold shift
Zinc	Zn2+
µg	Microgram
$µg/m^3$	Micrograms per cubic meter
µPa	Micro pascal — unit of measure for pressure equal to 1 x 10-6 Pascals

Note

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Executive Summary

1. Introduction

1. This Environmental Impact Assessment (EIA) is part of the process of compliance with the Asian Development Bank (ADB) Safeguard Policy Statement (SPS) (2009) in relation to the construction of the Poti-Grigoleti Road Section (Lot 1, Stage 2) of the Poti-Grigoleti-Kobuleti bypass, herein referred to as the "Project".

2. The Project is classified as environment Category A per ADB SPS requirements owing to the potential for significant, irreversible adverse impacts on the Rioni River – one of the few remaining spawning rivers globally for several Critically Endangered fish species.

3. The EIA provides a road map to the environmental measures needed to prevent and/or mitigate negative environmental effects associated with the project. More specifically, the EIA:

a) describes the existing socio-environmental conditions within the project area, including critical habitat and biodiversity features;
b) describes the project design, construction activities, and operational parameters;
c) examines alternatives to the proposed project site, technology, design, and operation;
d) describes the extent, duration, and severity of potential impacts on the environment; and
e) formulates the mitigation actions and presents it all in the form of an Environmental Management Plan (EMP).

2. Project Background

4. The Government of Georgia (GoG) is conducting a program to upgrade the major roads of the country, managed by the Roads Department (RD) of the Ministry of Regional Development and Infrastructure (MRDI). The program aims to improve transportation and transit of goods to surrounding countries, which is a significant and growing contributor to gross domestic product (GDP). In October 2016 Georgia also joined the Central Asia Regional Economic Cooperation (CAREC) program which links Central Asia's economic hubs to each other and connects the landlocked CAREC countries (Afghanistan, Azerbaijan, Peoples Republic of China, Georgia, Kazakhstan, Krygyz Republic, Mongolia, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan) to other Eurasian and global markets.

5. As a part of a the GoG's effort to strengthen and improve the wider road network, financial support is being sought from the EIB and the ADB for road construction of the Poti-Grigoleti-Kobuleti bypass, which is comprised of two sections: i) Grigoleti-Kobuleti bypass (Lot 1); and ii) Poti-Grigoleti road (Lot 2).

6. For design purposes, alignment for the Poti-Grigoleti road section (Lot 2) has been divided into three stages:

- Stage 1: From the beginning of E-60 highway to Rioni River
- Stage 2: From Rioni River to Maltakva River
- Stage 3: From Maltakva River to connection with the Grigoleti-Kobulety bypass (Lot 1)

7. Financing from the ADB is being sought for construction of the 2.5 km Poti-Grigoleti road section (Lot 2, Stage 1), which includes a bridge over the Rioni River and approach roads. The EIA analysis will be limited only to this section.

8. The feasibility study for the Project has been completed by the RD of Georgia under EIB funding. A Consortium represented by Getinsa-Payma-Eurostudios (herein referred to as the "Consortium") was engaged by the MRDI in 2016 for preparation of the feasibility studies; development of detailed design; preparation of bidding document; and environmental protection and resettlement documents.

9. Following review of the environmental and social safeguards documentation, and through consultation with non-governmental organizations (NGOs) and the ADB, the RD became aware of the of presence of sturgeon in the Rioni River, which are considered among the most threatened group of animals on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. The ADB's SPS is clear on the requirement that no project activity will be implemented in areas of Critical Habitat[1] unless the activity has no measurable adverse impacts, or likelihood of such, on the Critical Habitat that could impair its high biodiversity value or the ability to function (paragraph 28). Given the potential environmental impacts from the Project on Critical Habitat, a Biodiversity Action Plan (BAP) has been developed to demonstrate Project compliance with ADB biodiversity safeguards (ADB 2009) (see **Annex 1. Biodiversity Action Plan (BAP)**). The BAP analysis and a small number of additional specific mitigation and management measures necessary to reduce residual impacts on Critical Habitat-qualifying biodiversity to levels in line with the ADB Safeguard Policy Statement (ADB 2009) have been incorporated into the EIA.

3. Description of the Project

The Poti-Grigoleti-Kobuleti bypass section is part of the E-60 and E-70 highways and the larger East-West road corridor in Georgia, which is an integral part of one of the six key CAREC corridors (Corridor 2) providing the shortest transit link to connect Central Asia with Europe and East Asia. The Project is located along the Black Sea coastal area within the Sanegrelo-Zemo Svaneti Region and on the border between Khobi Municipality and the Poti administrative center (see Figure 1).

10. The 2.5 km road Project consists of a 2-lane (one lane in each direction) multi-span bridge over the Rioni River and its connection with the existing highway on both sides of the river. The starting point is located on the E-60 highway to Senaki at the right riverbank of Rioni River in the northern outskirts of the city of Poti. The new section of highway will pass next to a residential area (Patara Poti Village) using the same alignment and parallel to the existing railway bridge over the river. A small section (approximately 1 km) of an existing secondary road which runs to the Kulevi Oil Terminal from Patara Poti and parallel to the river will also be upgraded with a modified alignment to accommodate the new bridge and road approaches.

11. The Project's 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 Trans-European North-South Motorway (TEM) Standards.

[1] Defined in the SPS as the following: A subset of both natural and modified habitat that deserves particular attention. Critical habitat includes areas with high biodiversity value, including habitat required for the survival of critically endangered or endangered species; areas having special significance for endemic or restricted-range species; sites that are critical for the survival of migratory species; areas supporting globally significant concentrations or numbers of individuals of congregatory species; areas with unique assemblages of species or that are associated with key evolutionary processes or provide key ecosystem services; and areas having biodiversity of significant social, economic, or cultural importance to local communities.

Figure 1. Location of the Project

12. The main technical parameters adopted in the detailed design are provided in Table 1. Although interchanges will be built in Stage 2, their design needed to be considered at this stage.

Table 1. Design Parameters

Parameter	Main Alignment	Interchanges: Ramps and Loops
Design speed	100 km/h	40 km/h, 60 km/h, 80 km/h or 100 km/h
Speed limit	90 km/h	90 km/h
Spiral Transition Curves	As per TEM Standards	As per TEM Standards
Bend (Superelevation)	As per Georgian Standards	As per Georgian Standards
Min. crossfall and min. bend	2,50%	2.50%
Max. superelevation	7,00%	7.00%
Expansion width in curves	No necessary widening (each lane is 3,75 m wide)	As per Georgian Standards
Min. Vertical Gradient	0.30%	0.30%
Max. Vertical Gradient	4.00%	5% (100 km/h) and 6% (<100 km/h)
Convex Vertical Curves	22.600	10,000 (100 km/h), 5,000 (80 km/h), 1,800 (60 km/h), 400 (40 km/h)
Concave Vertical Curves	7.700	4,900 (100 km/h), 3,200 (80 km/h), 1.700 (60 km/h), 850 (40 km/h)
Acceleration Lane	-	150 m acceleration lane + 80 m taper
Deceleration Lane	-	100 m deceleration lane + 80 m taper

4. Alternatives

13. During Project preparation, various alternatives for Project components were proposed, screened, and studied against technical, economic, social, and environmental criteria. The primary objective with respect to the environmental criteria was to identify and adopt options with the least adverse environmental impacts and maximum environmental benefits. The following key environmental factors were used in comparing alternatives: (i) impact on air quality; (ii) noise; (iii) impact on soil; (iv) impact on surface water; (v) impact on biodiversity and ecological integrity; (vi) landscape and visual impact; and (vii) socio-economic impact.

14. The alternatives considered for the proposed Project include:

- alternatives for 'No Action' and upgrading of existing bridge;
- alternative for bridge alignment/location;
- alternatives for landing/approach roads and connecting roads;
- alternatives for bridge design (e.g., type of bridge, superstructure, number of piers, and type of foundation); and
- alternatives for construction methods, materials, and technologies including structure options.

15. The 'No Action' Alternative addresses the likely consequences of not undertaking the proposed action. While it has no environmental and social impacts resulting from construction works, the failure to develop the road section proposed would result in the continued deterioration of the road and bridge over the Rioni River, thereby impeding the economic development of the Project area and the region. Negative environmental and social impacts from traffic jams, noise, low speed, high emissions, and safety issues related to use of the existing bridge structure will continue without action. In addition, the existing bridge lacks the capacity to handle increased levels of traffic expected in the future from construction of the Anaklia deep sea port and further development of the Port of Poti. Local communities would not benefit from the positive effects associated with highway improvement under the Project, including profits resulting from increased cargo turnover and tourism. Therefore, it can be determined that the 'No Action' alternative is not a reasonable option if the overall socio-economic situation in the western region is to be improved.

16. Upgrading the existing road and bridge was an alternative also considered. The existing bridge provides a flood control function and recently needed repair due to its deteriorated condition. The bridge is also not operated or controlled by the RD, limiting its ability to maintain, repair, or upgrade the infrastructure as needed. The existing road alignment is also inconsistence with TEM Standards. Although there would be cost savings from the civil works if a new alignment was not constructed, it would reduce the effectiveness of road improvements currently being planned for under the Poti-Grigoleti-Kobuleti bypass. There are a large number of residences and businesses which would also be affected if the road was upgraded. Accessibility for residents will remain unchanged under the proposed Project as the plan is to keep the existing bridge open for local traffic, thereby retaining connectivity while reducing negative impacts from heavy traffic currently being experienced.

17. Considerations for various road and bridge alignment options were constrained by the proximity of residences in the village of Patara Poti, commercial buildings (e.g., Nikora meat factory), existing utility infrastructure (i.e., above ground natural gas pipeline), transportation infrastructure (i.e., railway line), and environmentally sensitive areas (e.g., Kolkheti National Park, Ramsar site, IBAs). During the Project's feasibility phase, a number of alignments were considered that broadly follow the existing E-60 corridor. While the alignment alternatives

analyzed have similarities, the option providing the greatest economic and social benefits and fewest negative environmental and social impacts has been selected as the preferred option.

18. Various structural design options were also considered for the bridge during the feasibility phase in order to identify the most appropriate solution for the Project (e.g., composite deck bridge, cast in place cantilever, precast prestressed concrete I-beams). After factoring cost and construction constraints; existing road profiles; nature of the soils present in the area; seismic and other natural hazards; protection of biodiversity and critical habitat; and aesthetic value, a bridge design with the following features was chosen:

- Abutments. The abutments are closed boxes and have a deep foundation similar to the piles. The dimension of the abutments allows access to the inside of the deck for inspection or repairs.
- Piers. The number of piers was reduced during the design phase to limit the structural footprint of the bridge in the Rioni River. The bridge's seven piers have two clearly differentiated typologies. Four standard piers and one at the center of the structure in the form of a triangular pier, whose purpose is to collect longitudinal horizontal forces caused by traffic, earthquakes, and thermal and rheological actions. This ensures a null point of movement and allows for maximum expansion lengths in both abutments.
- Underpasses/overpasses. The structure is a cast in-situ reinforced box. The length of the structure covers the transverse dimension of the embankment of the main road and has triangular retaining walls at both ends. The horizontal inner dimension of the box section is enough to allow the pass of the lower secondary road with a clearance of one meter at both sides of its platform. The box has a vertical gauge of six meters over the pavement.
- Road surface. Considering geological and geotechnical stresses, the presence of soft soils along the corridor, and expected differential settlement, flexible pavement or asphalt concrete pavement was chosen over rigid pavement or Jointed Plain Concrete Pavement (JPCP). The pavement structure will be designed in accordance with the AASHTO Guide for Design of Pavement Structures.[2]

19. In order to protect biodiversity and support sustainable management of living natural resources in the Project area and beyond, various alternatives (e.g., detention basins, incorporated storage within the superstructure, and tanks and vaults) were considered to protect water quality in the Rioni River during construction and operation of the bridge. Considering the sensitivity of the receptor, spillage of hazardous substances caused by accidents or runoff will be managed through a drainage system which diverts water into to two retention chambers, one on each side of the bridge.

5. Description of the Environment

20. The EIA report presents information about the physical, biological, and socio-economic characteristics of the environment alongside the Project alignment. The purpose of this description is to establish an environmental baseline to identify potential direct, indirect, cumulative, and induced environmental impacts on and risks to these resources, and to suggest adequate response through measures that are appropriate to avoid, minimize, or mitigate potential adverse impacts. The environmental baseline conditions in the Project area include:

[2] American Association of State Highway and Transportation Officials (AASHTO) - https://www.transportation.org/

- Climate and meteorology. Western Georgia has prevailing subtropical climate, influenced mainly by dry air masses from the Caspian and Central Asia in the east, and humid air from the Black Sea in the west. The climate of Khobi Municipality is warm and humid and total annual precipitation, mainly in the form of rain, amounts to 1,500-1,600 mm yearly. During the last 50 years average annual temperature on the whole territory of Georgia showed a growing trend. According to forecasts, by 2050, as compared with 1986- 2010, warming will mostly occur in the coastal zone and mountainous regions of Adjara (1.6-1.70C), and by 2100 the biggest increment of temperature (+4.20C) is anticipated in Batumi. In general, precipitation increased in most regions of West Georgia. According to the forecast, sustainable trends of increase of precipitation is anticipated until 2050.
- Geology and geomorphology. Geotectonically, the area belongs to the Kolkheti sub-district of the western depression zone of the Georgian Block. The geological structure of the district is represented by quaternary deposits – over several tens of meters thick alluvial soils. The Project area is located within the limits of Kolkheti lowland which is a depression where a lot of surficial origin terrigeneous matters are accumulated. The lowland is inclining towards the sea and bogged up in the west side.
- Hydrology and hydrogeology. Kolkheti lowland has a dense network of rivers with various types of feeding, morphology, and catchment capacity. Over 150 large and small rivers with their numerous tributaries discharge to the Black Sea. The rivers play vital role for the functionality of Kolkheti wetlands. The Rioni River basin is the second largest in Georgia and the largest in Western Georgia. The 13,400km2 river basin (20% of the land area of Georgia and 40% of Western Georgia), originates from two sources on the southern slopes of the Main Caucasian range and runs into the Black Sea near the city of Poti.[3] Similar to other lowlands and intermountain regions with shallow subsoil and pressure waters, Kolkheti lowland is at risk of pollution caused by industrial, infrastructure development, and other developments in the area.
- Soils, landscape, and land use. Soils in the Project area are represented by sub-area of intermountain plains where podzol and alluvial soils are present. In the area of interest, gleysols dominate, and in the narrow strip along the Supsa River, eutric fluvisols are present. Except for elevated lead (Pb) concentrations, other elements are within allowable limits based on international standards. High lead content is believed to be due to traffic related pollution.
- Air quality. Air quality in the Patara Poti area, where sources of industrial emission are limited, is generally good. Vehicle emissions are comparatively low because of low traffic volumes, and air pollution is rapidly dispersed due to winds. The quality of the ambient air in the study area is affected by exhaust gases from machinery and transport operating in the Poti port area as well as by the vehicles moving along the city roads.
- Noise. Stationary noise and vibration sources within the study area were identified and initial noise measurements were taken at five strategic points, including three points near residences in Patara Poti and two measurements near the Nikora meat factory as part of the initial noise monitoring undertaken during detailed design. The road and railway line are the main sources of noise in the study area. Based on preliminary noise studies, the noise levels at the residential sampling points in Patara Poti Village may require installation of a noise barrier. A noise and vibration study is being developed for the Project and results will be incorporated into this EIA as they become available during the public disclosure period. The new noise study will be conducted according

[3] Initial National Communication under the United Nations Framework Convention on Climate Change of Georgia, 1999.

to the limiting values set forth by the International Finance Corporation (IFC) Environmental, Health, and Safety Guidelines (known as the 'EHS Guidelines').[4]

- Natural hazards. Georgia is located within the Mediterranean seismic belt, in the active seismic zone of the Caucasus. Natural disasters take place on quite a large scale in Georgia and with a high frequency of recurrence due to the complex geological and geographical conditions in Georgia. The frequency of natural disasters has increased in the recent past and this increase is considered to be a consequence of the effects of global climate change as well as human activities, such as deforestation, overgrazing of pastures, land use changes without proper evaluation etc. Kolkheti depression is bounded by major folds and active faults. For the area of interest, flooding is the main hazard.
- Protected areas. There are two protected sites in the vicinity of the Project: Kolkheti National Park and the Wetlands of Central Kolkheti Ramsar Site. These two sites cover the same geographic area, were designated in the same year (1998), and have the same IUCN Management Category (II). This area is also being proposed as an Area of Special Conservation Interest (or "Emerald Site") by the national government under the Bern Convention.[5, 6] A large "Colchis Wetlands and Forests" World Heritage Site, overlapping the Project area, was proposed by the government in 2007.[7] This is now being revised for resubmission as a more select set of areas, which will still include Kolkheti National Park and thus parts of the Project area.[8, 9, 10] The internationally recognized Kolkheti Important Bird Area (also de facto a Key Biodiversity Area) also occurs within the Project area. The closest distance between the protected area and the new alignment is around 200m. An amendment bill to the Georgian Law on the "Establishment and Management of the Kolkheti Protected Areas" has been developed which extends the area of Kolkheti National Park and creates a new protected area called the Rioni Managed Reserve in Samtredia Municipality. Expansion of the Kolkheti National Park will cover the section adjoining the Rioni River confluence, the river confluence, and its adjoining sea area. Boundaries of that extension may reach as far east as the railway bridge neighboring the Project, however the exact extent is unknown at this time. The Rioni Managed Reserve will comprise the territory within the administrative borders of Samtredia Municipality with the total area of 624 ha, where remaining spawning grounds of the Sturgeons remain. As of the development of this EIA, the draft bill has been provided to different ministries for comment. Once the final version is developed, the final bill be submitted to the Parliament of Georgia for approval.
- Habitats, flora, and fauna. The Project is situated in a landscape of varying land use and land cover, comprising a matrix of natural and modified habitat. More than 194 different bird species are found in the region, including 21 species of migratory birds.

[4] Source: IFC Environmental, Health, and Safety Guidelines (EHS Guidelines) (https://www.ifc.org/wps/wcm/connect/06e3b50048865838b4c6f66a6515bb18/1-7%2BNoise.pdf?MOD=AJPERES).
[5] NACRES (2014) Development of Emerald Network in Georgia in 2013. Unpublished report by Centre for Biodiversity Conservation and Research (NACRES). Available at: https://pjp-eu.coe.int/documents/1461016/4159207/Report_2013_Emerald_developments_NACRES.pdf/d0ded329-fcdd-49a2-aac5-46db6fe3cf60.
[6] Archil Guchmanidze, MoEPA pers. comm.
[7] UNESCO (undated) Colchis Wetlands and Forests. Available at: https://whc.unesco.org/en/tentativelists/5223.
[8] Garstecki, T. (2017) *Feasibility assessment for a World Heritage nomination of the Colchic Forests and Wetlands under the natural criteria*. WWF, Tbilisi.
[9] Guchmanidze, A. (2017) Current status of sturgeon stocks in the Georgian Black Sea waters and their tributaries. Abstract from a talk given at the 8th International Symposium on Sturgeon, Vienna. Available at: http://www.vniiprh.ru/sites/default/files/file/page/17/11/a._guchmandize.pdf.
[10] Archil Guchmanidze, MoEPA pers. comm.

88 species of Ichtyofauna are present in the region including cartilaginous (e.g., sturgeon) and bony fish (e.g., Black Sea salmon, herring, striped mullet, pike, bonito, etc.). Six fish species (Beluga, Sea sturgeon, Sevruga sturgeon, Sea trout, Sand goby, Roach) are protected under the Red List of Georgia. The Kolkheti National Park area is also notable from a botanic point of view with complexes of phytocoenosis rich in diversity, relict, and endemic species, and various compositions. A full Critical Habitat Assessment (See BAP **Appendix A. Critical and Natural Habitat Assessment**) identified the Project area to be likely Tier 1 Critical Habitat for one globally Critically Endangered water plant, and likely or actual Tier 2 Critical Habitat for four freshwater fishes, one bird, one additional plant, two protected areas, and one internationally-recognized area. There is a very slim possibility that Atlantic (European) Sturgeon (*Acipenser sturio*) and/or Ship (Fringebarbel) Sturgeon (*Acipenser nudiventris*) also still regularly occur in the Rioni River. If that were the case, they would also qualify the Project area as Critical Habitat (see BAP, Section **3.2 - Priority biodiversity**).

- Historical and archaeological sites. The region is rich in archaeological sites and cultural monuments dated BC including churches, monasteries, castles, and fortresses from the medieval period. A range of archaeological sites were discovered in the region, including ancient settlements in the Kolkheti lowland, called locally "Dikhagudzuba" and a range of archaeological sites has been discovered when Baku-Supsa oil pipeline was laid in the late 20th century. In Senaki Municipality (approximately 30 km from the Project site), at a site known as Archaeopolis, human burials of Hellenistic and Byzantine periods have been excavated as well as ruins of buildings.
- Social environment. The residential areas closest to the Project sites are Poti and Patara Poti. According to official statistics, in 2016 unemployment rate in the Samegrelo-Zemo Svaneti regions was 10%. Majority of working population is self-employed, and agriculture is a leading sector. In the Rioni Basin section of Samegrelo-Zemo Svaneti, small to medium-size enterprises represent most of businesses and include food production and processing industries, textile factories, wood processing, paper production, extraction, and processing of construction materials. According to information published by the Ministry of Labour, Health and Social Affairs of Georgia, 781 households and 2,895 individuals receive social aid from the state in Khobi Municipality, representing 7.9% and 9.5% of the total households and individuals respectively. Within Patara Poti, two internally displaced families (four people) have been recorded. Based on the analysis developed as part of the project Land Acquisition and Resettlement Plan (LARP) concluded that two of the 12 Project Affected Households (AHs) are recognized as the vulnerable AH (women headed AHs).

6. Anticipated Environmental Impacts and Mitigation Measures

21. The Project is expected to generate both positive and negative impacts throughout the project cycle. Potential impacts were screened, identified, and assigned significance based on the assessment method provided in Section **F.1 - Impact Assessment Methodology**. Residual impacts after implementing mitigation measures were then identified in addition to appropriate compensation measures necessary to ensure that, overall, the high biodiversity value of the Critical Habitat is maintained, along with populations of Endangered and Critically Endangered species.

22. Potential direct impacts typical of project construction and operation include the use of geologic and water resources; soil disturbance and erosion; degradation of water resources; localized generation of fugitive dust and air emissions from construction and operational equipment; noise generation; disturbance or loss of paleontological and cultural resources; degradation or loss of fish and wildlife habitat; disturbance of resident and migratory fish and wildlife species, including protected species; degradation or loss of plant communities;

increased opportunity for invasive vegetation establishment; alteration of visual resources; land use changes; road access restrictions and increased traffic; accidental release of hazardous substances; and increased human health and safety hazards.

23. The primary environmental impacts and mitigation measures are provided below:

Primary Impacts During Site Preparation, Construction, and Worksite Closure Stages

24. Water quality. Without mitigation, one of the principal impacts during construction will be on water bodies, particularly during construction over the Rioni River. The activities posing the highest risk to deterioration in the surface water environment would be the temporary works associated with bridge construction and release of contaminants, sediment loading, and other runoff into watercourses. Therefore, water quality will be measured regularly throughout the construction phase and emphasis will be placed on local consultations with Kolkheti National Park, which is adjacent to and downstream from the bridge, and residents to ensure their water quality is not impacted on, to an unacceptable degree. Control of water, materials, and construction equipment will be of utmost importance during construction.

25. Noise. The greatest in-river disturbance impacts are likely to come from pile-driving. Although sturgeon suffer lower mortality from noise impacts than some other fish, pile-driving has been demonstrated to result in injuries to sturgeon. For ease of all in-water construction, this Project is already planning to use cofferdams dewatered down to the mud line. The use of coffer dams substantially reduces underwater pile driving sound,[11] and is likely to provide sufficient mitigation to avoid any mortality or serious injury impacts. Before starting any of the water construction activities, underwater noise measurements will be taken using hydrophones to establish in the water background noise levels. Modeling of the planned pile driving activities will also be done before construction to ensure noise from pile-driving is kept below current international interim good practice guidelines. Then regular noise measurements will be taken during pilling activities to determine compliance with the Project in the water SEL and Peak noise limits.

26. Aquatic fauna mortality. In-river construction might possibly also cause direct mortality or injury through accidental collision from propeller-driven boats, crushing of individual fish by machinery or equipment, or poaching of fish by construction workers. Given limited need for the use of propeller-driven boats here, they will not be used in this Project other than to set-up and remove pontoons that will be used during construction. Staff will be trained in construction best practice and poaching will be prohibited. Dropping structures into rivers/streams will be avoided [construction will instead take place from the river bank or pontoons].

27. Aquatic habitat. The potential for indirect modification of the Rioni River is of great concern. Licensed sand and gravel quarry sites in the Rioni River downstream of the Vartsikhe hydropower plants are currently having devastating impacts on the limited remaining spawning grounds of sturgeon species in the river. As such, sourcing of construction materials (e.g., sand, gravel) will avoid use of any licensed or unlicensed sites in the Rioni River or on its banks. There is potential that too large a proportion of the river may be blocked by cofferdams at any one time if construction of the bridge piers is not staged appropriately. Sheet piling coffer dams for all three piers will span approximately 100 m of the river (two of c. 25 m width and one of c. 50 m width[12]) – a relatively small proportion if split into two periods, but of concern if constructed simultaneously.[13] Therefore, the central bridge pier and adjoining two

[11] Caltrans, 2015
[12] Levan Kupatashvili, Roads Department, pers. comm. 2018
[13] Radu Suciu, pers. comm. 2019

piers will be constructed at two different times. All in-river activities will be avoided during March-September, inclusive, to avoid disturbance to sturgeon during their overall spawning season. Where feasible, in-river activities will also be avoided in October and November. Care will also be taken to avoid introduction of new invasive species to, and spread of existing invasive species within, the Project area through washing of vehicles, equipment and supplies before entry to the Project area; monitoring for invasive species; and control/eradication of invasive species where found.

28. Terrestrial habitat. It is unlikely that construction of the new road section will exert any significant additional impact on the existing flora and fauna in the project area over and above the current situation due to the relatively small footprint of the Project and presence of largely modified habitat. Short-term disturbances to fauna and fragmentation of habitat in the ROW of the project are unavoidable. A strip of riparian habitat along the edge of the river will be retained to reduce impact on species (ensuring connectivity and possibility for free movement along the river edge).

29. Protected areas and internationally-recognized areas. The Project's location near the Kolkheti National Park, Ramsar Site and IBA, and unavoidable disturbance and habitat loss due to construction, have the potential to impact fauna beyond the immediate Project site. Significant direct impacts are, however, unlikely since the most important parts of these sites, and concentrations of migratory and wintering birds, are not found near the Project footprint.

30. Dust and noise. The dust generated and mobilized by construction activities is likely to impact on residents close to the Project construction sites. However, dust suppression measures are clearly specified and will seek to manage dust to acceptable levels. Noise will be managed to the extent possible using best practice and mitigation measures aimed at reducing and or directing construction related sounds that may impact sensitive noise receptors.

31. Health and safety. Project workers will be exposed to different hazards during construction including noise and vibration, dust, handling heavy materials and equipment, falling objects, work on slippery surfaces, fire hazards, and chemical hazards such as toxic fumes and vapors etc. There are a number of potential health and safety related impacts which may result from construction activity on the Project, including traffic accidents, presence of new infrastructure, management of hazardous materials and waste, and spread communicable disease. Potential risks will be eliminated or reduced using good practice and known control and management solutions.

32. Socio-Economic. Several socio-economic beneficial impacts are expected including: (i) generation of skilled and unskilled employment opportunities; (ii) induced economic effects of spending on goods and services by construction workers; and (iii) long-term capacity enhancement for the local workforce. From the analysis provided by the LARP, we know that there will also be negative impacts associated with the Project. They include acquisition of 33,647 sq m of land from 30 plots, including 14 private plots and 16 public land plots. The Project has impact on 12 AHs and 1 company (59 individuals). All of these mentioned 12 AH and 1 company are losing land. Only 1 AH loses his buildings (abandoned and not finished residential house and ancillary building), 4 AHs are losing fences. There are no AH losing crops, trees, business, employment and other sources of income. No agricultural tenants or businesses will be affected. No physical relocation is planned under the LARP. The 11 AHs are deemed as severely AH (households losing > 10% of their income or productive land) and

2 AHs are recognized as the vulnerable AH (women headed AHs). Given the impacts identified in the LARP, the Project has been classified as "B" for resettlement.[14]

Primary Impacts during Operation Phase

33. Community health and safety. This EIA indicates that one of the main potential impact during operation will be the increased traffic volume and higher speed that could result in increased risk to drivers and the communities the road section passes through. The risk will be reduced to acceptable levels through installation of road signs, pavement marking, installation of guide posts and steel guardrails, cast in situ concrete parapets in the dividing strip, sidewalks, and enforcement of speed limits to ensure traffic regulations and safety.

34. Noise. Traffic noise prediction results indicate that the future noise levels after the completion of the project would be higher by less than 0.5 dB from the existing noise levels which is not noticeable. Therefore, no noise mitigations such as noise barriers are needed.

35. GHG emissions. The Project road section will help to increase the economic development of the region and result in increased traffic. This will lead to higher levels of GHG emissions. The overall contribution to GHG emissions will be low and no adverse air quality impacts are expected at the air sensitive receptors in the vicinity of the Project site above what already exists.

36. Poaching. A potential longer-term impact of the Project would also be to elevate poaching levels of sturgeon. Where bridges exist, methods of catching sturgeon in the region include stringing nets or snag lines between bridge piers, with hanging nooses or unbaited hooks to catch the sturgeon. While occurring at a small spatial scale, such activity could be persistent and thus have high consequences. CCTV cameras will be set up on the bridge and maintained through operation. A live feed will be provided to the relevant authorities and key stakeholders to ensure that no illegal fishing occurs on the bridge. Regular (at least weekly) monitoring of installed CCTV cameras during the overall spawning season (March-September inclusive) will be undertaken as well as reporting of incidents to the RD and the MoEPA Biodiversity Service under the Department of Biodiversity and Forest Policy.

Induced and Cumulative Impacts

37. Socio-Economic. These impacts will be mainly positive. The full scale of positive indirect impacts will be achieved once the Western Regional Road corridor is completed. These benefits include improved access to education, social, health and community services, and improved economic development opportunities.

38. Ecology and biodiversity. With regards to potential cumulative impacts from anticipated development in the region, there is significant uncertainty considering that information is limited or not available and the development activities are outside of the control of this Project. The Rioni River and its biodiversity are already suffering impacts from issues such as pollution, gravel and sand extraction, and unsustainable fishing practices. Surrounding areas have been extensively cleared for agriculture and are increasingly being impacted by urban or large-scale development. A number of other large-scale developments in the region of the Project may specifically impact sturgeon (including development of the Anaklia deep sea port 30 km to the north of Poti) or the Rioni River (including the Samtredia-Grigoleti highway; Namakhvani hydropower cascade c. 150 km upstream; improvement of the Poti wastewater system;

[14] Based on the *ADB Safeguards Policy Update (2009) a Project is classified as A for LAR when it entails severe impacts (*> 200 persons lose >10% of their income or are resettled). For category A projects a full LARP is to be prepared.

improvement of the Kutaisi water supply system; and structural measures in the Rioni River to reduce impacts of flooding).

39. The Project will be carefully managed and monitored by the RD and consultations will be undertaken with IFIs, donors, and implementing units on other projects that are identified as likely to contribute to cumulative impacts so as to reduce uncertainty and, where necessary, take action to minimize environmental harm.

Residual Impacts

40. GHG emissions. Residual impacts from the generation of GHGs will remain throughout the lifecycle of the Project. This is deemed to be an unavoidable and acceptable impact for the Project as the economic and social benefits are considerable. As mentioned, the overall contribution of this Project to global GHG emissions is considered negligible.

41. Water quality. Water from bridge will be collected and retained prior to discharge. If not maintained appropriately by the Road Maintenance Contractor, residual impacts will occur during the operational phase if polluted road water run-off drains directly into the Rioni River. It is noted that collection and treatment of water from road runoff should also be considered for the road drainage network in general.

42. Habitat. The clearing of natural habitat and modified habitat will have impacts to biodiversity in the area, including direct loses where the new road lies. The restoration and re-planting programs should go a long way to mitigating these impacts, but in some locations, such as river banks, residual impacts may remain. It will take a number of years for the habitat to be restored and for re-planted areas to develop into something similar to the habitats they are replacing. Overall the residual impact is low however considering the existing condition of the Project site.

43. Land use. No residual impacts are anticipated if the LARP is implemented correctly. However, there will still be disruption to the local community during the LARP implementation process. A grievance redress mechanism (GRM) has been prepared to manage complaints received during this process.

44. Noise. Despite the fact that comprehensive mitigation measures have been set to manage construction noise, there may still be instances where construction works result in unanticipated elevated noise levels and vibration. However, these will only be temporary and localized. Good oversight from the Contractor's Health, Safety and Environment (HSE) team and the Engineer's environmental manager should limit the impact of these types of incidents. Additional measures in the operation phase may be required if actual noise levels exceed limits or if complaints from residents are received.

45. Critical Habitat-qualifying biodiversity. In only a few cases are impacts on priority biodiversity expected to remain greater than negligible by the Project operations phase, for plants and sturgeon (Stellate, Russian and Beluga Sturgeon). In neither case are such impacts anywhere near the level that could impair the ability of the Critical Habitat to function. There remains a risk that the Project may facilitate illegal fishing, and thus result in reductions in the population of Critically Endangered sturgeon. These impacts are not predicted likely to impact on these species' ability to persist.

46. Based on analysis from the BAP (See BAP, Section **5.2 - Residual impacts**), there is anticipated to be a limited residual impact on the two priority plant species (Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus*) remaining into the operations phase. Plants will suffer some mortality if translocated during the pre-construction phase and other will be

lost under the Project footprint (to be confirmed during pre-construction walkover surveys), but this is predicted to be minimal (particularly within the context of available habitat nearby). Moreover, these two plants should be able to re-establish in temporarily disturbed areas after the construction period. As such, long-term residual impacts on the priority plants are considered negligible (non-measurable).

47. Restricting in-river construction and disturbance to periods outside of the sturgeon spawning season will dramatically reduce the potential for displacement and mortality impacts on the three priority sturgeon species (i.e., Stellate Sturgeon, Russian Sturgeon, and Beluga Sturgeon). Nonetheless, all three species are believed to still use the river in lower numbers outside of the spawning season. There is thus still (lower) potential for disturbance and mortality impacts on sturgeon during construction. These have the potential to negatively affect spawning or juvenile dispersal. The breeding populations of these species are now so limited that any such effects could have impacts on the sturgeon populations that last into the operational phase, though likely not at such a scale that they would last into the long-term. Such medium-term impacts are, nonetheless, of concern for species in such a perilous overall condition as these sturgeon. Overall, on a precautionary basis, significant, Low-level, residual impacts on Stellate, Russian, and Beluga Sturgeon may thus be anticipated from this Project (See BAP, Section **5.2 - Residual impacts)**.

7. Implementation

48. The EMP, its mitigation and monitoring programs, contained herewith will be included within the Project Bidding documents for Project works. This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs.

49. The Bid documents state that the Contractor will be responsible for the implementation of the requirements of the EMP through his own Specific Environmental Management Plan (SEMP) which will adopt all of the conditions of the EMP and add site specific elements that are not currently known, such as the Contractors construction camp locations.

50. The SEMP will also include the following thematic management plans:

- Waste Management Plan
  - Wastewater Management Plan
  - Spoil Disposal Management Plan
- Soil Erosion Management Plan
- Traffic Management Plan
- Method Statement for Temporary Roads
- Aggregate and Borrow Pits Management Plan
- Employment and Procurement Procedure
- Occupational and Community Health and Safety Management Plan
- Emergency Response Plan
- Waterway Safety Plan
- Method Statement for River Crossings
- Air Quality Plan
- Spill Management Plan
- Clearance, Revegetation, and Restoration Management Plan
- Noise Management Plan
- Biodiversity Management Plan
- Laydown Area and Construction Camp Management Plan

- Asphalt, Rock Crushing, and Concrete Batching Plant Management Plans
- Bridge Construction Plan
- Chance Finds Procedure (included in **Annex 6. Chance Find Procedure**)

51. Direction and guidance on what the above-mentioned thematic management plans should cover is provided in **Annex 7. Thematic Management Plans**.

52. The EMP and all its requirements will then be added to the Contractor's contract, thereby making implementation of the EMP a legal requirement according to the Contract. He will then prepare his SEMP which will be approved and monitored by the Engineer. Should the Engineer note any non-conformance with the SEMP (and the EMP) the Contractor can be held liable for breach of the contractual obligations of the EMP. To ensure compliance with the SEMP the Contractor should employ an Environmental Officer (EO) to monitor and report Project activities throughout the construction phase.

53. The GRM prepared as part of the Project provides a structure for stakeholders to make complaints and a mechanism for the complaints to be resolved both locally and centrally (see Chapter **H. Grievance Redress Mechanism**).

8. Recommendations and Conclusions

54. Recommendations. The ADB Safeguard Policy Statement requires *'measures to avoid, minimize, or mitigate potentially adverse impacts and risks'*. Nonetheless, some residual impacts cannot be fully mitigated, and – on a precautionary basis – it is recognized that this Project may have significant, though Low-level, residual impacts on Stellate, Russian and Beluga Sturgeon. In such cases, ADB requires *'compensatory measures, such as biodiversity offsets, to achieve no net loss or a net gain of the affected biodiversity'*. These compensatory measures should ensure that, overall, the high biodiversity value of the Critical Habitat is maintained, along with populations of Endangered and Critically Endangered species.

55. Two main approaches are assessed as potentially suitable compensation measures for this Project's residual impacts on sturgeon species: (i) support to a high standard mixed-method monitoring system; and (ii) support to a cumulative impacts working group to improve hydropower management upstream and reduce sand/gravel quarrying in the Rioni River. In both cases, funding would need to be allocated to non-governmental or research institution partners to implement these approaches. Refer to the BAP in **Annex 1. Biodiversity Action Plan (BAP)** for further analysis on this recommended no net loss / net gain approach. It is recommended that sufficient financing be provided to establish a high standard sturgeon monitoring program at a minimum as a suitable compensation action for this Project.

56. Conclusions. Based on the analysis of information and feedback received from various stakeholders, this EIA concludes that potential significant physical, biological, or socio-economic environment impacts from the Poti-Grigoleti Road Section (Lot 2, Stage 1) Project can be addressed and it is unlikely that there will be any significant environmental impacts remaining after planned mitigation and offset measures. The project will have short term impacts during construction which can be mitigated to an acceptable level through measures which seek to reduce the potential for harm to the environment and human health.

57. Provided that all general and specific mitigation and compensatory measures are implemented, the Project is predicted to reach no net loss or net gain for all Critical Habitat-qualifying biodiversity. Only a few impacts on priority biodiversity are expected to remain measurable by the Project operations phase, for plants and sturgeon. In neither case are such impacts anywhere near the level that could impair the ability of the Critical Habitat to function.

58. There remains a risk that the Project may impact sturgeon during in-river construction, and that the bridge may facilitate illegal fishing into the long term. Either of these may result in reductions in the populations of three Critically Endangered sturgeon species, though are not likely to impact these species' ability to persist. The Project is thus planning to make a positive contribution to sturgeon conservation that will compensate for these risks of residual impacts in order to align with ADB safeguard requirements for projects in areas of Critical Habitat (ADB 2009), by achieving at least no net loss for these fish species.

59. Moreover, the stakeholder and community consultation during the development of the EIA demonstrated that the Project has local support as it will result in significant benefits in terms of accessibility to services, improved connectivity between communities, and importantly the economic development prospects of the area will be increased.

A. Introduction

A.1 - Overview

60. The Government of Georgia (GoG) is conducting a program to upgrade the major roads of the country, managed by the Roads Department (RD) of the Ministry of Regional Development and Infrastructure (MRDI). The program aims to improve transportation and transit of goods to surrounding countries, which is a significant and growing contributor to GDP. Transport of goods into and through Georgia has increased over the past 10-15 years as markets have expanded following the breakup of the Soviet Union, and Georgia is now a major transit country.

61. More than 30 million tons of cargo and 380 million passengers[15] are transported by road in Georgia over the country's 21,301 km road network.[16] Many of the roads are however poorly equipped to cope with the volume of traffic. The proportion of heavy vehicles, and factors such as insufficient dual carriageways, routing through inhabited areas, and inadequate maintenance and repair, hinder throughputs and increase transit times. This creates difficulties for haulage companies and their clients, truck drivers, Georgian motorists, and local residents.

62. Upgrading transportation infrastructure and the road network in particular, including major roads such as the E-60 and E-70, has been made a priority by the GoG as outlined in the Social-economic Development Strategy of Georgia document "Georgia 2020". International Financial Institutions (IFI's) including the Asian Development Bank (ADB), European Investment Bank (EIB), World Bank, and Japan International Cooperation Agency (JICA) have already provided a series of loans to the GoG for construction/rehabilitation of the road infrastructure. Georgia also joined the Central Asia Regional Economic Cooperation (CAREC) program in October 2016 and the East-West road corridor in Georgia is an integral part of one of the six key CAREC corridors (Corridor 2) providing the shortest transit link to connect Central Asia with Europe and East Asia.

63. As a part of the GoG's effort to strengthen and improve the wider road network, financial support is being sought from the EIB and the ADB for road construction of the Poti-Grigoleti-Kobuleti bypass, which is comprised of two sections: i) Grigoleti-Kobuleti bypass (Lot 1); and ii) Poti-Grigoleti road (Lot 2).

64. For design purposes alignment for the Poti-Grigoleti road section (Lot 2) has been divided into three stages:

- Stage 1: From the beginning of E-60 to Rioni River
- Stage 2: From Rioni River to Maltakva River
- Stage 3: From Maltakva River to Connection with the Grigoleti-Kobulety bypass (Lot 1)

65. Financing from the ADB is being sought to provide financial support for construction of 2.5km of the Poti-Grigoleti road section (Lot 2, Stage 1) which includes a bridge over the Rioni River. The EIA analysis will be limited to this section only, herein referred to as the "Project".

[15] General Overview of the Transport Sector presentation. Ministry of Economy and Sustainable Development of Georgia, Transport and Logistics Development Policy Department. May 2017, Tbilisi.
[16] Georgian Economic Outlook. Ministry of Economic Development of Georgia, 2009

66. The Project is consistent with the ADB's Country Partnership Strategy (CPS), 2019-2023 for Georgia which identifies the development of an efficient, sustainable transport network as a strategic objective and operational priority in line with making the country an international gateway and to promote inclusive growth.

A.2 - Purpose and Scope of the EIA Report

67. Construction of international and interstate highway and bridges belongs to the list of activities subject to the state ecological examination (ref. law of Georgia on Environmental Impact Permit[17]). The project under consideration belongs to this category and therefore requires assessment of impact on environment. Environmental impact assessment (EIA) and social impact assessment is also required according to the ADB's Safeguard Policy Statement (SPS) (2009), which is classified by significance of potential environmental impacts.

68. This EIA provides a road map to the environmental measures needed to prevent and/or mitigate negative environmental effects associated with the Project. The EIA provides a detailed description of the direct and indirect environmental effects associated with the proposed Project during key periods of work.

69. More specifically, the EIA:

a) describes the existing socio-environmental conditions within the Project area;
b) describes the project design, construction activities and operational parameters;
c) describes the extent, duration, and severity of potential impacts;
d) analyzes all significant impacts;
e) ensures that affected communities are appropriately engaged on issues that could potentially affect them;
f) analyses project alternatives; and
g) formulates the mitigation actions and presents it all in the form of an Environmental Management Plan (EMP).

70. The EIA covers the proposed construction of 2.5 km of the Poti-Grigoleti road section (Lot 2, Stage 1) including a bridge over the Rioni River and other associated components such as transition structures (road viaduct), bridge end facilities (construction yards and potentially workers camp), and bridge storm water and spill management systems.

A.3 - Category of the Project

71. According to the ADB's SPS, projects are classified by significance of potential environmental impacts. A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence. Each proposed project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. Projects are assigned to one of the four categories (Category A, B, C, FI):

- **Category A –** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
- **Category B** – A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These

[17] https://matsne.gov.ge/en/document/view/20206?publication=16

impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.

- **Category C –** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
- **Category FI** – A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI.

72. The triggering of a Critical Habitat designation, due to the presence of sturgeon, meant that additional analysis was necessary and elevated the category of the Project from a Category B to a Category A.

A.4 - Methodology and Defined Spatial Unit of Analysis Adopted for the EIA

A.4.1 - Feasibility Studies, Detailed Design, and National EIA

73. A consortium represented by Getinsa-Payma-Eurostudios (herein referred to as the "Consortium") was engaged by the MRDI in 2016 for preparation of the feasibility studies; development of detailed design; preparation of bidding document; and environmental protection and resettlement documents, for the entire Poti-Grigoleti Road project.

74. Georgian environmental consultancy company Gamma Consulting Ltd (herein referred to as "Gamma") was hired by the Consortium to manage environmental and social (including resettlement) components. The tasks of Gamma under the contract included (i) preliminary impact assessment of the project alternatives, (ii) development of a Resettlement Framework at feasibility study stage; and (iii) preparation of a national EIA and a Resettlement Action Plan (RAP) at detailed design stage.

75. Activities implemented by the Consortium EIA team included desktop studies and field works for verification of available reference/literary data and additional data gathering, followed with analysis of information. Modelling was also completed to predict future air quality, noise levels, and greenhouse gas (GHG) emissions with the future projected traffic.

76. Field surveys involved sampling and analysis of soil and surface water quality, measurements of background noise and radiation, faunistic and flora surveys, socio-economic data gathering.

77. The GoG EIA received national government approval in 2018. The EIA has been disclosed and is available on the Roads Department of Georgia website.[18]

A.4.2 - Methodology of ADB EIA Analysis

78. This ADB EIA was developed by an international team of environment and biodiversity specialists[19] through a review of existing Project documentation, other existing grey and published literature, and consultations with government and non-government stakeholders within and outside Georgia (Section **G.5 - Stakeholder Engagement Activities**). Additional field visits were undertaken in November 2018.

[18] http://www.georoad.ge/?lang=eng&act=project&uid=1512467340
[19] Mr. Raymond Von Culin, Environment Specialist
Dr. John Pilgrim - Biodiversity Specialist

79. The EIA has been carried out in accordance with the requirements of the ADB's SPS. The study methodology has been adopted in such a manner to ensure that environmental concerns are given adequate weight in the selection of alignment and design of the bridge and approach roads.

80. Process of EIA preparation consisted of six main activities:

1) Collection of baseline data describing the existing environment impact (physical, biological, and anthropogenic aspects) within the area of the proposed Project; desk studies and field surveys conducted to address important gaps in the existing data, update of information on topics and areas where significant negative impacts are expected
2) Identification of impacts, assessment of their significance, and development of impact avoidance, reduction and/or mitigation measures (avoidance of impacts is preferred over mitigation by both - ADB safeguards and existing Georgian regulations and norms)
3) Analysis of alternatives in terms of location, technology, design, and operation, including the 'No Action' alternative.
4) Development of EMP
5) Stakeholder consultation and disclosure
6) Drafting of the EIA report

81. Additional noise and vibration studies have been developed for the Project in line with national legislation and in accordance with the limits provided in the IFC's EHS Guidelines for noise. Findings and analysis from the noise and vibration study have been incorporated into this EIA as appropriate.

82. A Resettlement Action Plan (RAP) for this Project was prepared by the Consortium (Gamma Consulting) under the EIB financing. Further development of the Project under the ADB financing required review of the original RAP and its update in ADB format compliant with SPS 2009. A Land Acquisition and Resettlement Plan (LARP) consistent with ADB standards has been prepared by RD under the assistance of the international social safeguards (resettlement) specialist.[20] Findings and analysis from the LARP have been incorporated through this EIA as appropriate.

83. The information collected through the methods described above was analyzed to help identify key Project impacts and provide recommendations for avoiding, minimizing, mitigating impacts, and providing compensatory measures. Recommendations have also been made to enhance the local environmental conditions with the intention of having no net loss of biodiversity due to the project and maintaining the environmental conditions in line with the baseline or improving the environmental conditions in comparison to baseline conditions.

A.4.3 - Defined Spatial Unit of Analysis

84. Identification of impacts and assessment of their significance has been carried out throughout the area of influence of the Project and its component activities. In this case, the EIA has aligned the areas of assessment, referred to as 'discrete management units' (DMU's), with those defined by the BAP (see Annex **1. Biodiversity Action Plan (BAP)** Section **A.1 - Discrete management units**). Since most of the species of concern in this area are freshwater fish and waterbirds, impacts on such species are only likely to occur in the vicinity of the project or just downstream (certainly not upstream of the existing tidal gates), and are

[20] Mr. Medgar Tchelidze, Social Safeguards (Resettlement) Specialist

unlikely to extend into nearshore marine areas. Terrestrial impacts may occur up to 40 km from the Project, through sand and gravel quarrying (**C.8.1 - Borrow Material**). Without further clarity on the location of suitable sand and gravel extraction sites for the Project, which may occur on land or in rivers, it is challenging to define appropriate DMUs however. As such, two DMUs were defined. First, an aquatic DMU was defined that extends from the west end of the Rioni River estuary upstream to 40 km beyond the Project site. Second, an arbitrary terrestrial DMU was defined as a buffer of 40 km around the Project. In both cases, the arbitrary 40 km buffer was chosen to encompass all potential impact sites from sand and gravel quarrying. These two discrete management units are outlined in the BAP (**Annex 1. Biodiversity Action Plan (BAP)** on Figure 1 (and Figure 3 and Figure 5).

85. Identification of these 'discrete management units' does not mean that the Project has management obligations across them. Rather, the aim of this EIA is to identify which impacts within the defined spatial boundaries are likely to occur while considering the physical extent of the planned activities, the baseline status of recipient environment, and the ability of impact to propagate beyond the project boundary.

A.5 - Structure of the Report

86. This EIA report has been presented as per requirements of the ADB's SPS. The report is organized into the following 11 Chapters:

- **Chapter A. Introduction –** This section describes the background information about the project and EIA study.
- **Chapter B. Policy, Legal, and Administrative Framework –** This section summarizing the national and local legal and institutional frameworks that guided the conduct of the assessment.
- **Chapter C. Description of the Project –** This section presents the key features and components of the proposed project.
- **Chapter D. Alternatives Analysis –** This section examines alternatives to the proposed project site, technology, design, and operation.
- **Chapter E. Description of the Environment –** This section discussing the relevant physical, biological, and socioeconomic features that may be affected by the proposed project.
- **Chapter F. Anticipated Impacts and Mitigation Measures –** This section details the impact assessment methodology used for this EIA and presents the environmental assessment of likely positive and adverse impacts attributed to the proposed project and concomitant mitigation measures.
- **Chapter G. Public Consultations and Information Disclosure –** This section describes the consultation process undertaken during the environmental examination and its results, their consideration in the project design, and manner of compliance to the ADB's Public Communications Policy and related national laws.
- **Chapter H. Grievance Redress Mechanism –** This section describes the formal and informal redress procedures for registering, resolving, and reporting complaints.
- **Chapter I. Environmental Management Plan and Institutional Requirements –** This section takes the impacts and mitigation measures identified in previous sections and translates them into action plans to avoid, reduce, mitigate, or compensate adverse impacts and reinforces beneficial impacts.
- **Chapter J. Cost Estimate of Environmental Mitigation Measures–** This section provides an approximate cost estimate for environmental mitigation measures.
- **Chapter K. Conclusions and Recommendations –** This section highlights key findings and recommendations to be implemented by the borrower.

B. Policy, Legal, and Administrative Framework

B.1 - Overview

87. The EIA will be carried out in compliance with Georgian legislation and environmental standards, the environmental and social safeguard policies of International Financial Institutions (IFI's), as well as Core Labour standards (CLS) outlined in the International Labor Organization (ILO) Declaration on Fundamental Principles and Rights at Work, and the relevant national labor laws.

88. During planning and development of the EIA a range of documents were considered. The list, inter alia, includes:

- International Conventions and Directives (environment, social);
- Environmental and social safeguards of International Financial Institutions, such as:
    - ADB Safeguard Policy Statement, 2009;
    - ADB Environmental Safeguards – A Good Practice Sourcebook (Draft Working Document), 2012;
    - World Bank Environmental and Social Safeguard Policies, 2013;
    - European Bank for Reconstruction and Development (EBRD) Environmental and Social Policy, 2014;
    - IFC Environmental and Social Performance Standards, 2012;
    - General EHS Guidelines document (IFC, WB group, April 30, 2007);
- Recommendations given in the WB technical paper No. 376 "Roads and the Environment. A Handbook" (1997);
- Georgia's Third National Communication to the UN Framework Convention on Climate Change.

89. Technical design of the planned highway is being developed in compliance with the Trans-European Motorway (TEM) standards and Georgia technical standards and regulations relevant to the project.

90. According to Georgian law, the project is subject to environmental regulation and requires an environmental impact permit in order to begin planned development activities. Environment permits for the project have been received in 2018, with conditions, from the Georgian Authorities for the project.

91. According to the ADB's SPS, the project is a Category A which requires a full-scale Environmental Impact Assessment (EIA) and development of the environmental management and monitoring plans is required.

B.2 - Environmental Legislation of Georgia

92. Environmental legislation of Georgia comprises the Constitution, environmental laws, international agreements, by-laws, presidential 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.

93. MoEPA is responsible for regulating the activities that affect the natural environment.

94. A table below presents a list of Georgia's environmental legislation as it pertains to the proposed project.

Table 2. List of Environmental Laws and Regulations Relevant to the Project

Year	Law / Regulation	Last Revision	Code
1994	Law on soil protection	07/12/2017	370.010.000.05.001.000.080
1995	Constitution of Georgia	13/10/2017	010.010.000.01.001.000.116
1996	Law on subsoil	07/12/2017	380.000.000.05.001.000.140
1996	Law on environmental protection	07/12/2017	360.000.000.05.001.000.184
1996	On the system of protected areas	07/12/2017	360.050.000.05.001.000.127
1997	Law on wildlife	07/12.2017	410.000.000.05.001.000.186
1997	Law on water	07/12/2017	400.000.000.05.001.000.253
1998	Law of Georgia on Creation and Management of Kolkheti Protected Areas	13/05/2014	360.050.000.05.001.017.418
1999	Law on protection of atmospheric air	07/12.2017	420.000.000.05.001.000.595
1999	Forestry code of Georgia	07/12/2017	390.000.000.05.001.000.599
1999	Law on compensation of damage from hazardous substances	07/12/2017	040.160.050.05.001.000.671
2000	Law on regulation and engineering protection of the sea and river banks	05/05/2011	400.010.010.05.001.000.830
2003	Law on Red List and Red Book of Georgia	07/12/2017	360.060.000.05.001.001.297
2005	Law on licenses and permits	23/12/2017	300.310.000.05.001.001.914
2003	Law of Georgia on conservation of soil and restoration-amelioration of soil fertility	07/12/2017	370.010.000.05.001.001.274
2014	Waste code	07/12/2017	360160000.05.001.017608
2017	Environmental Assessment Code	07/12/2017	360160000.05.001.018492

95. Brief summaries of the listed documents are given below:

96. **Constitution of Georgia** states the basic rights of people to live in a healthy environment and obligation to protect it. According to constitution everyone has the right to obtain complete, objective, and timely information about environmental conditions (Article 37 Part 3). It assures that the state shall protect the environment and foster sustainable development (Article 37 Part 4). It establishes a legal framework that guarantees public access to information about the condition of the environment (Article 37 Part 5, Article 41 Part 1).

97. **Environmental Assessment Code (EAC)**. The Code establishes a legal basis for regulating issues related to projects and strategic documents, and which implementation may have significant impact on the environment, human life, and health. It regulates the following: (i) procedures related to environmental impact assessment, strategic environmental assessment, public participation in decision-making, trans boundary environmental impact assessment; (ii) defines rights and obligations of the developer, the planning authority, the public and the competent authorities in the course of decision-making envisaged by this Code; (iii) describes procedures of issuing Environmental Decision; and (iv) exemption rules. The law includes two annexes. Annex I of the Code lists activities subject to EIA and Annex II lists activities/projects that require screening procedure. The responsibility for screening falls on the Ministry of Environment Protection and Agriculture. Under the EAC, construction of international and interstate roads as well as construction and operation of tunnels and/or bridges on the international and interstate roads falls under activities subject to EIA. According to the document, the main stages of environmental impact assessment include:

- screening;
- scoping procedure;

- preparation of the EIA Report by the developer or the consultant;
- ensuring public participation;
- examination of the information presented in the EIA Report and any supplementary information provided by the developer to the Ministry as well as assessment of the information received through the public participation and consultation processes;
- expertise procedure;
- implementation of transboundary environmental impact assessment procedure (weather appropriate); and
- issuance of Environmental Decision or the decision on refusal to implement the project by the Minister.

98. **Law on Licenses and Permits** regulates legally organized activities posing certain threats to human life/health, and addresses specific state/public interests, including usage of resources, regulates activities requiring licenses/permits, determines types of licenses/permits required, and defines the procedures for issuing, revising, and cancelling of licenses and permits. The law is generic and refers to the Environmental Assessment Code for details of environmental permitting (Environmental Decision) procedures.

99. **Law on Environmental Protection** regulates the legal relationship between the bodies of the state authority and the physical persons or legal entities (without distinction-legal form) in the field of environmental protection and in the use of nature on all Georgia's territory including its territorial waters, airspace, continental shelf, and special economic zone. The law defines the principles and norms of legal relations, rights and obligations and responsibilities, awareness raising, education and scientific research in the field of environment, and the key players and principles of environmental management. It also describes economical mechanisms and levers; ecological insurance; basics of environmental audit; environmental requirements during privatization; justifies needs of environmental standards and limits (air, water, soil, noise, vibration, fields, radiation) and ecological requirements for production, transportation and storage of goods and food products; ecological requirements applicable to waste; states necessity of environmental impact assessment and related issues (strategic environmental protection and transboundary environment assessment) referring to Environmental Assessment Code; defines general principles of environmental protection; considers different aspects on protection of ecosystems, protected areas, issues of global and regional management, protection of ozone layer, biodiversity, protection of Black Sea and international cooperation aspects. As stated in the law, in order to protect the climate against the global changes, the subject of the business activity is obliged to observe the limits to green-house gas emissions as well as to take measures for mitigating this emission. The emission of the green-house gases is regulated on the basis of integrated control of pollution of environment (Article 51). Besides, the subject of the business activity is obliged to reduce or stop production and use of such chemicals, which are likely to have effects on the ozone, layer of the earth and cause depletion of it (Article 52).

100. The status of natural resources and the study and usage of mineral resources is regulated by the **Law of Georgia on Subsoil**. The law describes rights and obligations of the users (Including re-cultivation after expiration of the license term), duration of the licenses (for energy resources – up to 45 years; for metal ores – up to 40 years; up to 30 years for construction materials and other non-ore mineral resources; groundwater and gas (except for the natural gas) – up to 25 years); protection of natural resources and safety requirements; termination of license; state supervision and control over the use of mineral resources; general requirements during mining. With regards to the issues related to the licenses for use of the natural resources the law gives reference to the law on Licenses and Permits, Law on Oil and Gas and related regulations. The law states the need for protection of environment and OHS during operation (mining), including requirements for waste (including waste water)

management. According to the law extraction and treatment of mineral resources from deposits both of natural and technogenic origin (soil disposal areas) are subject to state supervision and control.

101. The **Waste Management Code** (2015) provides the legal conditions for implementation of measures aiming at prevention of generation of waste and increased re-use, environmentally-sound treatment of waste (including recycling and extraction of secondary raw materials, energy recovery from waste, as well as safe disposal). The following summarizes the key points of the code.

Article 7 - General waste management requirements

- Waste, depending on its type, properties, and composition, shall be collected, transported, and treated in a manner not impeding its further recovery.
- Waste shall be collected, transported, and treated in a manner which excludes, to the maximum extent possible, pollution of the environment and risks for human health.
- In case of waste pollution caused by waste transport activities, the waste transporter shall be responsible for taking clean up measures.
- The producer and holder of waste is obliged to treat their waste
- on their own or hand it over for collection, transport and treatment to persons entitled to carry out such operations in accordance with this Law and legislation of Georgia.
- Where waste has been submitted for recovery or disposal, the original producer's and/or holder's responsibility shall remain until recovery or disposal is completed.
- Persons who collect and transport waste shall hand it over for treatment to appropriate facilities, holding the relevant permit or registration.
- The burning of waste outside permitted incinerators shall be prohibited.

Article 14 - Company waste management plan

- Legal and natural persons that produce more than 200 tons of non-hazardous waste or 1,000 tons of inert waste or any amount of hazardous waste annually, shall prepare a company waste management plan.

Article 15 – Environmental Manager

- The persons under Article 15 of this Law shall nominate a suitable person as a company environmental manager.

Article 17 - General obligations for hazardous waste management

- The production, collection, and transportation of hazardous waste, as well as its storage and treatment, shall be carried out in conditions providing protection for the environment and human health. It shall be prohibited to

  a) discard hazardous waste outside waste collection containers;
  b) discharge it into the sewerage systems or underground or surface waters, including the sea;
  c) burn it outside waste incinerators permitted for that purpose; and
  d) treat it outside waste treatment facilities permitted to treat such type of waste.

Article 18 - Special obligations for hazardous waste management

- Waste producers that produce more than two tons of hazardous waste per year shall:

  a) create and implement a suitable separation and collection system for such waste;
  b) designate an environmental manager, pursuant to Article 15 of this Law, responsible to make arrangements for the safe management of said waste; and
  c) make arrangements for briefing and training for staff handling hazardous waste.

- Until the exact content of waste is unknown, the waste shall be regarded as hazardous.
- Hazardous waste for which no appropriate treatment techniques and/or technologies are available in accordance with the requirements of this Law within the territory of Georgia shall be exported for treatment. Until the export is carried out, the waste shall be safely stored at temporary storage facilities.
- The Ministry may exceptionally once allow for an extended storage period of up to one year if this is justified and does not harm human health or the environment.
- Hazardous waste may only be collected and transported by a natural or legal person after its registration pursuant to this Law.

Article 29 - Obligations for keeping records and reporting on waste

- Records on waste shall be kept and waste reports shall be submitted to the Ministry by natural and legal persons:

  a) dealing professionally with collection, transport and/or treatment of waste; and
  b) which produced more than more than 2 tones non-hazardous (excluding municipal waste) waste or any amount of hazardous waste per year.

102. **Law on Protection of Atmospheric Air.** The law regulates protection of atmospheric air from man-caused impact. Pollution of atmospheric air is emission of hazardous substances originating from activities which are able to have negative impact on human health and environment. Four types of pollution are considered (Part II, Chapter IV, Article II.2): (i) Pollution of environment with hazardous matter; (ii) Radiation pollution of atmospheric air; (iii) Pollution with microorganisms and biologically active matter of microbial origin; and (iv) Noise, vibration, electromagnetic fields, and other physical impact. Maximum permitted limits for concentration of hazardous substances into the atmospheric air are defined for each contaminant and represent maximum concentration of hazardous pollutants, in averaged time span, recurring action of which has not have negative impact on human health and environment. Maximum permitted levels of emission of hazardous matters into the atmospheric air are defined with allowance of prospective of development of the enterprise, physical. geographical and climatic conditions, dispersion of emitted substances, background concentration of pollutants emitted from other neighboring enterprises, taking into account inter-location of existing or planned dwellings, sanatoria and recreation zones. In compliance with the law (Clause 28), in order to restrict pollution from the stationary sources[21] of hazardous emissions the limits of emissions are to be set. The limit of pollution from the stationary source of emission is permitted quantity (mass) of emitted hazardous matters (Clause 29). Maximum annual emission level means the maximum permitted limit of discharge. This is annual permitted quantity of emission predetermined by technology in conditions of standard permitted capacity of discharge. Annual maximum capacity is defined for each hazardous substance and is calculated so that for each stationary source of emission cumulative emission from all registered sources of discharge does not exceed relevant maximum permitted value. Discharge of hazardous emissions from the stationary sources of emission without approved limits of discharge is forbidden. The standards of emissions (Clause 30) are to be worked out by the enterprise itself. According to the law (Clause 38) the enterprise is responsible for conducting self-monitoring which includes measurement of emission (evaluation), recording/registration and accounting. Emission which has not been recorded in self-monitoring record is considered illegal. As mentioned in the Clause 51 results of the monitoring and information on pollution of the air with hazardous substances is transparent and accessible for the public.

[21] Stationary source of pollution of the atmospheric air is stationary device or construction with a special emission unit. Any stationary device or construction which, proceeded from its technological peculiarities, is not fitted with sputtering device is also considered as a stationary source of emission.

103. **Law on Water** regulates water use, defines rights and obligations of water users; sets out the types of licenses for the use of water; the rules and conditions of their issuance; considers conditions of suspension, withdrawal, and deprivation of license; and regulates water flows. The law states liability of all natural and legal persons to prevent pollution of catchment basins, water reservoirs, snow and ice covers, glaciers, permanent snow cover with industrial, household and other wastes, and emissions which may cause deterioration of the underground water quality; prohibits piling of industrial and household wastes near the public water headwork's and in their sanitation zones; bans construction of facilities and implementation of any other activity which may cause water pollution; and sets requirements for forest use within water protection zones. The state management of water protection and use is exercised through accounting, monitoring, licensing, control, and supervision.

1. State monitoring of water is implemented by the Legal Entity under Public Law - the National Environmental Agency under the MoEPA. By virtue of the law when locating/designing/constructing/commissioning of a new or reconstructed enterprise, or other facility, as well as in introducing of new technological process capable to affect the state of water, rational water use is to be secured. At the same time, attention is to be paid to the measures ensuring due accounting of water abstracted from and returned to water bodies; protection of water from contamination, pollution-and depletion; avoidance of the unfavorable water impact; restriction of land flooding up to minimum necessary level; protection of land from silting, swamping, or drying up; and environmental protection and landscape preservation.

2. Under the law, purification of the waste water discharged in a water body is required up to the fixed standard. In order to protect the quality of water resources, the law requests creation of sanitary protection zone that consists of three belts, each having a special regime. The procedure fixing the water quality standards, the maximum permissible rates of emission of harmful substances (including microorganisms) into ambience, the water abstraction quotas, and the temporary rates (limits) of emission of harmful substances (including microorganisms) into water is defined by the Law of Georgia on the Environmental Protection.

3. Georgian legislation may provide liability for other violations of law in the water protection and use sphere. Water users shall compensate for damages caused by violation of the law on Water in the amount and under procedure established by legislation of Georgia. Under Article 17 (Protection of natural resources of the Black Sea), anadromous fish species (fish species seasonally migrating upstream of a river against the current) within the rivers of Georgia shall be protected by creation of conditions necessary for their reproduction, through conservation of the habitat, determination of procedures for regulating the fishing industry, determination of a total permissible amount of catching these species within the territorial waters, and within and outside special economic zones of Georgia, also through implementation of other measures defined by the legislation of Georgia. Article 20 (River water protection zone) defines protection zone of a river shall be its adjacent territory, where a special regime is established to protect water resources from pollution, littering, fouling, and depletion. This zone may include its dry bed, adjacent terraces, natural elevated and steep riversides, as well as gullies directly adjacent to riversides. The width of a river water protection zone shall be measured in meters from the edge of a riverbed to both sides under the following procedure:

- 10 meters - in the case of a river up to 25 kilometers long,
- 20 meters - in the case of a river up to 50 kilometers long,
- 30 meters - in the case of a river up to 75 kilometers long,
- 50 meters - in the case of a river over 75 kilometers long.

4. Within this zone, it is prohibited to: (i) construct, expand or reconstruct functioning enterprises, except for cases directly determined by law; (ii) spray, by air atomization, perennial plants, sown crops, and forest lands with toxic chemicals; and (iv) keep, collect or place toxic chemicals and mineral fertilizers, as well as any other wastes as defined in the legislation of Georgia. It is requested that hydraulic structures located within a water protection zone shall be normally equipped with appropriate technical facilities to completely exclude the possibility of river pollution and littering.

104. **Law on Wildlife.** The law regulates wildlife protection and use including hunting and fishing. The main goal of the law is to ensure protection and restoration of wildlife, its habitats, preservation and sustainability of species diversity and genetic resources, creation of conditions for sustainable development, taking into account the interests of present and future generation; legal ensuring of wildlife protection (including in-situ and ex-situ conservation, translocation and reproduction of wildlife) and state-based provision of use of wildlife objects. In addition to this law, Georgian legislation on the wildlife is based on the Constitution of Georgia, Georgia's international agreements and treaties, laws on Environmental Protection and on the System of Protected Areas, law of Georgia on Wildlife and law of Georgia on the "Red List" and "Red Book". It is one of the main goals of the Environmental Protection Law to support the preservation of biodiversity of the country, the preservation of rare, endemic, and endangered species, the protection of the marine environment, and the maintenance of the ecological balance (Art. 3.1 (d)). The Law contains regulations on both wild animals and plants which are threatened by extinction and those which are not. Two main legal acts regulating the issues of species protection in Georgia.

105. **Law on Red List and Red Book** which gives the legal definitions of Red List and Red Book (relevant recommendations and methodological issues) of endangered species of Georgia. The Red List structure was also legally defined, as well as the relevant procedures for including species in the Red List, procedures for revising, and updating of it. The Law also regulates issues related to planning and financial matters connected with the protection, taking of, rehabilitation and conservation of endangered species. The Red List of Georgia was approved by Order of President of Georgia No. 303 (2006), later - by the Resolution of the Georgian Government No. 190, dated 20-Feb-14. The law defines special cases when removal of individuals of the Georgian Red List species from their habitats is allowed. Decisions are made by the Government of Georgia.

106. **Forestry Code** regulates relations and state policy in the area of forestry management, use and protection. The code specifies all activities, which may be carried out in Forestry Fund. It allows only those activities, which are related to forest resource protection or use such as timber logging, collection of non-timber resources, use of area for agriculture or recreation, establishment of hunting farms, etc. State forestry fund may be used for a special purpose in urgent cases. Decisions are made by the Government of Georgia.

107. **Law on Soil Protection.** The law provides the policy requirements and principles of the protection and preservation of fertility soil resources against negative impacts. Soil protection is the state problem since correct and rational use of all types of soil, including barren soil, saline soils, swamped soil, alkali soil, and aqueous soil are the main reserve of dynamic development of agriculture and of the national economy as a whole. The purpose of the present Law is to establish the rights and the duties of landholders, landowners, and the state in the field of soil protect. The law defines soil protection measures and methods and prohibits certain activities, e.g. use of fertile soil for non-agricultural purposes; implementation of non-agricultural activity without topsoil removal and conservation; any activity, which results in deterioration of soil properties, etc. In addition to this law soil protection issues are regulated by order #2-277 (25.11.2005) of the Minister of Agriculture on approving Recommendations for Complex Measures for Soil Protection from the Erosion.

108. **Law of on Conservation of Soil and Restoration-Amelioration of Soil Fertility** is to ensure conservation and improvement of soil in the territory of Georgia, define the legal principles, measures, limitations, and prohibitions to that end; and soil conservation and fertility restoration improvement measures. It prohibits unregulated grazing, removal of windbreaks, application of non-registered fertilizers or other substances, soil contamination and any activity, which results in deterioration of soil properties and facilitates desertification, swamping, salinization, etc. Businesses that use soil or conduct activities upon soil that have the potential to negatively impact soil conservation are required to follow the Law and related normative documents and regulations, including Order #113 (27.05.2005) of the Minister of Environment and Natural Resources' Protection on affirming regulation on "Removal, Storage, Use and Re-cultivation of the Fertile Soil Layer" as well as the Resolution of the GoG #424 (31.12.2013) on affirming technical regulations on "Removal, Storage, Use and Re-cultivation of the Fertile Soil Layer". These documents consider issues of land resources protection and rational use and issues related to removal, storage, use and re-cultivation of the fertile soil layer during different activates. According to the regulation, restoration of degraded soil fertility must be implemented using re-cultivation (technical and biological) methods.

109. **Law on System of Protected Areas**. Forms a legal basis for planning, establishment and maintenance and assignment of categories of protected areas, described funding issues for each category. It specifies ownership forms of land and other natural resources in protected areas, allowed and prohibited activities.

110. **Law on Regulation and Engineering Protection of Seacoast and Riverbanks of Georgia** provides general principles and requirements for protection of coastal areas and riverbanks from negative environmental impacts.

111. **Law on Compensation for Damage Caused by Hazardous Substances** Includes principles and procedures for compensating the negative impacts caused by discharge of hazardous substances into environment.

112. Laws and regulations related to social aspects and land ownership applicable to the project are presented in Table 3)

Table 3. List of social and land ownership related laws relevant to the project

Year	Law / Regulation	Last revision	Code
1996	Law on agricultural land ownership	16/06/2017	370.030.000.05.001.000.132
1997	Civil code of Georgia	23/12/2017	040.000.000.05.001.000.223
1997	Law on compensation of land substitute costs and damages due to allocating agricultural land for non-agricultural purposes	25/12/2014	370.020.000.05.001.000.244
1999	Law on rules for expropriation of property for public needs	06/09/2013	020.060.040.05.001.000.670
2007	Law on cultural heritage	07/12/2017	450.030.000.05.001.002.815
2007	Law on public health	07/12/2017	470.000.000.05.001.002.920
2010	Law on state property	07/12/2017	040.110.030.05.01.004.174
2010	Labour Code	04/05/2017	270000000.04.001.016012
2018	Law of Georgia on Labor Safety	22/12/2018	270000000.05.001.018780

113. Brief summaries of the listed documents are given below:

114. **Law on Agricultural Land Ownership.** Objective of the law is to ensure improvement of the structure of agricultural land based on rational use of resources, avoidance of splitting and unsustainable use of the land plots. The law defined the rules for acquisition and selling the land, participation of the state in agricultural land related relations. The law deals with land ownership issues, restrictions of land alienation in case of co-ownership, sets priority of the state in buying out the agricultural land plots.

115. **Civil Code** regulates contractual relations, describes the rights and responsibilities of natural and legal persons, defines the penalties in the case of violations of the requirements set out in the document. The Civil Code differentiates between movable and immovable property and provides rules for acquiring title over property, as well as any proprietary or obligatory rights thereto. This piece of legislation must be taken into account when entering into contracts in Georgia.

116. **Law on Compensation of Land Substitute Costs and Damages due to Allocating Agricultural Land for Non-agricultural Purposes** defines compensation amounts, required at the time of allocation, use or disposal of agricultural land parcel for non-agricultural purpose; the payment procedure and the procedure for changing the agricultural land category, including payment of losses to landowners or land users, as a result of restricting their rights or reducing the quality of their land.

117. **Law on Rules for Expropriation of Property for Public Needs** outlines respective procedures and conditions for expropriation of private property as well as procedures for compensation payment for expropriated property or the transfer of other property with the same market value.

118. **Law on Cultural Heritage** sets out procedures for protection of cultural heritage and permitting arrangements for archaeological investigations.

119. **Law on Public Health** regulates legal relations for ensuring a safe environment for human health. It indicates quality norms of for air, soil and water pollution and restrictions related to ionized radiation, noise, and vibration. The limits must be complied with. Section 7 of the law is dedicated to safety of technological processes.

120. **Law on State Property** regulates relationships on state property management and transfer for use by others, defines special requirements and procedures for transfers. The Ministry of Economy and Sustainable Development is the state authority in charge of the property.

121. **Labour Code** regulates employment relations, unless such relations are otherwise regulated by international treaties that have been implemented in Georgia. Employers are obliged to comply with requirements and clauses of the document for the purpose of ensuring that the rights of employees are protected.

122. **Law of Georgia on Labor Safety** define basic requirements and preventive measures in terms of workplace safety for the employers. The Law applies to jobs considered to be of increased danger, hard, harmful and hazardous. The employer's compliance with the labor safety regulations in Georgia are overseen by the Ministry of Health, Labor and Social Affairs of Georgia through its respective departments.

B.3 - Environmental Regulations and Standards of Georgia

B.3.1 - Air Quality Standards

123. Maximum permissible concentrations (MPC) for air born pollutants are set by the hygienic standards on Maximum Permissible Concentrations of Air Born Pollutants for Settlements (HN 2.1.6. 002-01), see Table 4. This project will also ensure compliance with IFC guideline values (not interim targets) as these values are, in some instances, more stringent than the national standards, the most stringent standards are highlighted in green.

Table 4: Ambient Air Quality Standards

Parameter	Averaging Period	Limit (µg/m^3)		
		Maximum Permissible Concentration (MPC) for Air Quality	IFC Guideline Value	EU Ambient Air Quality Guidelines
Nitrogen Dioxide (NO_2)	30 minutes	200	-	-
	1 Hour	-	200	200
	24 Hours	40	-	-
	1 Year	-	40	40
Sulphur Dioxide (SO_2)	10 minutes	-	500	-
	30 minutes	500	-	-
	1 Hour	-	-	350
	24 Hours	50	20	125
Carbon Monoxide (CO)	30 minutes	5,000	-	-
	24 Hours	3,000	-	-
Total Suspended Particulates (TSP) / Dust	24 Hours	150	-	-
	30 minutes	500	-	-
PM10	1 year		20	40
	24 hours		50	50
PM2.5	1 year		10	25
	24 hours		25	-
Ozone	8-hour daily maximum		100	120

B.3.2 - Surface Water Quality Standards

124. The values of Maximum Admissible Concentrations of the harmful substances in surface are provided in the Environmental Quality Norms approved by the Order #297N (16.08.2001) of the Ministry of Labour, Health and Social Protection (as amended by the Order No 38/n of the same Ministry of 24.02.2003). The admissible level of pollutants in surface water is given in Table 5. All effluents shall comply with the Georgian National Standards. However certain parameters are not specified in the national standards for these IFC Guidelines are being used as shown in the Table.

Table 5: Applicable Standards for Surface Water Quality

Parameter	Maximum Permissible concentration	Source
pH	6.5-8.5	National
Diluted Oxygen, mg/l	4-6	National
BOD5, mg/l	30	IFC
COD, mg/l	125	IFC
Total Nitrogen, N, mg/l	10	IFC
Total Phosphate, mg/l	2	IFC

Chlorides, mg/l	350	National
Oil Products, mg/l	0.3	National
Zinc (Zn^{2+})	1g/kg	National
Lead (Pb total)	23.0	National
Chrome (Cr^{6+})	32.0	National
Cadmium (Cd, total)	6.0	National
Total Suspended Solids, mg/l	50	IFC
Total coliform bacteria	400 MPN* / 100 ml	

*Note: * MPN = Most Probable Number*

125. Quality requirements depend on category of water body (ref. Technical regulations of protection of surface water from pollution, approved by decree #425 of the government of Georgia, 31/12/2013). The categories are: (a) household water use; (b) domestic water use; and (c) fisheries. The latter, in its turn, splits in highest, first and second categories.

Table 6: Water Quality Requirements by Water Use Category

	Water use category			
	Household water use	**Domestic water use**	**Fisheries**	
			Highest and first	**Second**
	Increase not higher that listed below is allowed			
Suspended solids	0.25 mg/l	0.75 mg/l	0.25mg/l	0.75 mg/l
	For rivers with natural content of suspended solids 30mg/l, around 5% increase is allowed			
	If waste water contains suspended particles with deposition rate above 0.2mm/sec discharge in water reservoirs is not allowed. Discharge of effluents containing suspended particles with deposition rate above 0.4mm/sec is prohibited.			
Floating matter	Patches and films of oil, petroleum products, fats must not be detectable			
Colour	Must not be visible in water column		Water must not have unusual colour	
	20 cm	10 cm	-	
Odour, taste	Water must not have odour and taste of higher than 1-unit intensity		Water must not result in unusual odour and taste in fish	
	After chlorination of other treatment	Without treatment	-	
Temperature	After discharge of waste water, temperature in water reservoir must not exceed by more than 5 percent compared to the natural value		For water bodies where cold water lowing fish is found (*Acipenseridae, Coregonidae*) maximum allowable temperatures in summer and winter are 20°C and 5°C respectively, for other water bodies 28°C (in summer), 8°C (in winter)	
pH	Must be in 6.5 - 8.5 interval			
Water mineralisation	<1000mg/l, Incl. chlorides – 350mg/l; sulphates - 500mg/l	To comply with requirement given in section related to taste (see above)	In accordance with taxation	
Dissolved oxygen	Must not be lower than			
	4 mg/l	4 mg/l	6 mg/l	6 mg/l
Biological oxygen demand	At 20°C must not exceed			
	3 mg/l	6 mg/l	3 mg/l	6 mg/l
Chemical oxygen demand	Must not exceed			
	15 mg/l	30 mg/l	-	-
Chemical substances	Must not exceed maximum permissible limits			
Pathogens	Must be free for pathogens, including viable helmint eggs, tenia oncosperes and viable cysts of pathogen organisms			

Toxicity	-	-	At the point of discharge and control section of the river toxic impact must not be observed.

B.3.3 - Groundwater Quality Standards

126. Groundwater quality standards are not set under Georgian law. Drinking water quality standards are commonly used instead as assessment criteria for groundwater. Quality of drinking water is determined by the Technical Regulations for Drinking Water (approved by order №58 of the government of Georgia, (15.01.2014).

Table 7: Drinking Water Quality Criteria

Parameter	Units	Value
Odour	Unit	2
Taste	Unit	2
Colour	Grad	15
Turbidity	Turbidity units (formazine) or mg/l (kaolin)	3.5 or 2
Metals and Miscellaneous		
Boron, B	mg/kg	0.5
Arsenic, As	mg/kg	0.01
Cadmium, Cd	mg/kg	0.003
Copper, Cu	mg/kg	2
Mercury, Hg	mg/kg	0.006
Nickel, Ni	mg/kg	0.07
Lead, Pb	mg/kg	0.01
Selenium, Se	mg/kg	0.01
Zinc, Zn	mg/kg	3
Total Petroleum Hydrocarbons, TPH	mg/kg	0.1
Cyanide	mg/kg	0.07
Sulphate	mg/kg	250
Chloride	mg/kg	250
pH	pH value	6-9
Sodium, Na	mg/kg	200
Microbiological characteristics		
Thermotolerant coliforms	Bacteria in 100cm^3	not allowed
Tota; coliforms	Bacteria in 100cm^3	not allowed
Mesophylic aerobes and facultative anaerobes	Colony forming units in 1cm^3	< 50
Colifagues	Negative colonies in 100m^3	not allowed
Sulphitereducing clostridia	Spores in 20cm^3	not allowed
Lamblias and cysts	Cysts in 50dm	not allowed

B.3.4 - Noise Standards

127. The IFC's EHS Guidelines on Noise Management provides noise level guidelines for daytime and night time which are applicable for the traffic noise but does not offer any guidelines for construction noise and vibration. Because no vibration impact is anticipated from the traffic, there are no specific vibration guidelines for traffic. Admissible noise standards of the IFC and Georgian national standards for residential areas are similar. The national standards for noise are set according to the Technical regulation – Acoustic noise limits for

rooms/premises in residential houses and public establishments (Document #300160070.10.003.020107, Date 15/08/2017) see Table 8.

128. For IFC noise impacts should not exceed the levels presented in Table 9 or result in a maximum increase in background levels of 3 decibels (dB) at the nearest receptor location off site. This project will comply with both IFC Guidelines and Georgian Standards.

Table 8: Georgian Standards for Noise Levels

Purpose/use of area and premises	**Allowable limits (A-Weighted Decibels (dBA))**		
	L_{day}		**23:00 – 08:00 L_{night}, Night**
	08:00 - 19:00, Day	**Evening 19:00-23:00**	
Educational facilities and library halls	35	35	35
Medical facilities/chambers of medical institutions	40	40	40
Living quarters and dormitories	35	30	30
Hospital chambers	35	30	30
Hotel/motel rooms	40	35	35
Trading halls and reception facilities	55	55	55
Restaurant, bar, cafe halls	50	50	50
Theatre/concert halls and sacred premises	30	30	30
Sport halls and pools	55	55	55
Small offices (≤100m^3) – working rooms and premises without office equipment	40	40	40
Small offices (≤100m^3) – working rooms and premises without office equipment	40	40	40
Conference halls /meeting rooms	35	35	35
Areas bordering with houses residential, medical establishments, social service and children facilities (<6 story buildings)	50	45	40
Areas bordering with houses residential, medical establishments, social service, and children facilities (>6 story buildings)	55	50	45
The areas bordering with hotels, trade, service, sport, and public organizations	60	55	50

Note: 1. in case noise generated by indoor or outdoor sources is impulse or tonal, the limit must be 5dB less than indicated in the table.
2. Acoustic noise limits given above are set for routine operation conditions of the 'space', i.e. windows and door are closed (exception – built-in ventilation canals), ventilation, air conditioning, lighting (in case available) are on; functional (baseline) noise (such as music, speech) not considered.

Table 9: IFC Noise Level Guidelines

Receptor	**One-hour L_{aeq} (dBA)**	
	Daytime 07.00-22.00	**Night-time 22.00 – 07.00**
Residential; institutional; educational	55	45
Industrial; commercial	70	70

129. No standardized criteria have been developed by international organizations for assessing construction noise impact. Consequently, criteria must be developed on a project-specific basis unless local ordinances apply. Generally, local noise ordinances are not very useful in evaluating construction noise. They usually relate to nuisance and hours of allowed activity and sometimes specify limits in terms of maximum levels, but they are generally not practical for assessing the impact of a construction project. Project construction noise criteria

should take into account the existing noise environment, the absolute noise levels during construction activities, the duration of the construction, and the adjacent land use.

130. Due to the lack of local construction noise limits, recommended noise limits for the construction activities in the Noise and Vibration Impact Assessment manual of the US Department of Transportation, Federal Railroad Administration (2012) will be used for this project. Table 10 presents recommended noise limits.

Table 10: General Assessment Criteria for Construction noise

Land Use	One-hour L_{eq} (dBA)	
	Day	Night
Residential	90	80
Commercial	100	100
Industrial	100	100

131. For workplace noise the following IFC standards are applicable to the construction workers. It should also be noted that IFC EHS guidelines advise that where existing ambient noise levels already exceed thresholds, the Project should not result in an increase of more than 3dB over existing ambient noise at the nearest receptor location off-site.

Table 11: IFC Work Environment Noise limits

Type of Work, workplace	IFC General EHS Guidelines
Heavy Industry (no demand for oral communication)	85 Equivalent level Laeq,8h
Light industry (decreasing demand for oral communication)	50-65 Equivalent level Laeq,8h

B.3.5 - Vibration Standards

132. The Georgian Standards for vibration are designed for human comfort. These are shown in Table 12. Note that no standards for building damage exist.

Table 12: Georgian General Admissible Vibration Values in Residential Houses, Hospitals and Rest Houses, Sanitary Norms 2001

Average Geometric Frequencies of Octave Zones (Hz)	Allowable Values X0, Y0, Z0			
	Vibro-acceleration		Vibro-speed	
	m/sec^2	VdB	$m/sec\ 10^{-4}$	VdB
2	4.0	72	3.2	76
4	4.5	73	1.8	71
8	5.6	75	1.1	67
16	11.0	81	1.1	67
31.5	22.0	87	1.1	67
63	45.0	93	1.1	67
Corrected and equivalent corrected values and their levels	4.0	72	1.1	67

Note: It is allowable to exceed vibration normative values during daytime by 5 dB during daytime In this table of inconstant vibrations, a correction for the allowable level values is 10dB, while the absolute values are multiplied by 0.32. The allowable levels of vibration for hospitals and rest houses have to be reduced by 3dB.

133. Over the years, numerous vibration criteria and standards have been suggested by researchers, organizations, and governmental agencies. Because IFC does not have specific vibration impact guidance, the California Department of Transportation (Caltrans) Transportation and Construction-Induced Vibration Guidance Manual (Caltrans, 2013) was used as a guideline for this construction vibration study. The manual provides practical guidance for addressing vibration issues associated with construction, operation, and maintenance of roadway projects. Table 13 presents vibration limits that are used for this

project to evaluate the potential for damage and annoyance from vibration-generating activities.

Table 13: Human and Building Response to Transient Vibration

PPV (mm/sec)	Human Response	Effect on Buildings
10 - 15	Unpleasant	Architectural damage and possible minor structural damage
5	Annoying	Threshold at which there is a risk of architectural damage to normal dwelling houses (houses with plastered walls and ceilings)
2.5	Begins to annoy	Virtually no risk of architectural damage to normal buildings
2	Readily perceptible	Recommended upper limit of vibration to which ruins and ancient monuments should be subjected
0.15 – 0.5	Threshold of perception	Vibration unlikely to cause damage of any type

B.3.6 - Fish Impact Thresholds

134. Since 2002 numerous studies have been conducted to determine the impacts of underwater high noise levels on different types of fish and to establish a workable criterion. There are no international standards yet for underwater noise criteria; therefore, criteria recommended by the Fisheries Hydroacoustic Working Group (FHWG 2008) of the US Federal Highway Administration (FHWA) will be used for this project.

135. The recommended $SEL_{CCUMULATED}$ criteria are as follows:

- Non-auditory tissue damage: 183 to 213 dB-$SEL_{CCUMULATED}$ sliding scale corresponding to fish mass between 0.5 and 200 g,
- Auditory tissue damage: 189 to 213 dB-$SEL_{CCUMULATED}$, and
- Temporary threshold shift (TTS): 185 dB-$SEL_{CCUMULATED}$.

136. Exposure to low levels of sound for a relatively long period of time, or exposure to higher levels of sound for shorter periods of time, may result in auditory tissue damage or temporary hearing loss—referred to as a “temporary threshold shift” (TTS). Indirect effects of hearing loss in fish may relate to the fish’s reduced fitness, which may increase the animal’s vulnerability to predators and result in the fish’s inability or reduced success in locating prey, inability to communicate, or inability to sense their physical environment. However, the TTS is not considered to be “injury” because a fish recovers from this effect.

137. The non-auditory tissue damage threshold for a fish with a mass of less than 2 g is recommended to be 183 dB-SEL. Typically the smallest fish likely to be encountered is 2 g; therefore, the 187 dB-SEL threshold for auditory tissue is the lowest threshold that typically should be used for this project. The most stringent peak sound pressure level (SPL) criterion for all hearing generalist fish, for all types of effects, is 206 dB_{PEAK}.

138. In summary, the thresholds for injury (injury thresholds) recommended in simplify to the following two levels:

- 206 dB_{PEAK}, and
- 187 dB-$SEL_{CCUMULATED}$.

B.3.7 - Soil Quality

139. Soil quality is currently assessed by Methodological Guides on Assessment of Level of Chemical Pollution of Soil (MG 2.1.7.004-02). However, these limits will soon be replaced as Georgia harmonizes its regulations with the European Union (EU) and moves away from the outdated standards prepared while part of the Soviet Union. The national standards for soil quality are given in Table 14 along with the limits proposed by MoEPA and the Ministry of Labour, Health and Social Affairs.

Table 14: Soil Screening Values

Compound	Units	Current Limit	Proposed Limit
Metals and Miscellaneous			
Arsenic, As	mg/kg	2	30
Cadmium, Cd	mg/kg	2*	0.5** – 1.0***
Copper, Cu	mg/kg	3-132*	60**-100***
Mercury, Hg	mg/kg	2.1	
Nickel, Ni	mg/kg	4-80*	60**- 80***
Lead, Pb	mg/kg	32-130*	100** - 140***
Zinc, Zn	mg/kg	23-220*	130** - 200***
Total Petroleum Hydrocarbons	mg/kg	1000	-
Cyanide	mg/kg	0,2	-
Volatile Organic Compounds			
Benzene	mg/kg	0.3	0.05
Toluene	mg/kg	0.3	-
Total xylenes	mg/kg	0.3	0.05
Semi Volatile Compounds			
Benzo(a)pyrene	mg/kg	0.02-0.2	0.1
Isopropylbenzene	mg/kg	0.5	-
Pesticides			
Atrazine	mg/kg	0.01-0.5	-
Lindane	mg/kg	0.1	-
DDT (and its metabolite)	mg/kg	0.1	0.075

** Note: Sodium and neutral (clay and clayey) pH >5.5 - No screening value available,*
*** Light Soils, ***Other Soils*

B.4 - National Technical Regulations Applicable to the Project

140. Technical (national) regulations applicable to the road project in Georgia include:

- Law on Roads (310.090.000.05.001.000.089, last amended in 2013);
- Construction norms and regulations 2.05.03-84 - Design of bridges, viaducts, overpasses, and pipes;
- Construction norms and regulations 2.05.02-85 - Motor roads (regulate traffic safety, environmental issues, set forth main technical and traffic operation norms, crossings and intersections, paving aspects, etc.).

141. According to these documents:

- Roads of international and national importance should be built bypassing settlements. Access roads to the settlements should be provided. To allow modernization, the distance between the residential area (settlement) and the edge of the carriageway

must be not less than 200m, distance to agricultural land - 50m. If because of technical or economical purposes the road is to cross the settlement, minimum distance to the residential area must be 50m, in case noise barriers are provided – 25m. For local roads minimum distance to residential area must be 50m, distance from agricultural land – 25m.

- To protect residential area from noise and emission impact, 10m wide green barrier must be arranged;
- Along with technical and economic aspects environmental impacts must be taken into account during design and construction;
- Prior to arrangement of temporary infrastructure and preparation of road embankment, topsoil must be removed and stockpiled until subsequent use for re-cultivation after completion of construction and removal of all temporary facilities;
- Roads along the rivers, lakes and reservoirs must be built with consideration of protection zone boundaries for the surface water bodies.

B.5 - Environmental Permitting Procedure – National regulations

142. Application procedure for obtaining authorization from environmental authorities required for implementation of the planned development, including environmental and social impact assessment coordination, timeframes for information disclosure and public review for this project (note: the draft report was disclosed before January 1, 2018) follows procedure described below:

Table 15. Procedure Applicable to the Project Disclosed Before January 1, 2018

Step	Action	Comment	Timeframe
1	Publication of information on the project in central and regional newspapers.	The advertisement has to be included the project title, location, place and the date, time and venue of public disclosure meeting(s). It will also identify locations where the EIA can be reviewed and where comments may be submitted.	Day 0
2	Submission of the draft EIA report to the Ministry of Environment Protection and Agriculture (MoEPA, former Ministry of Environment and natural Resources Protection - MENRP)	Hard copy and electronic version of the report delivered to MoEPA	Within 3 days after announcement in the newspapers
	Feedback	Receiving public comments on the disclosed EIA	45 days from announcement in the newspapers
	Meetings with stakeholders including local community, NGOs, local authorities, etc.	All comments and questions must be documented and answers, minutes of the meeting(s) written up.	Between 50 and 60 days after publication of the advert
3	Development of final version of the EIA and submission to MoEPA, (together with non-technical Summary, Technical Summary, reports on emissions and allowable limits) for the state ecological examination.	Comments received from the stakeholders considered in the report. Minutes of meeting(s) enclosed to the document as attachment. .	After arranging a public review of the EIA report and development of final version of the EIA, the developers is authorized to submit,

Step	Action	Comment	Timeframe
			within one year, an application to the permit issuing administrative body for a permit
4	Consideration of the documents by Ministry and issuance of conclusion		20 days after registration of an application for a permit and submission of the EIA package to the MoEPA.

Note: According to the national regulations (Law on Licenses and Permits and in compliance with Resolution of the GoG on rules and conditions for issuance of construction permit (N57, 24 March 2009, with amendments)) construction/ modernization of highways requires Construction Permit.

143. After January 1, 2018, a new procedure including screening, scoping and EIA stages has been introduced. According to the Code, 'construction of international and interstate roads' and 'construction and operation of tunnels and/or bridges on the international and interstate roads' belong to the Annex 1 projects that require EIA. This does not differ from the statement given in the law on Environmental Impact permit replaced by the new Code. The differences between the old and the new procedures are in scoping stage, which was not required before, and an increased role for the public consultations process.

144. The procedure described below will be applicable to all international/interstate road and construction and operation of tunnels and/or bridges disclosed after January 2018 (Note, this project was started prior to January 2018 so is not subject to the new rules).

Table 16: Environmental Decision (formerly environmental impact permit) issuance procedure (after January 1, 2018)

Step	Action	Comment	Timeframe
1	Written application to the Ministry submitted by developer.	The application submitted by the developer shall be accompanied with the following documents and/or data: a. EIA report; b. Projects on estimation of the limits for emission of harmful substances into the atmospheric air and for the injection of polluting substances into the surface waters together with the waste waters. c. Notification about a confidential part of a submitted application, if applicable; d. Copy of the document evidencing payment of the fee (500 GEL) in accordance with the existing legislation. e. Electronic copy of above mentioned documents.	Day 0
2	Ministry ensures publication of submitted application and attached documents on its official website as well as on the notice board of the relevant local authorities and/or representative bodies and upon request, provides paper copies of	The Developer is entitled to request the Environmental Decision on several activities through a single application, if the activities are significantly interconnected.	Within 3 days after submission of the application

Step	Action	Comment	Timeframe
	abovementioned documentation.		
3	Minister sets up the Expert Commission		Within 5 days after registration of the application
4	Expert commission prepares and submits the expertise conclusion on the EIA report to the Ministry		Within 40 days
5	Ministry takes decision on the finding of a deficiency in application		Within 15 days after registration of the application
6	Feedback from stakeholders		Within 40 days after the publication of the application
7	Publication of announcement on the public hearing	The announcement on public hearing shall include the information on: a. The content and brief description of the issue to be discussed, format of the discussion; b. The time, place and rules of the public hearing; c. The web address where the respective application, the EIA report and any other information relevant to decision-making will be available as well as indication about the opportunity of accessing the paper copies of these documents during the public hearing.	No less than 20 days prior to organizing the public hearing
8	Public hearing	The Ministry is responsible for organizing and conducting the public hearing. It is chaired and protocoled by a representative of the Ministry. The public hearing is organized in the closest appropriate administrative building to the site of the planned project or within its vicinity. If the project is planned to be implemented within the administrative borders of a self-governing community, the public hearing is organized in the closest appropriate administrative building to the site of the project or within its vicinity and if the project is planned to be implemented within the administrative borders of a self-governing city, the public hearing is organized in the appropriate administrative building determined by the Ministry, or within its vicinity. The public hearing is open to the public and any person has a right to participate in it.	No earlier than 25th day and no later than 30th day after the publication of the application
9	Prior to issuance of the Environmental Decision or the decision on the refusal to implement the project, the Ministry ensures involvement of the Ministry of Culture and Monument Protection of Georgia, within its competence, in the administrative procedures as other		

Step	Action	Comment	Timeframe
	public authority, under the rule envisaged by Article 84 of General Administrative Code of Georgia.		
10	The Minister issues individual administrative legal act on issuance of the Environmental Decision or the decision on the refusal to implement the project		No less than 51 and no more than 55 days after registration of the application
11	Ministry ensures publication of the EIA report, the Expertise Conclusion, the Environmental Decision or the legal act on the refusal to implement the project and the results of public participation on its official website as well as on the notice board of the relevant local authorities and/or representative bodies and upon request, provides paper copies of abovementioned documentation		Within 5 days after issuing the Environmental Decision or the legal act on the refusal to implement the project

Note: The table does not include description of the scoping stage procedures.

B.6 - Licenses, Permits, and Approvals

145. The Project will also be required to obtain a number of permits and consents, of which the main permits and the implementing national legislation are described in Table 17. The Law on Licenses and Permits governs the issue of all permits and consents. Subject to satisfaction of application requirements, all the permits are issued within 30 days from application submission.

Table 17: Permits Register

Permit Required Activity	Permit Title	Issuing Authority	Implementing Law	Responsible Party for Obtaining License
Preparation Phase				
Construction activities	Construction Permit	Ministry of Economy and Sustainable Development	Law No.1775 on Licenses and Permits; Government Resolution N57 "On Terms and Conditions of issuance of Construction Permit"	RD
Construction activities	Environmental Decision	MoEPA	Law No.519 on Environmental Protection	RD

			Law No 890-II Environmental Assessment Code	
Construction activities	Cultural Heritage Clearance	National Agency of Cultural Heritage	Law No 4708 "On Cultural Heritage" Law No.1775 on Licenses and Permits; Government Resolution N57 "On Terms and Conditions of issuance of Construction Permit"	RD
Construction activities	Visual geological-engineering conclusion	National Environmental Agency	Government Resolution N57 "On Terms and Conditions of issuance of Construction Permit"; Order N7 of the Minister of Environment Protection	RD
Construction Phase				
Tree felling in state forest lands for ROW and permanent facilities	Forest use agreement	MoEPA	Law No.2124 on Forestry Code of Georgia; Resolution No.242 of Government of Georgia on Approval of Rules for Forest Use Resolution No.132 of Government of Georgia on Approval of Regulations on Rules and Conditions of Issuance of Forest Usage License	Contractor
Tree felling in state forest lands for Temporary Facilities	Forest Use Agreement	MoEPA	Resolution No.242 of Government of Georgia on Approval of Rules for Forest Use; Order N10/61 of the Chairman of State Department of Forestry	Contractor
Underground water abstraction	Mineral extraction license	Ministry of Economy and Sustainable Development	Decree of the Government of Georgia N136 of August 11, 2005; Law N 946 "On	Contractor

			Fees for Use of Natural Resources"	
Construction or upgrade of access roads	Approval of construction or upgrade activities	Ministry of Infrastructure and Regional Development; local municipalities	Government Resolution N57 "On Terms and Conditions of issuance of Construction Permit"	Contractor
Transportation of oversized and overweight cargo	Transportation permit	Ministry of Internal Affairs	Joint Order N956/1-1/746 of the Minister of Internal Affairs and Minister of Economic Development; Law N 700 "On Road Transport"; Law "On Road Traffic"	Contractor
Spoil disposal	Spoil disposal approval	MoEPA	Law "On Subsoils", May 8, 2012	Contractor
Import of explosives	Permit to import explosives	Ministry of Internal Affairs	Tax Code of Georgia; Decree of the Government of Georgia N420; Law N2911 "On Control of Technical Hazard"; Order N 1-1/2502 of the Minister of Economy and Sustainable Development	Contractor
Use of explosives	Permit to use explosives	Ministry of Economy and Sustainable Development	Tax Code of Georgia; Decree of the Government of Georgia N420; Law N2911 "On Control of Technical Hazard"; Order N 1-1/2502 of the Minister of Economy and Sustainable Development	Contractor

B.7 - Construction Permits

146. The Law on Licenses and Permits defines protocols for the issue, amendment and withdrawal of permits. For projects such as this, a construction permit is needed.

147. Construction permit – a different hierarchical permit which, proceeding from the economic interests of permit seekers, is divided into three mutually-dependent but in terms of administrative procedure independent stages: I stage – establishment of urban planning conditions; II stage - endorsement of architectural-construction design; III stage – issuance of

construction permit. The rules and principles defined by this law for permit issuance shall apply to these stages.

148. The responsible authority (the RD) must obtain the following approvals before it gets approval from the Ministry of Economy and Sustainable Development:

- Geological conclusions to be issued by National Environmental Agency;
- Cultural heritage clearance to be issued by National Agency of Cultural Heritage;
- Environmental Decision issued by MoEPA;
- Project design approval to be issued by MoESD; and
- Project's registered rights to land.

149. Relocations of utilities will need approval as well including by the Georgian Oil and Gas Corporation (GOGC) for the relocation of existing gas pipelines.

B.8 - State Forest Fund

150. According to The Resolution No.242 of Government of Georgia on Approval of Rules for Forest Use, Article 271 State forest land (or State Forest Fund (SFF)) may be used for the purposes of construction of motorways, as well as for other activities which are deemed as special use of forest lands. Article 27 states that if the activity that is deemed as special use of forest land and is subject to Ecological Expertise then the Client (in this case the RD) is obliged to apply to remove all trees identified in the affected SFF area from the SFF register or "de-list" them before they can be cut. The decision to de-list trees and plants from the State Forest Fund of Georgia is issued by the National Forest Agency excepting the vegetation species protected by the Red List of Georgia. A decision to de-list trees and plants from the Red List of Georgia is made by MoEPA. The client must apply to the MoEPA in writing regarding the presence of the Red-Listed species in the project area.

B.9 - International Conventions Relevant to the Project ratified by Georgia

151. List of key conventions on air quality and climate change, biodiversity and protection of ecology and habitats, cultural heritage, public consultation, labor issues and the dates of ratification by Georgia are listed below (see Table 18):

Table 18. Conventions (relevant to the project) ratified by Georgia

	Title	**Status in Georgia, date**	
Natural environment			
1961	International Convention for The Protection of New Varieties of Plants	Entry into force	2008
1971	Ramsar Convention on Wetlands of International Importance Especially as Wildfowl Habitat	Entry into force	1997
1973	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Entry into force	1996
1991	Agreement on The Conservation of Populations of European Bats	Entry into force	2002
1995	Agreement on The Conservation of African-Eurasian Migratory Waterbirds	Entry into force	2001
1996	Agreement on The Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area	Entry into force	2001

1997	International Plant Protection Convention (1997 Revised Text)	Entry into force	2007
1983	Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (CMS)	Entry into force	2000
1992	Rio Convention on Biological Diversity	Entry into force	1994
2000	Cartagena Protocol on Biosafety to the Convention on Biological Diversity	Entry into force	2009
2000	European Landscape Convention	Entry into force	2011
2002	Black Sea Biodiversity and Landscape Conservation Protocol to the Convention on the Protection of the Black Sea Against Pollution	Entry into force	2011
2008	Convention on the Conservation of European Wildlife and Natural Habitats (Bern)	Entry into force	2010
2010	European Landscape Convention	Entry into force	2011
Environmental pollution, waste			
1992	Convention on The Protection of The Black Sea Against Pollution	Entry into force	1994
1992	Protocol on Cooperation in Combating Pollution of The Black Sea Marine Environment by Oil and Other Harmful Substances in Emergency Situations	Entry into force	1994
1992	Protocol on The Protection of The Black Sea Marine Environment Against Pollution by Dumping	Entry into force	1994
1992	Protocol on The Protection of the Black Sea Marine Environment Against Pollution from Land-Based Sources	Entry into force	1994
1997	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	Entry into force	2009
1998	Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	Entry into force	2007
1989	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	Entry into force	1995
2001	Stockholm Convention on Persistent Organic Pollutants	Entry into force	2007
2009	Protocol on the Protection of the Marine Environment of the Black Sea from Land-Based Sources and Activities	Ratified	2009
Climate			
1994	UN Framework Convention on Climate Change (UNFCCC)	Entry into force	1994
1994	International Convention to Combat Desertification	Ratified	1999
1985	Vienna Convention for the Protection of the Ozone Layer	Entry into force	1996
1987	Montreal Protocol on Substances that Deplete the Ozone Layer, (and its London, Copenhagen, Montreal, and Beijing Amendments 2000 and 2011)	Entry into force	1996
1997	Kyoto Protocol to UNFCCC	Entry into force	2005
1999	Geneva Convention on Long-Range Transboundary Air Pollution	Entry into force	1999
Cultural heritage			
1954	European Cultural Convention	Entry into force	1997
1972	Paris Convention Concerning the Protection of the World Cultural and Natural Heritage	Entry into force	1992
1982	European Convention on the Protection of the Archaeological Heritage	Entry into force	2000
1985	Convention for the Protection of the Architectural Heritage of Europe	Entry into force	2000
2005	Council of Europe Framework Convention on the Value of Cultural Heritage for Society (Faro convention)	Entry into force	2011
Public participation and information accessibility			
1998	Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters	Ratified	2000

Labour issues			
1930	Forced Labour Convention	Entry into force	1993
1936	Holidays with Pay Convention	Entry into force	1993
1949	Freedom of Association and Protection of the Right to Organise Convention	Entry into force	1999
1948	Right to Organise and Collective Bargaining Convention	Entry into force	1993
1950	European Convention for the Protection of Human Rights and Fundamental Freedoms	Entry into force	1999
1951	Equal Remuneration Convention	Entry into force	1993
1957	Abolition of Forced Labour Convention	Entry into force	1996
1958	Discrimination (Employment and Occupation) Convention	Entry into force	1993
1962	ILO Social Policy (Basic Aims and Standards) Convention	Entry into force	1997
1964	Employment Policy Convention (Geneva)	Entry into force	1993
1973	Geneva Convention concerning Minimum Age for Admission to Employment	Entry into force	1996
1975	Human Resources Development Convention	Entry into force	1993
1978	Labour Relations (Public Service) Convention	Entry into force	2003
1987	Seafarers Welfare Convention	Entry into force	2004
1997	Employment Service Convention	Entry into force	2002
1997	Private Employment Agencies Convention	Entry into force	2002
1999	Worst Forms of Child Labour Convention	Entry into force	2002
2003	Seafarers identity Documents Convention	Entry into force	2015

152. In addition to conventions listed above, the following EU directives will be taken into account:

- EU Environmental Impact Assessment (EIA) Directive [Directive 2014/52/EU of the European Parliament and Council, amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment];
- Habitats Directive [Directive 92/43/EEC (ref. Art. 6 of the Directive)];
- Bird Directive [Directive 2009/147/EC on the conservation of wild birds];
- EU Water Framework Directive [Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy]; and
- EU Waste Framework Directive [Directive 2008/98/EC on waste].

153. Georgia is also committed to harmonize national legislation with EU and international legislation.

154. EU and Georgia signed an Association Agreement (27 June 2014). Along with other issues the Association Agreement requires implementation of a number of environmental commitments aimed at maintenance, protection, improvement and rehabilitation of the environment, protection of human health and the sustainable use of natural resources. It involves facilitation of international efforts to resolve regional/global issues relating to environmental protection.

B.10 - ADB Safeguards Policy

155. ADB's SPS adopted in 2009 describes common objectives of ADB's safeguards, lays out policy principles, objectives, scope and triggers, and principles for three key safeguard areas: (i) environmental safeguards, (ii) involuntary resettlement safeguards, and (iii) indigenous peoples safeguards. It applies to all ADB-financed, ADB administered projects, and their components including investment projects funded by a loan, grant, or other means. Objectives of ADB's safeguards are to:

- avoid adverse impacts of projects on the environment and affected people, where possible;
- minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
- help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

156. **Safeguard Requirements 1: Environment** – The objectives are to ensure the environmental soundness and sustainability of projects, and to support the integration of environmental considerations into the project decision-making process. Environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts. Eleven 'Policy Principles' have been adopted as part of the SPS, including:

1. Use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment so that appropriate studies are undertaken commensurate with the significance of potential impacts and risks. (The Project is classified as a Category A project).
2. Conduct an environmental assessment for each proposed project to identify potential direct, indirect, cumulative, and induced impacts and risks to physical, biological, socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical cultural resources in the context of the project's area of influence. Assess potential transboundary and global impacts, including climate change. Use strategic environmental assessment where appropriate. (The EIA herewith provides the environmental assessment for the Project, including an assessment of climate change. Transboundary impacts are not applicable).
3. Examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts and document the rationale for selecting the particular alternative proposed. Also consider the no project alternative. (Alternatives have been considered, including the 'no project' alternative in Chapter **D. Alternatives Analysis**).
4. Avoid, and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts by means of environmental planning and management. Prepare an environmental management plan (EMP) that includes the proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators. Key considerations for EMP preparation include mitigation of potential adverse impacts to the level of no significant harm to third parties, and the polluter pays principle. (An EMP has been prepared for the Project and is outlined in detail in Chapter **I. Environmental Management Plan and Institutional Requirements**).
5. Carry out meaningful consultation with affected people and facilitate their informed participation. Ensure women's participation in consultation. Involve stakeholders, including affected people and concerned nongovernment organizations, early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address issues related to environmental assessment. Establish a grievance redress mechanism to receive and facilitate resolution of the affected people's concerns and grievances regarding the project's environmental performance. (Consultations were held to discuss environmental issues, the findings of the consultations (and a description of the Project grievance redress mechanism) are presented in Chapters **G. Public Consultations and Information Disclosure** and **H. Grievance Redress Mechanism**).

6. Disclose a draft environmental assessment (including the EMP) in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected people and other stakeholders. Disclose the final environmental assessment, and its updates if any, to affected people and other stakeholders. (This EIA and its EMP will be disclosed on the ADB and RD web-sites).
7. Implement the EMP and monitor its effectiveness. Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports. (The EIA and its EMP outline a plan to monitor the implementation of the EMP and the institutional responsibilities for monitoring and reporting throughout the Project lifecycle: Section **I.10.4 - Environmental Monitoring Plan**).
8. Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area. In an area of natural habitats, there must be no significant conversion or degradation, unless (i) alternatives are not available, (ii) the overall benefits from the project substantially outweigh the environmental costs, and (iii) any conversion or degradation is appropriately mitigated. Use a precautionary approach to the use, development, and management of renewable natural resources. (No critical habitats have been identified that would be significantly impacted by the Project).
9. Apply pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous materials from their production, transportation, handling, and storage. Avoid the use of hazardous materials subject to international bans or phase-outs. Purchase, use, and manage pesticides based on integrated pest management approaches and reduce reliance on synthetic chemical pesticides. When host country regulations differ from these levels and measures, the borrower/client will achieve whichever is more stringent. (The EIA and its EMP outline specific mitigation and management measures to prevent and control pollution: Section **I.10 - Management Plans**. Chapter **B. Policy, Legal, and Administrative Framework**, identifies the most stringent regulations. No pesticides will be used during the lifecycle of the Project).
10. Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities. (The EIA and its EMP outline the requirement for specific health and safety plans and emergency response plans: Chapter **I. Environmental Management Plan and Institutional Requirements**).
11. Conserve physical cultural resources and avoid destroying or damaging them by using field-based surveys that employ qualified and experienced experts during environmental assessment. Provide for the use of "chance find" procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation. (No physical and cultural resources have been identified that would be significantly impacted by the Project. Chance finds are discussed in Section **E.5.1.9 - Cultural Resources**) and a sample chance finds procedure is provided in **Annex 6. Chance Find Procedure**.

157. **Safeguard Requirements 2: Involuntary Resettlement**.

158. The objectives are to avoid involuntary resettlement wherever possible; to minimize involuntary resettlement by exploring project and design alternatives; to enhance, or at least restore, the livelihoods of all displaced persons in real terms relative to pre-project levels; and to improve the standards of living of the displaced poor and other vulnerable groups. The safeguard requirements underscore the requirements for undertaking the social impact assessment and resettlement planning process, preparing social impact assessment reports and resettlement planning documents, exploring negotiated land acquisition, disclosing information, and engaging in consultations, establishing a grievance mechanism, and resettlement monitoring and reporting.

159. The involuntary resettlement requirements apply to full or partial, permanent or temporary physical displacement (relocation, loss of residential land, or loss of shelter) and economic displacement (loss of land, assets, access to assets, income sources, or means of livelihoods) resulting from (i) involuntary acquisition of land; or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. Resettlement is considered involuntary when displaced individuals or communities do not have the right to refuse land acquisition that results in displacement. A LARP has been prepared for the Project to ensure compliance with the safeguard on Involuntary Resettlement.

Safeguard Requirements 3: Indigenous Peoples.

160. The objective is to design and implement projects in a way that fosters full respect for Indigenous Peoples' identity, dignity, human rights, livelihood systems, and cultural uniqueness as defined by the Indigenous Peoples themselves so that they (i) receive culturally appropriate social and economic benefits; (ii) do not suffer adverse impacts as a result of projects; and (iii) can participate actively in projects that affect them.

161. The Project does not involve impacts to Indigenous Peoples and therefore no further actions relating to this safeguard are required.

B.11 - Comparison of ADB and National Requirements

162. The environmental assessment of the Project will need to satisfy the requirement of both the GoG and ADB. A harmonized safeguard framework is developed for conducting EIA study of the Project. It should be noted that in harmonizing the National and ADB standards the most stringent will be applied in accordance with the SPS 2009. For example, the noise level guidelines (see Table 9) set out in the IFC EHS Guidelines, that are themselves derived from the Guidelines for Community Noise, World Health Organization (1999), will apply to this Project.

163. The table comparing ADB and GoG legislation requirements is given below.

Table 19: Comparison of ADB and GoG Legislation Requirements

Aspect	ADB	GoG	Harmonized Framework
Environmental Policy and Regulations	ADB's SPS (2009) sets out the policy objectives, scope and triggers, and principles for three key safeguard areas: • Environmental safeguards, • Involuntary resettlement safeguards, and • Indigenous peoples safeguards	Environmental assessment and permitting procedure in Georgia is set out in the Environmental Assessment Code.	The Project shall comply with both requirements.
Screening	ADB carries out project screening and categorization at the earliest stage of project preparation when sufficient information is available for this purpose using REA checklist Categorization into Category A, B, C, FI.	Project Proponent in consultation with MoEPA.	The Project is Categorized as Category A.
Alternatives	Examination of financially and technically feasible alternatives to the project location, design, technology and components, their potential environmental and social impacts. Consider no project alternative.	Alternative assessments are to be carried out for the project location and design.	Assessment of alternatives will include the location and design, and also no project alternative.
EIA Report	Guidelines and Table of Contents are provided for EIA report in SPS (2009). EMP will include proposed mitigation measures, monitoring and reporting requirements, institutional arrangements, schedules, and cost estimates.	No Table of Contents are available for EIA reports. Only guidelines (Regulation) on EIA is available, which includes required content of the EIA.	The EIA and EMP reports will follow the table of contents proposed by ADB SPS (2009)
Public Consultations	Carry out meaningful consultation with affected people and facilitate their informed participation. Involving stakeholders, project- affected people and concerned NGOs early in the project preparation and ensure that their views and concerns are made known and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address environmental assessment- related issues.	Publication of information in national and regional mass-media. Arrange consultation not later than 60 days from the date of publication. All stakeholders are to be invited for the meetings.	Consultations will be carried out with the stakeholders, affected people, NGOs throughout the project cycle and consider their views in project design and safeguard plan. Questions and concerns raised during public consultations held will be considered and addressed in the EIA.
Public Disclosure	Draft EIA will be published in ADB website for 120 days before Project approval by the Board.	The draft EIA should be available for public review for 45 days before public consultations.	Draft EIA report (English and Georgian) will be published in ADB and Roads Department Websites. The copies of the draft EIA report will be made available with the municipal offices.

Note: In harmonizing the National and ADB standards the most stringent will be applied in accordance with the SPS 2009.

B.12 - Institutional Framework

164. **Ministry of Environment Protection and Agriculture (MoEPA)** - In December 2017, MoEPA had its responsibilities split between the ministries of agriculture and economy, with the latter also taking over the Ministry of Energy.

165. MoEPA is responsible for all environmental protection issues and agriculture in Georgia. The responsibilities of the Ministry as the competent authority are: (i) to intermit, limit, or stop any activity having or likely to have adverse impact on the environment; (ii) to carry our screening of planned development; (iii) to implement scoping; (iv) to issue environmental decisions for projects subject to EIA procedure (ref. Environmental Assessment Code); (v) to control the execution of mitigation measures by the developer; and (vi) to organize public meetings, provide estimates of impact from the project on the environment, and prepare the documentation to receive necessary clearances to begin work under the project.

166. **Ministry of Economy and Sustainable Development (MoESD)** - MoESD is responsible for carrying out the review of technical documentation (including conclusion of independent experts) and issuing Permits on Construction for projects, as well as for supervision over constructing activities and for arranging Acceptance Commission after completion of construction. State supervision of construction and compliance monitoring is provided by the Main Architecture and Construction Inspection (MACI), which is operating under the Ministry of Economy and Sustainable Development of Georgia. Following to reorganization of MoEPA and the Ministry of Energy the MoESD took over the functions of the latter, as well as part of the main functions of MoEPA (viz. licensing activity).

167. **The Roads Department** - The Roads Department of the Ministry of Regional Development and Infrastructure (RD) is responsible for elaboration of policy and strategic plans related to developing motor roads, management of road and traffic related issues and construction, rehabilitation, reconstruction, and maintenance of the roads of public use of international and national significance, utilizing funds from the state budget, lawns, grants, and other financial sources. Thus, the RD is responsible for the procurement of design and EIA studies, as well as works on construction and rehabilitation of roads and is responsible for ensuring compliance with the Georgian legislation and environmental and social requirements of the relevant donor organizations. Control of implementation of the Environmental Management Plan (EMP) is direct responsibility of the RD. Within the RD there is Environmental Division dealing with the environmental issues. This division is supposed to review the EIAs and EMPs related to the Roads Department projects and perform monitoring of compliance of the contractor's performance with the approved EMPs, EIAs, environmental standards and other environmental commitments of the contractor.

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

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

170. **The Ministry of Interior** – This Ministry is the responsible authority for road accident data management (during construction and operation) and all issues involving detours will be National Police (under the Ministry of Interior).

C. Description of the Project

C.1 - Overview

172. The Project is located along the Black Sea coastal area within the regions of Sanegrelo-Zemo Svaneti and Guria Regions and comprises the area from Poti up to the Kobuleti bypass.

173. There is an existing two-lane two-way road that includes a 200m long precast deck bridge crossing over the Rioni River before circling through the settlement known as Patara Poti and then east towards Senaki. The existing crossing over the Rioni is approximately 70 years old and provides a flood control function in addition to access across the Rioni. The road represents a critical linkage between the E-70 highway which runs north along the Black Sea coast through Batumi and Poti and the E-60 highway leading to the interior of Georgia and the capital of Tbilisi. This accessibility function is particularly important for Poti seaport, which is Georgia's main port and a vital link in the Europe-Caucasus-Asia transport corridor.

174. The Project consists of a new bridge over the Rioni River and its connection with the existing road on both sides of the river. The new alignment starts in the area near the turn from the E-60 to Patara Poti. For about 360 m the straight alignment runs parallel to the existing railway, crosses the Rioni River 40 m east to the railway bridge in a straight alignment of 450 m. The total length of the resulting viaduct is 432 m, with a span distribution of 36.00 + 6 spans of 60.00 + 36.00 meters. The supported platform width is 15.54 meters.

175. A secondary road that leads from the town of Patara Poti to the Kulevi Oil Terminal located on the coast within the Kolkheti National Park will need to be realigned since it falls within the ROW of the new road. The Project will include realignment and repaving of approximately 1 km of service road that leads to the Kulevi Oil Terminal. Where the new road connects to the E-60 and where the service road interchange will be constructed in the town of Patara Poti, a drainage canal will also be crossed.

C.2 - Section Layout

176. Figure 2 indicates the location of the Project within the context of Georgia. Figure 3 provides a map of the entire Project road and Figure 4 to Figure 7 provide a set of detailed maps of the site including locations of the proposed road and bridge. Please note that interchanges shown in light grey are not part of this project and therefore not within the scope of this EIA.

Figure 2: Road Location Map

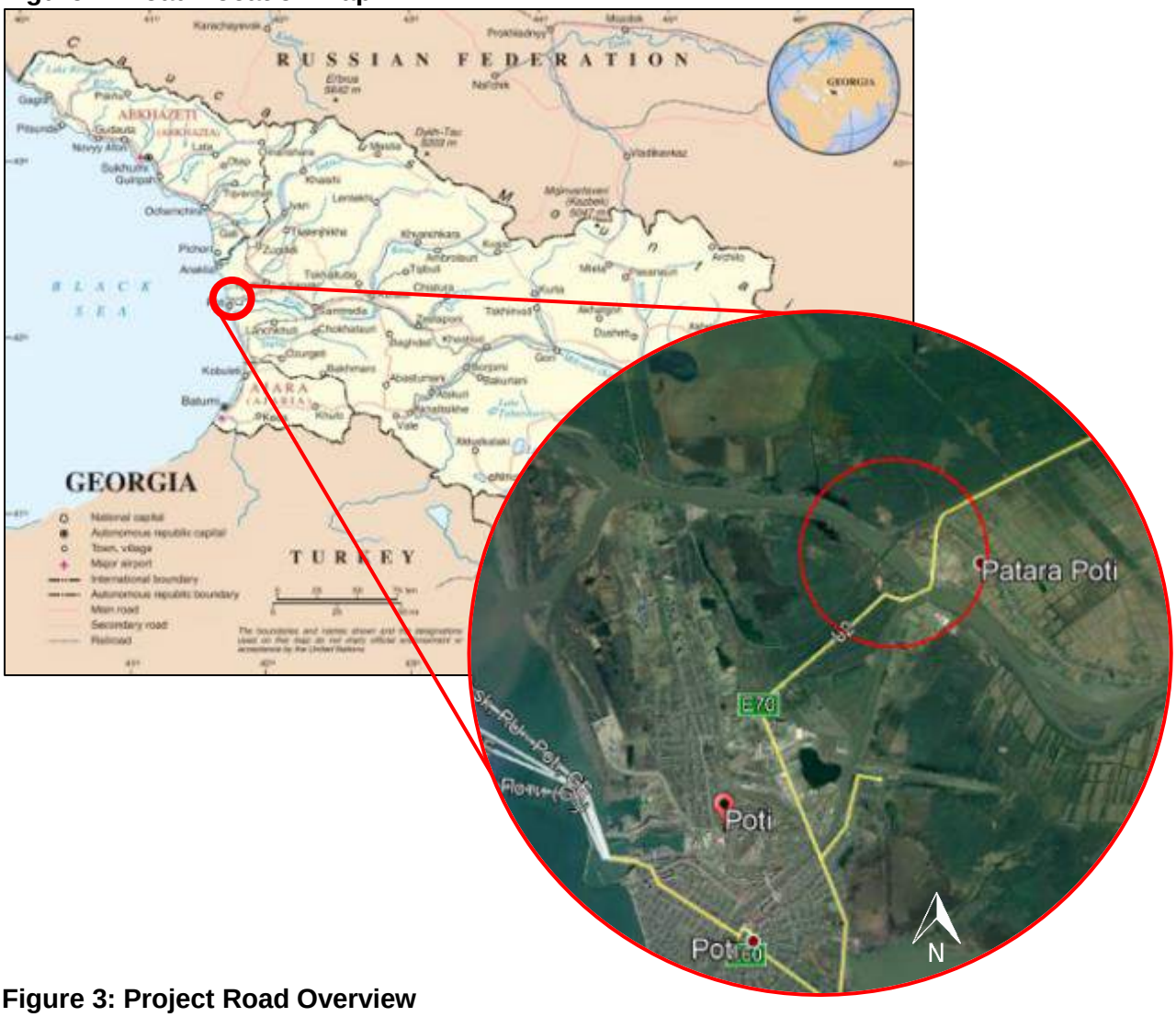


Figure 3: Project Road Overview

Note: Only the road section in white is relevant to this Project and the EIA.

Figure 4: Map 1 - Project Road

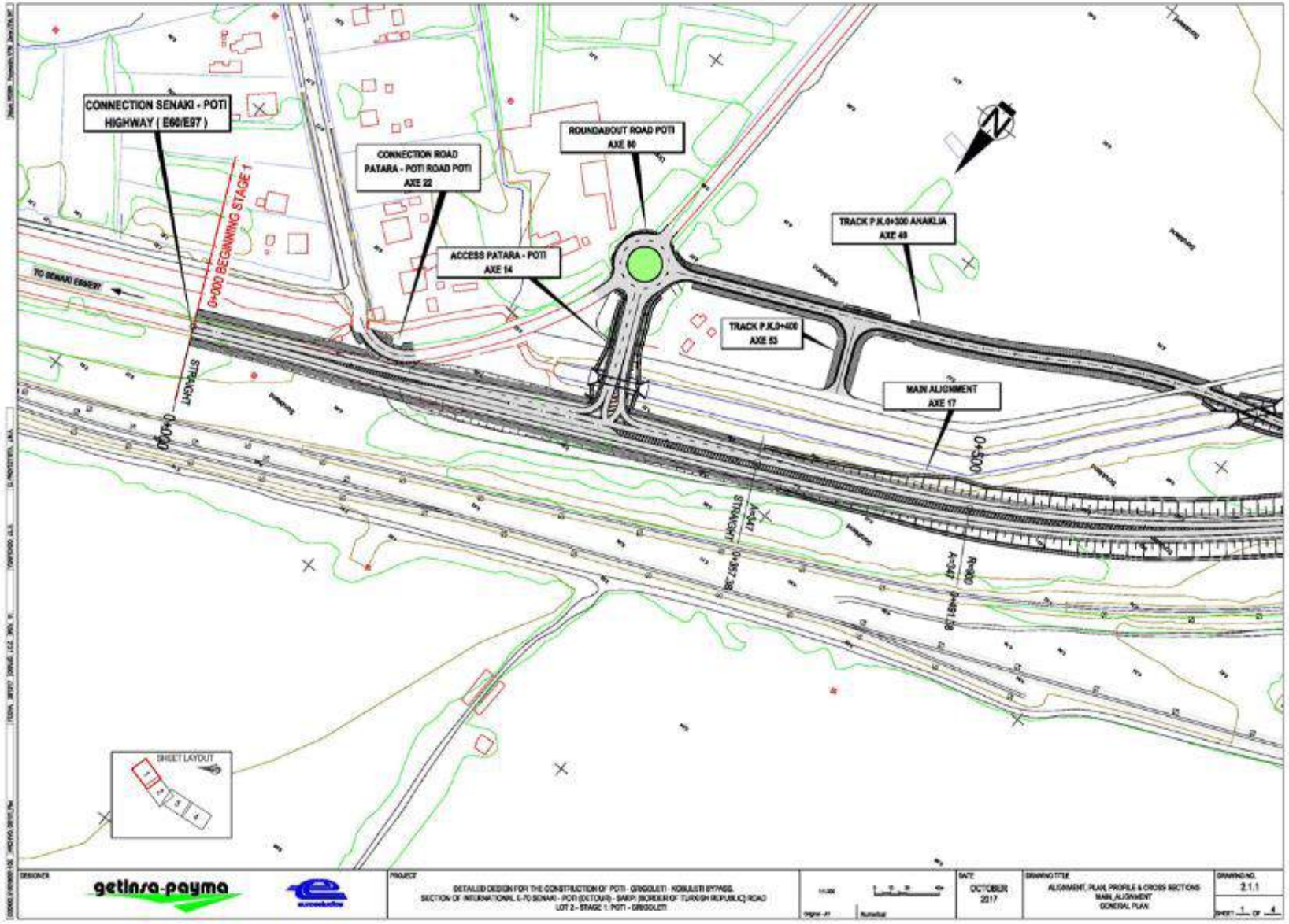


Figure 5: Map 2 - Project Road

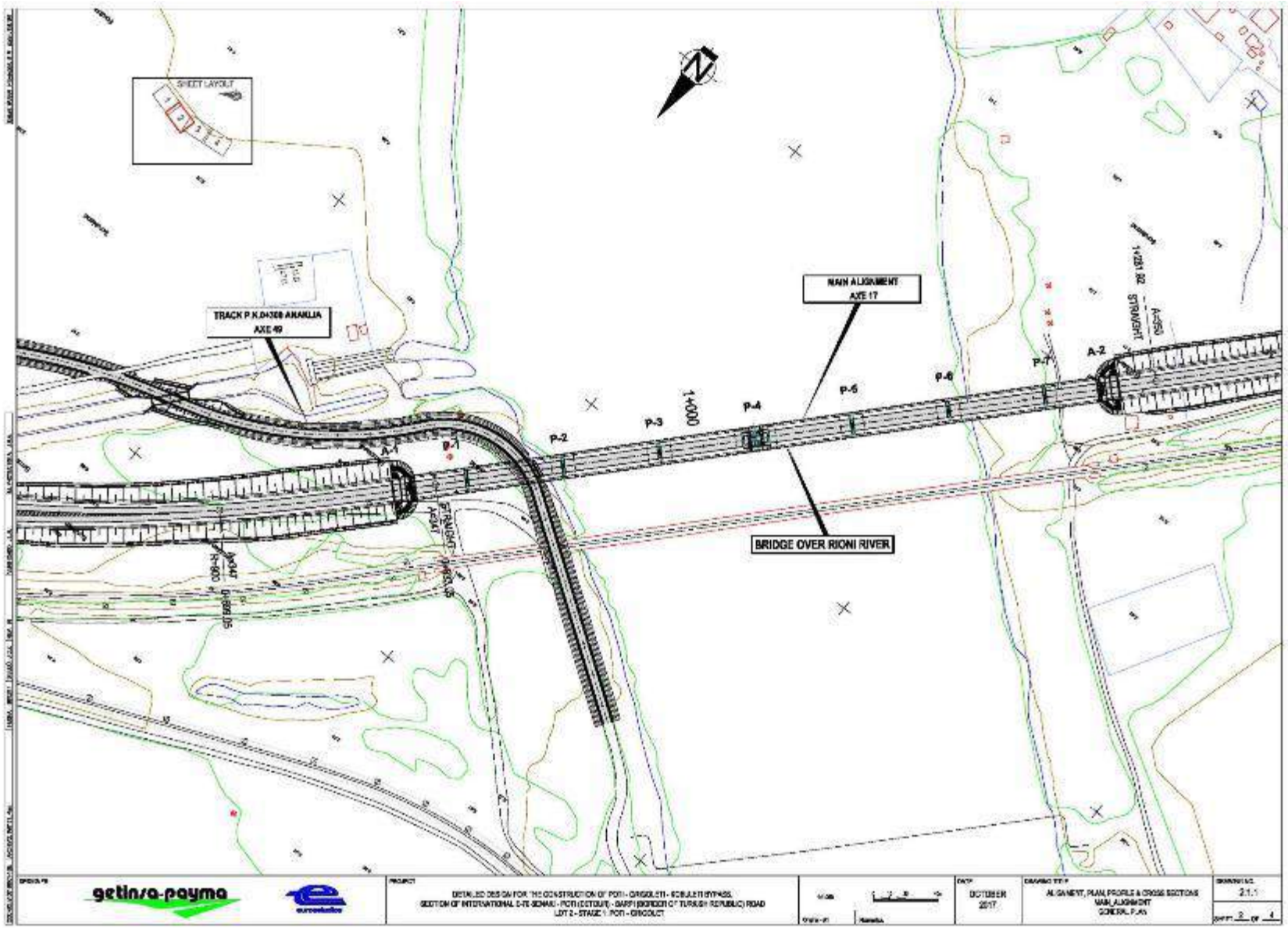


Figure 6: Map 3 - Project Road

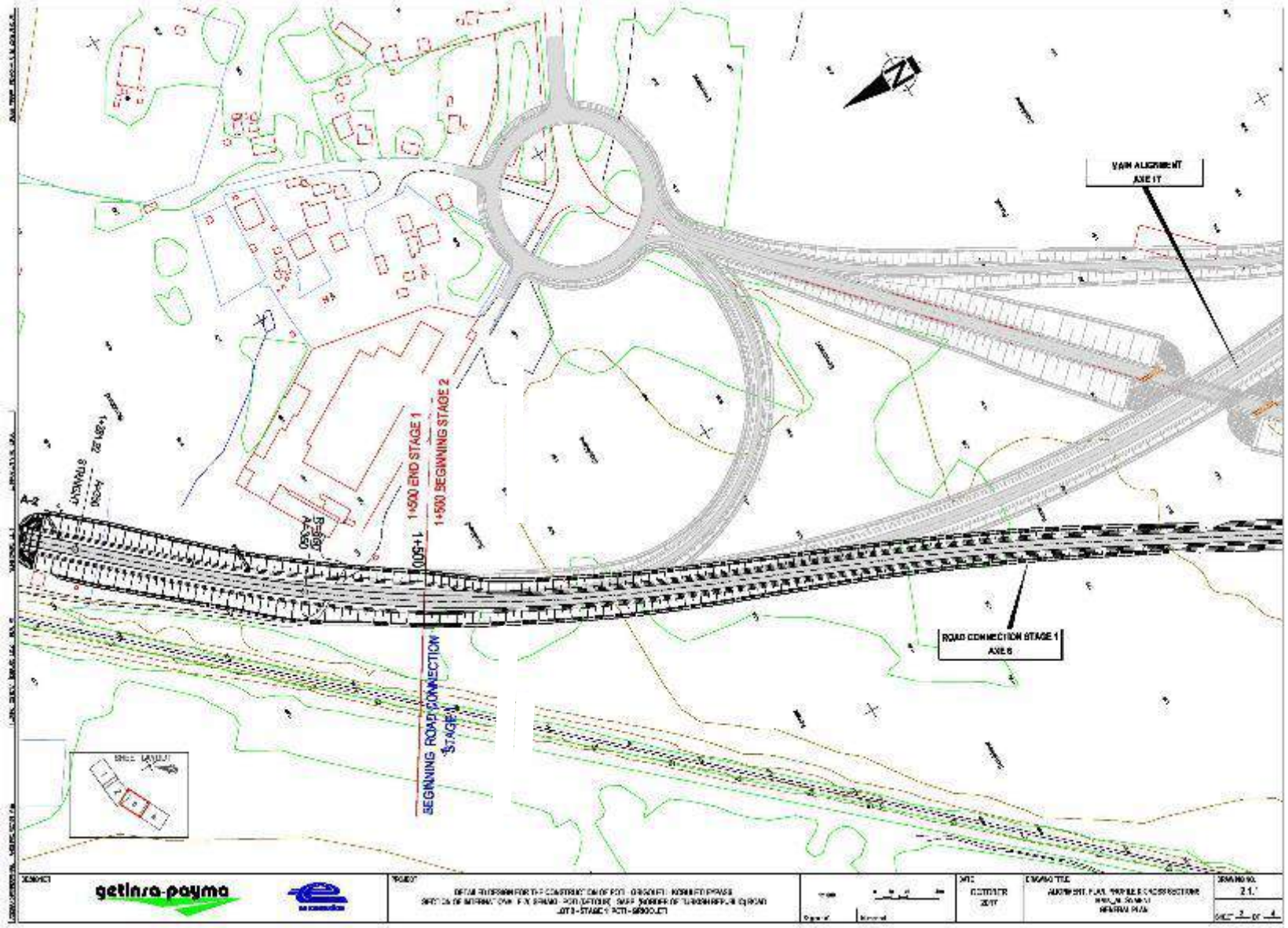
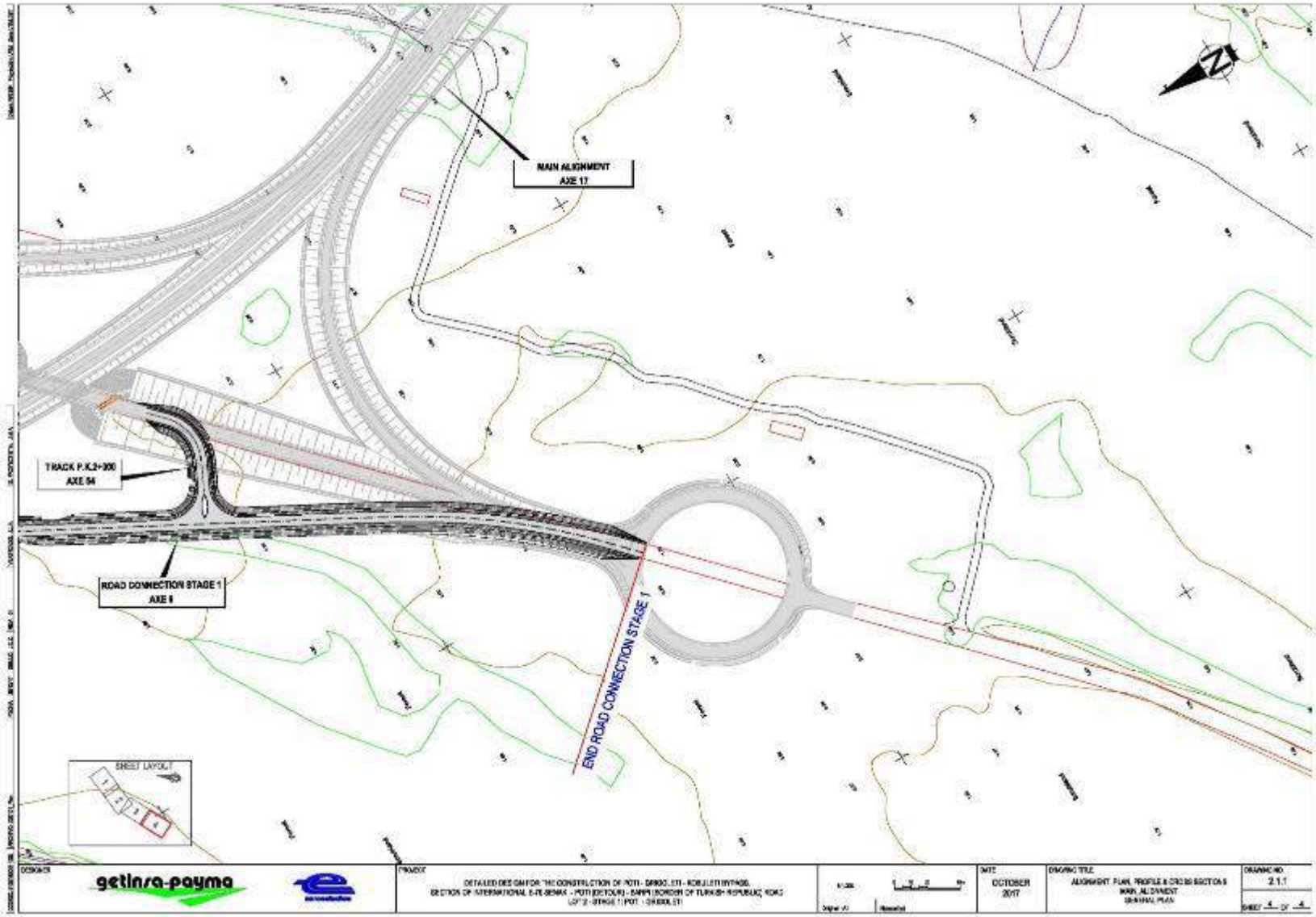


Figure 7: Map 4 - Project Road



C.3 - Environmental Setting

177. Figure 8 provides an overview of the environmental setting of the Poti-Grigoleti road section (Lot 2, Stage 1).

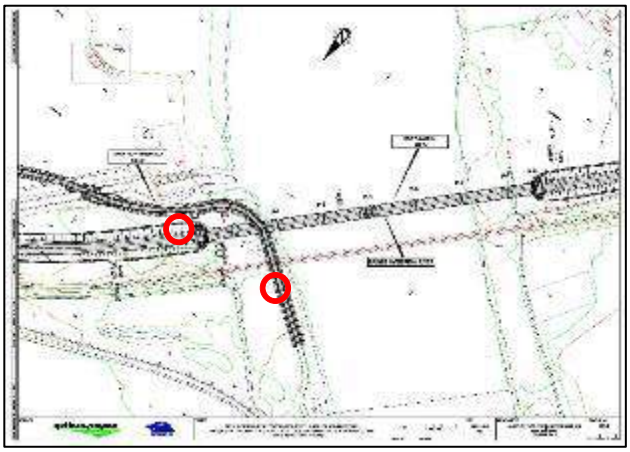
Figure 8: Environmental Setting

KM 0.00

The Project road connects to the E-60 at the town of Patara Poti. The interchange with the new road will be close to several residences in Patara Poti. The existing noise levels are high due to road traffic and the railway line.

The new road will run parallel to the railway line. An abandoned building and a bus stop (both shown in picture #1) will need to be demolished and moved respectively.

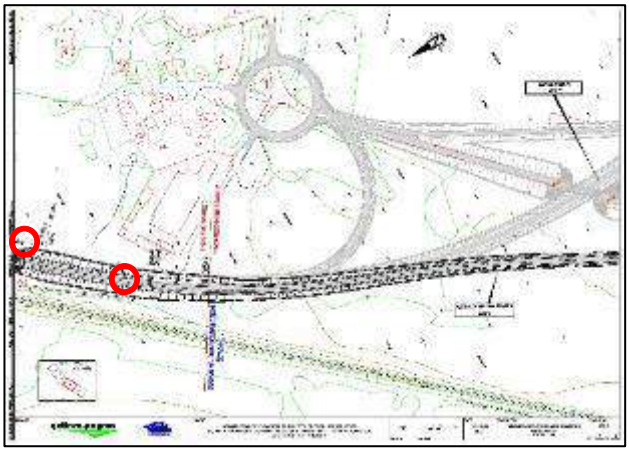
A gas station (shown in picture #2) is located in between where interchanges are planned for the new road and the realigned secondary road which leads to the Kulevi Oil Terminal.



KM +0.833

The realigned secondary road to the Kulevi Oil Terminal begins in Patara Poti and will extend further along the river after passing underneath the new bridge before.

The landscape is primarily characterized by grasses, shrubs and weeds. There exist elements of a former industrial landscape and the presence of abandoned materials and other wastes are present.

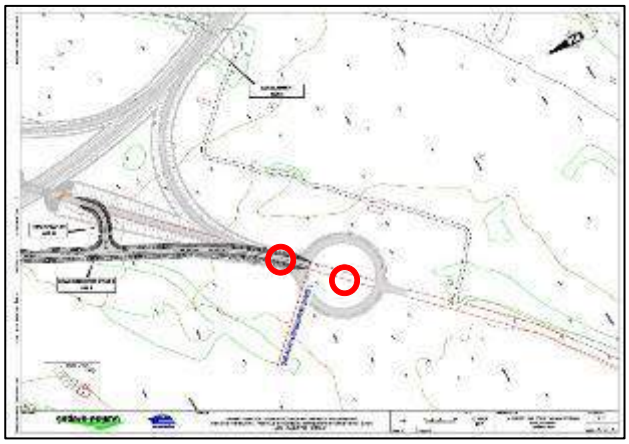


KM +1.281

On the southside of the Rioni Riverbank where the new road and bridge will be constructed, a guard tower will likely need to be demolished.

The landscape is similar to the northside with small farms nearby and the presence of farm animals which graze on both sides of the existing railway bridge. Designs for construction of the new bridge under this Project will allow for continued grazing access.

The large structure near the road alignment is the Nikora meat factory. The new road will run in between the railway line and factory.



KM +2.545

On the southside of the Rioni Riverbank the new road reconnects with the existing E-60 roadway.

The landscape between approximately KM +1.750 and KM +2.545 includes more natural habitat than the other areas affected by the proposed alignment. This includes low areas that are seasonally inundated by water (as seen in picture #7).

C.4 - Design Parameters and Geometric Standards

178. 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 the 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:

a) Carriageway. Main Alignment:

Design Speed:
100 km/h for all the alternatives, as it is established in the Contract for the main Highway and the bridge over the Rioni River.

Spiral Transition Curves:
Complying the Standards of TEM (Chapter 3.1.5)

Bend (Superelevation):
As the TEM standards are very generic (min. 2% and max. 7%, with no more indications), we assume the Georgian Standards, Chapter 13.3. We propose a minimum crossfall and minimum bend of 2.5%, as stated in Georgian Standards.

Expansion width in curves:
Widening is no necessary in the main road, given each lane is 3.75 m wide.

Typical Cross Sections:
As shown in the drawings, the road characteristics the following:

- Width of roadway: 14.50 m
- Number of lanes: 2 (1 lane per direction)
- Width of carriageway: 2 x 3.75 m
- Width of lane: 3.75 m
- Width of paved right-side piece: 2.5 m
- Width side piece: 0.50 m
- Width of wayside: 0.50 m

Vertical Gradients:
We assumed the TEM standards, with 4% in main road for 100 km/h. Minimum gradient, for drainage purposes: 0,30 percent in TEM Standards.

Vertical Curves:
The TEM standards propose a minimum value of 10,000m for 100 km/h. In the opinion of the Consultant, this value is not going to ensure the visibility compliance of stopping distance of 200 m (as per TEM standards also) in some cases, so we propose to follow the Georgian Standards. These standards require 150 m of stopping distance for 100 km/h design speed. The minimum values recommended are included in Chapter 23 (convex curves) and Chapter 24 (concave curves). Nevertheless, in further stages, a study of the stopping sight distance will be performed.

b) Interchanges: ramps and loops, roundabout and connection road

Design Speed:

Ramps and loops have been developed for a design speed of 40 km/h, 60 km/h, 80 km/h or 100 km/h depending on the solution adopted for the interchange and the traffic volume of the ramp. Loops have the lower design speed due to geometrical reasons.

Speed Limit:
The speed limit for the highway and the bridge over the Rioni River is expected to be set at 90km/h.

Spiral Transition Curves:
Complying the Standards of TEM (Chapter 3.1.5).

Bend (Superelevation):
Following the same criteria for highways, we propose a minimum crossfall and minimum bend of 2.5%, as per the Georgian Standards, and a max. superelevation of 7%.

Expansion width in curves:
The TEM standards don't include this measure, which is included in the Georgian Standards, so we assume these latter values, included in Chapter 15.

Section Type:
As it is shown in the drawings, the characteristic are the following:

Ramps and loops:

- Width of roadway: 7.00 m
- Number of lanes: 1 (single lane)
- Width of lane: 4.00 m
- Width of right paved side piece: 1.0 m
- Width of left paved side piece: 1.0 m
- Width of wayside: 0.50 m (slope: 6%)

Roundabout:

- Width of roadway: 11.00 m
- Number of lanes: 2 (double lane).
- Width of lane: 4.00 m
- Width of right paved side piece: 1.0 m
- Width of left paved side piece: 1.0 m
- Width of wayside: 0.50 m (slope: 6%)

Connection road:

- Width of roadway: 10.00 m
- Number of lanes: 2 (1 lane per direction)
- Width of lane: 3.50 m
- Width of right paved side piece: 1.0 m
- Width of left paved side piece: 1.0 m
- Width of wayside: 0.50 m (slope: 6%)

Vertical Gradients:
We assumed the TEM standards, with five percent for a design speed of 100 km/h and 6% for lower design speeds. Minimum gradient, for drainage purposes: 0,30% in TEM Standards.

Vertical Curves:
Following the same criteria described for the main highway, we propose to follow the Georgian Standards.

The minimum radii for convex curves used are stated below:

- For a design speed of 40 km/h, 400 m
- For a design speed of 60 km/h, 1.800 m
- For a design speed of 80 km/h, 5.000 m
- For a design speed of 100 km/h, 10.000 m

The minimum radii used for concave curves are:

- For a design speed of 60 km/h, 1.700 m
- For a design speed of 80 km/h, 3.200 m
- For a design speed of 100 km/h, 4.900 m

Acceleration and Deceleration Lanes:
According to the TEM Standards, parts 3.4.2 and 3.4.3, acceleration and deceleration lanes length should be calculated on the basis of an average acceleration of 0.6-0.8 m/s2 and an average deceleration of 1.5 m/s2. The lengths obtained following these criteria, are much greater than other international standards and practices, leading to unnecessary higher construction costs.
In this way, we have adopted the following lengths, which are considered to be more realistic and widely used:

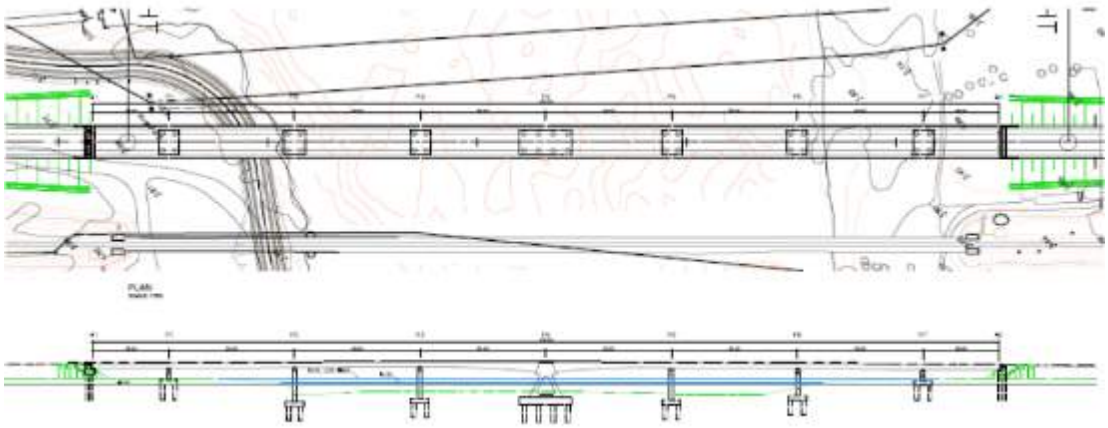
- Acceleration lane:
  - 150 m acceleration lane + 80 m lane of variable width (taper)
- Deceleration lane:
  - 100 m deceleration lane + 80 m lane of variable width (taper)

C.5 - Bridge

C.5.1 - Superstructure Design

179. The total length of the resulting viaduct is 432 m, with a span distribution of 36.00 + 6 spans of 60.00 + 36.00 meters. This provision is justified by the need, given the length of the structure, to modulate it in equal spans, as far as possible, to systematize and facilitate its construction. The end spans are set at 36 m compensating for the type span.

Figure 9: Bridge Over the Rioni River



180. At the center of the structure is a fixed point, in the form of a triangular pier, whose purpose is to collect all the longitudinal horizontal forces due to earthquake, braking, and thermal and rheological actions, and to ensure the null point of movement and the maximum expansion lengths in both abutments. The cross-section of the deck will be composed of two steel girders with a cross section of 2.25 m of constant height, plus an upper slab of 0.40 m of thickness over the metallic webs. The separation between the girders is six meters at the upper level and has a slightly sloping face, so that its width increases slightly along the beam. The supported platform width is 15.54 meters. The upper slab incorporates the necessary pumping in the platform so that it grows up to 45 centimeters of edge in the axis of the deck. At the cantilever extreme the thickness of the slab is reduced to 25 centimeters. The slab cantilever on either side is 4.77 m long.

181. The girders system, open in its metallic design, requires its closure in order to guarantee a dynamic and deformational response under eccentric loads. The bottom closure is provided by the bottom concrete slab located on piles, but in the zones of spans as in abutments it is necessary to put a closure that provides the necessary torsion rigidity. In the areas over piers that are predominantly subjected to negative bending, the use of double mixed action is provided by the provision of a lower slab between beams and, therefore, this lower slab also provides the necessary closure. In the zones of spans and next to abutments, the closure of the section is realized by light precast slabs of reinforced concrete of 14 centimeters of thickness and two meters of length that are arranged between the inferior platforms of the beams. These precast slabs are not connected to each other except in the lateral strips of about one meter of width next to each one of the beams. This is done by means of reinforced concrete that runs longitudinally along the whole bridge arriving in the areas of piers to be joined with the full inferior slab. It should be noted that the effective width provided by the lower precast slabs in the areas of spans subjected to positive bending is very small, and the crack width resulting from the pulling of the metal flanges is suitably controlled by passive reinforcement under the action of dead loads and variable loads.

182. This lower closure arrangement of the span zones with precast concrete slabs has already been successfully employed in multiple viaducts. The proposed system is extremely active in order to control the structure's response under torsion actions, in particular its dynamic response, while both conceptually and constructively it is very compatible with the double mixed action traditionally used for negative bending. It should be noted that the studies done on the subject show that the torsional rigidity obtained with the closure plates, even in the most conservative hypotheses regarding the eventual loss of rigidity by cracking of the same, show a torsion rigidity in the areas of span even greater than would be obtained with the usual horizontal tie of lower closure features of French technology. And, of course, the

torsional stiffness provided by the double mixed action in the areas of negative bending is significantly higher because it has the full twisting circuit closure materialized by the compressed bottom concrete.

183. In the junctions between webs and flanges, both upper and lower, cellular elements are arranged on the inner side of the section. The upper cells are very favorable for the general stability of the compressed plates in the centers of the spans while collaborating with them in resistance and improving the introduction of the local loads coming mainly from the cantilever. The design calls for provision of triangulated diaphragms in ties every eight meters approximately, as well as transverse stiffeners of webs in the middle of the panel formed by said ties.

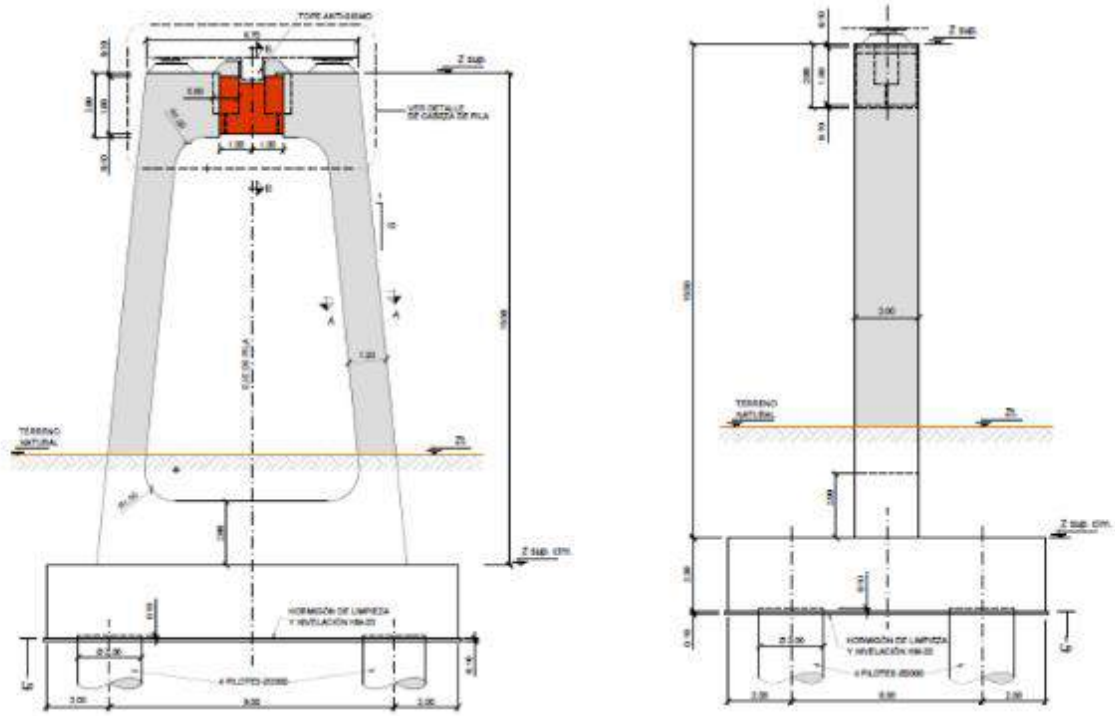
184. The upper slab will be executed by means of precast semi-resistant slabs on which the concrete is cast and poured in situ until the whole slab is formed in the negative sections close to piers. The center sections of the span will be constructed with precast slabs and poured in situ. The pouring of the joints and holes will be made with a concrete strength of 50 MPa, without retraction and with a maximum aggregate size 10 mm, to guarantee fast reach of resistance, little or no affection by retraction, and easiness of concreting in zones of high density of reinforcement. The purpose of this arrangement of slabs and precast slabs is, on the one hand, to facilitate and expedite construction through use of prefabrication means, and on the other, to reduce the deformations imposed by the effect of shrinkage and creep, because the precast element of an advanced concreting age can be used at the moment of the bonding with the metallic structure, which will produce a smaller opening of the joints.

C.5.2 - Abutments and Piers

185. The abutments are closed boxes and have a deep foundation similar to the piles. The dimension of the abutments allows access to the inside of the deck for inspection or repairs.

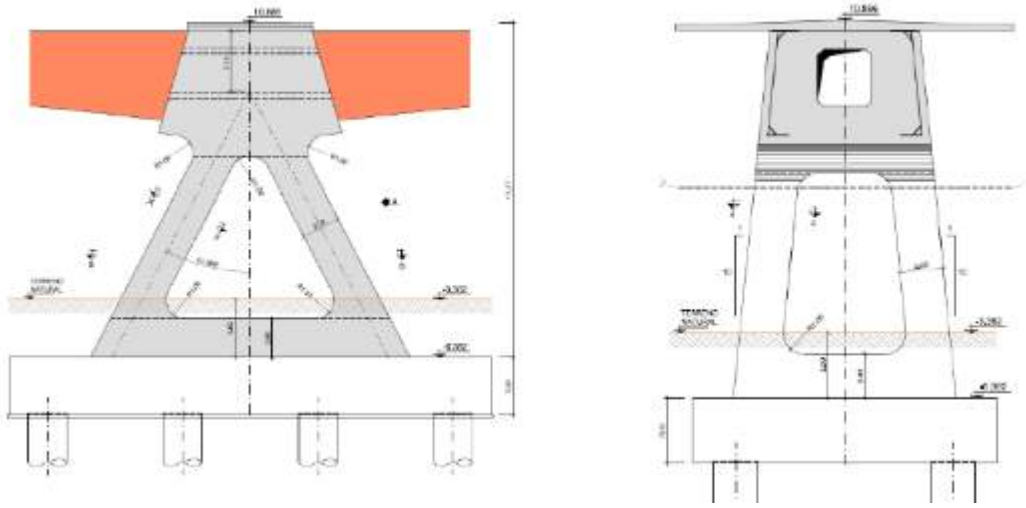
186. The piers have two clearly differentiated typologies. On the one hand, the central triangular pier that serves as fixed point and on the other one the standard piers of the viaduct.

Figure 10: Design of Standard Bridge Piers



187. The standard piers are formed by two solid reinforced concrete columns with a rectangular section joined at the top by a horizontal and rectangular lintel. They have varying heights up to 15.50 m. Seismic bearing pads will be located within the lintel that will respond to transverse movements due to the action of earthquakes, transversal movements during operation (e.g., wind, centrifugal force). The piers are supported over a pile cup that joins multiple piles of 400 x 400 mm and length of approximately 30 m, as recorded in the Geotechnical Appendix. Given the existing bonding, the piles are considered free in longitudinal, and linked to the board in transversal.

Figure 11: Design of Central Pier



188. The central pier is composed of four 2.00 m wide columns that forming a triangle of 17 m in height. The lintel is rigidly linked to the head of the pier at the ends of the 60 m spans, adjacent to the central pier. The design of the pier is conditioned by being the fixed point of

the structure where the longitudinal horizontal actions of earthquake, braking, and imposed thermal and rheological deformations are supported. The foundation of this pier consists in a pile cap with 120 piles of 0.40 x 0.40 m square section of approximately 32 m in length.

C.5.3 - Bridge Runoff and Spill Containment Chamber

189. Protection measures have been incorporated into the bridge design to protect water quality from spillage of hazardous substances into the Rioni River.

190. The drainage system will collect runoff from the bridge diverting it to two retention chambers (see Figure 12 and Figure 13), one on either side of the bridge (see Figure 14). The chamber is designed with consideration of the surface area of the bridge, the regions climate, and the typical carrying capacity of a medium truck to cover average common situations.

191. The containment system will allow basic treatment of the runoff and enable retention and removal of spillage caused by a traffic accident. The retention chambers will be serviced regularly by the Road Maintenance Contractor in the operation phase.

Figure 12. Retention Chamber

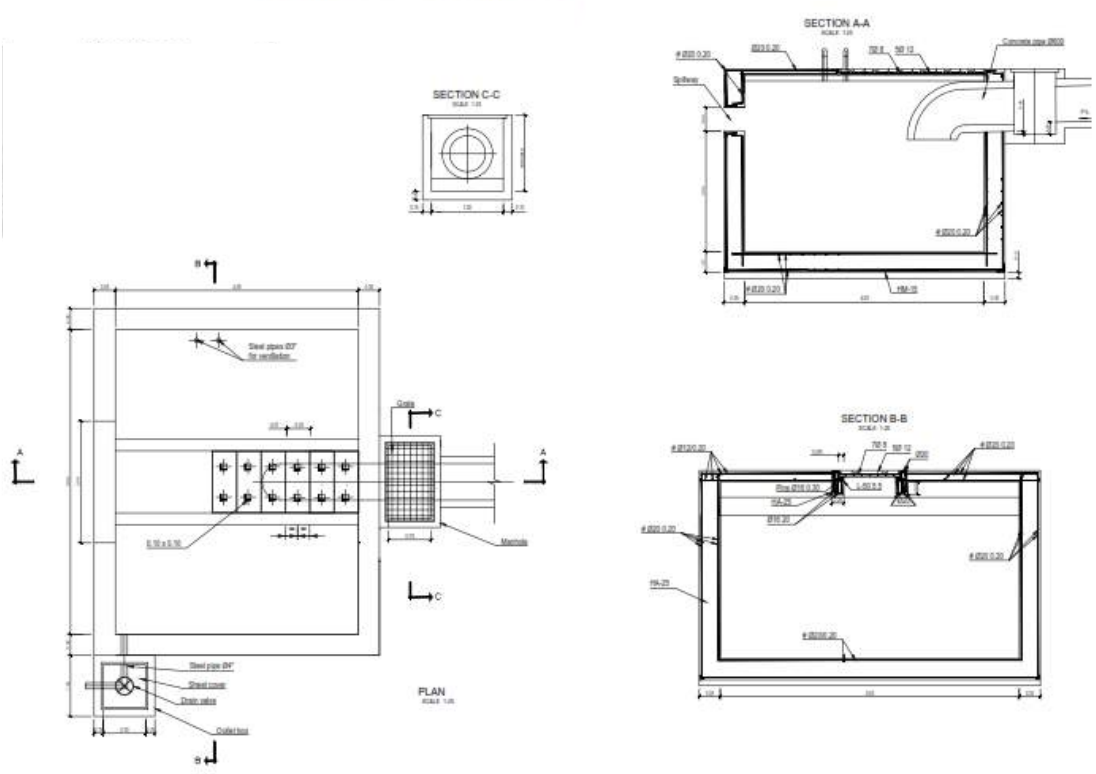
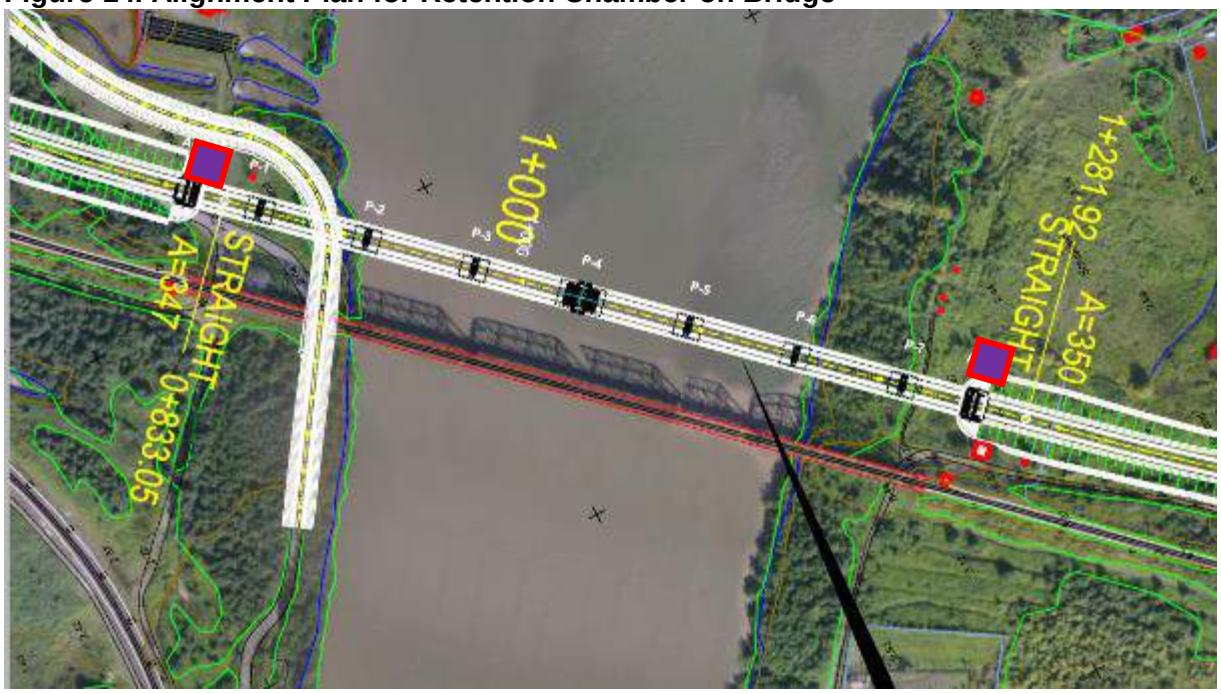


Figure 13. Retention Chamber: Operation Phase

Figure 14. Alignment Plan for Retention Chamber on Bridge



Note: The approximate locations of the chambers are identified by purple squares with red borders

C.6 - Interchanges

192. Locations of interchanges have been determined with consideration of the national and international standards and taking into account the following:

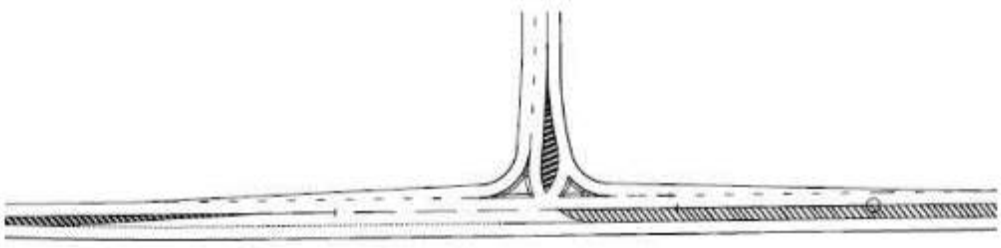
- traffic Intensity;
- distance between interchanges;
- size of urban areas;
- land use;

- cost of interchange construction; and
- maximum flood level.

193. The types of interchanges proposed for design road section are as follows:

194. A T- intersection at PK 0+265 will be constructed at Patara Poti (see Figure 15). The proposed solution presents triangular traffic islands for right movements. An additional lane will be provided as a waiting lane for left turns. This lane will facilitate the entry of vehicles from the main road to the secondary road, suppressing in the opposite direction. The intersection will be completed with acceleration and deceleration lanes to join the secondary carriageway.

Figure 15: T- Intersection with a Third Lane of Waiting Lane



195. A roundabout has been projected on the road from Patara Poti to Poti which accommodates the existing gas station (see Figure 16).

Figure 16: Roundabout on the Road from Patara Poti to Poti with Access to the Gas Station

Figure 17: Interchanges In the Area of Patara Poti

196. At Pk 2+000 of the connection road there is projected to be a new intersection, which will facilitate rapid access to the houses on the left bank of the Rioni River. In order to give continuity to the existing road with the design already constructed, the new road section will proceed approximately 500 m in the direction of Poti. Work under Stage 2 will be carried out to adjust the branch to the carriageway and will also incorporate a roundabout (shown in light grey in Figure 18).

Figure 18: Interchanges in the Area of Patara Poti

C.7 - Pavement

197. Pavement structures have been analyzed for a 20-year design period (2020 - 2039). Cumulative expected 18-kip Equivalent Single Axle Load (ESAL W18) at the design lane have been calculated from the basis of the Annual Average Daily Traffic (AADT), provided by the traffic study.

198. A flexible pavement (asphalt concrete pavement) will be used for the road segment. The pavement structure has been designed in accordance with the 1993 AASHTO Guide for Design of Pavement Structures, for both types, flexible and rigid.

199. In addition, a Mechanistic – Empirical verification of the selected pavement has been also developed, supported by the software ALIZE-LCPC, to check the validity of the proposed sections in the main carriageway.

200. The following table summarizes the pavement thickness calculated for each section and type of pavement:

Figure 19: Flexible Pavement Structure Summary

C.8 - Source of Materials

C.8.1 - Borrow Material

201. The project will require a significant amount of inert material for construction and the exact sources for construction materials have yet to be identified by the Contractor. There are a large number of potential sources for suitable burrow materials within 40 km which were identified during the design stage. The inert material in the project area, in general, fits the requirements for fillers, pavements and base materials, but may need sieving. A list of licensed sand and gravel borrow pits within 40 km of the project area is provided in Table 20.

Table 20: Licensed Quarries Within 40 km of Project Site

#	Number of License	Object Name	Owner of License	License Registration	Validity period
1	1002377	River Rioni sand extraction (Khobi municipality, village Near the small poti)	ფ/პ Bakhva Baramidze	17.03.15	18.03.20
2	1002389	River Khobi (I and II) sand, gravel harvest (Khobi city) territory)	Ltd. "Sharagzamsheni Pirveli"	27.03.15	28.03.18
3	1002410	R4iver Khobistskali "Shua Khorshi" (two precincts) sand, gravel extraction (Khobi municipality, nearby village Khorshi)	Ltd "Karieri"	07.04.15	08.04.20
4	1002767	River Khobistskali - "Khibi" sand, gravel extraction (Khobi municipality, nearby village Bia)	Ltd "Karieri"	20.07.15	21.07.20
5	1003715	River Rioni – "Old Rioni" sand extraction (City Poti territory)	ფ/პ Bakhva Baramidze	22.06.16	23.06.20

6	1003956	River Rioni sand extraction (Khobi municipality, near village Small Poti)	Ltd "Rioni +"	06.09.16	07.09.21
7	1004017	River Rioni sand extraction (Khobi municipality, near village Small Poti)	Ltd "Avtokrati"	10.10.16	11.10.18
8	1004046	River Rioni – "Old Rioni" sand extraction (City Poti territory)	Ltd "Rioni +"	25.10.16	26.10.19
9	1004022	River Rioni sand extraction (Khobi municipality, near village Small Poti)	Ltd "Sand"	11.10.16	11.10.16 10.09.21

202. Purchase of material from already existing licensed quarries will be preferable as opposed to opening of new quarries by the Contractor. Material purchase will be allowed from authorized and licensed providers only. Contractor will be requested to provide copies of licenses obtained from material provider to the client before commencement of works.

203. Material sourcing area must be selected carefully. There are important protected and ecologically significant areas (e.g., Kolkheti National Park, IBAs) in the vicinity of the project where the Contractor will not be permitted to source materials. There is also active quarrying taking place in the Rioni River, including in the area of Samtredia which is believed to be a spawning area for sturgeon species. This represents another critical area for biodiversity conservation which should be restricted to Contractors for this Project.

204. The coastline of Georgia experiences deficit in beach forming material, due in large part to hydropower plant development. Removal of large amount of gravel from the areas along the riverbed reduces sediment flow aggravating the situation and the Supsa and Natanebi rivers have been identified as the most vulnerable. A subproject under the Sustainable Urban Transport Investment Program (SUTIP) finaced by the ADB includes the implementation of coastal protection measures in Anaklia. Activities include shoreline rehabilitation, restoration of the full profile of beaches to the possible limits (which is necessary for wave breaking and suppression of its power and assigns to the beach a function of bank protecting structure), and the installation of hydro-technical coast protecting structures (5t tetrapods).

205. Therefore, the use of gravel from Khobistskali, Tekhuri and Enguri and sourcing sand from the Poti area for this Project will be less damaging to the coastline. Abstraction of material from the Rioni River will be avoided.

C.8.2 - Concrete Batching and Asphalt

206. There are several asphalt bitumen and cement producers in Poti and the adjacent area (i.e., Virage Ltd, Cacascement Ltd, Lider cement Ltd, Prime beton Ltd, GRG Ltd). Bitumen and bituminous products must be imported and comply with European standards. The Contractor will propose to the RD the source of asphalt bitumen and cement producers.

207. Cement is produced locally by companies such as Saqcementi and Kartuli Cementi in Kaspi (approximately 70 km east of the Project area), but other sources of cement may also be available closer to the site.

208. In the event that the Contractor decides to run an asphalt production facility, the MoEPA will provide oversite in the licensing and operation. Asphalt production belongs to activities listed in Annex II to Environmental Assessment Code and the need for EIA will be determined by MoEPA based on the screening procedure (ref. Environmental Assessment Code (document code: 360160000.05.001.018492).

209. The Contractor will be responsible for ensuring the concrete batching facilities and asphalt plant comply with all legal environmental conditions and that all necessary permits to operate are obtained from the MoEPA. A Contractor that sources concrete and asphalt from existing batching plants or from his own dedicated plant must adhere to explicit conditions set by MoEPA.

C.8.3 - Technical and Potable water

210. Most technical water will be sourced from the water bodies adjacent to the construction sites. Potable water will be sourced from existing water supply pipelines or will be provided to camps in reusable bottles – no single use bottles will be permitted.

211. Any water abstraction will be subject to permitting (see Table 17) unless using piped or existing well water. The Law of Georgia on Water 1997 (Last Amended in 2017) (See Table 2) regulates the use of water resources, determines the rights and responsibilities of water users, and regulates water abstraction and discharges. Consistent with the legislation, water within the territory of Georgia owned by the State can be abstracted only for consumption. Any actions directly or indirectly violating the State ownership rights for water are prohibited.

212. The final locations of the extraction points (for both technical and potable water) will require the approval of the Engineer and the RD prior to the start of extraction to ensure that over-extraction of water resources does not happen. Potable water will also need to be tested regularly throughout the construction period to ensure it meets the drinking water standards of GoG.

213. The contractor will be responsible for develop a document indicating the discharge points and water quality limits. The document must be submitted to MEPA for approval.

C.9 - Camps and Storage Areas

C.9.1 - Construction Camps

214. The Contractor will specify whether the need to establish a camp will be necessary. If a camp site is to be built, its location will be selected keeping in view the availability of an adequate area, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from sensitive areas in the vicinity. The RD and Engineer will have to coordinate to ensure that locations for the Contractors camp are appropriate and cumulative impacts are not made more significant. In addition, where practical, camp sites and ancillary facilities, such as batching plants, rock crushing, etc., should be kept separate (distance of more than 500 meters) to avoid noise and air quality impacts to accommodation areas and offices within camps. The locations and technical parameters of the camps will need to be agreed with MoEPA and approved by the Lenders.

215. The area requirement for construction camps will depend upon the workforce deployed and the type and quantity of machinery mobilized. For example, the camps may include rock crushing plant and concrete batching facilities. In view of the area required, it will not be possible to locate campsites within the ROW and the Contractor will have to acquire land on

lease from private landowners. The construction camp will also have facilities for site offices, workshop and storage yard, and other related facilities including fuel storage.

216. The Contractor will provide the following basic facilities in the construction camps:

- safe and reliable water supply;
- hygienic sanitary facilities and sewerage system;
- facilities for sewerage of toilet and domestic wastes;
- storm water drainage facilities; and
- sickbay and first aid facilities.

217. Since the project site is located at reachable distance to the residential area, accommodation in Patara Poti and/or Poti is deemed to be advisable however. This will help to avoid additional impact on environment related to organization and operation of the camp facilities.

C.9.2 - Storage Areas

218. Temporary storage areas will be required for certain activities, such as the storage of sand and gravels and construction equipment. The precise locations of these temporary facilities are not known at this stage and mitigation measures shall be prepared by the Contractor and reviewed by the RD to ensure that these areas are sited in approved locations. There is ample room to establish storage area in the vicinity of the Project area, including a significant amount of state-owned land. Care will be taken not to encroach upon protected areas (i.e., Kolkheti National Park, Ramsar site, and IBA).

C.10 - Mobilization and Construction Process

C.10.1 - Mobilization

219. Pre-construction activities connected with the highway/bridge construction works include the following:

- selection of temporary camp sites in the vicinity of the road bed in accordance with environmental requirements (if needed);
- selection of temporary sites for stationing of machinery;
- selection of temporary sites for separate stockpiling of topsoil and subsoil, obtaining approval from local administration and environmental authorities for their use;
- land acquisition/compensation and obtaining permanent land use rights;
- obtaining permits (environmental impact permit issued by the MoEPA) for the operation of asphalt plants (in case contractor plans to run his own plants);
- approval of quality characteristics of waste water by MoEPA (part of environmental impact permit) – if discharge into any water body if planned;
- obtaining mining licenses by contractor or concluding sub-contracts for the supply of aggregate materials (use of licensed suppliers rather than development of new quarries is advisable);
- development of Site Environment Management Plan (SEMP) by Contractor;
- developing thematic management plans (see **Annex 7. Thematic Management Plans** for direction and guidance); and
- relocation of Existing Services - The Works include the relocation of all services affecting the construction of the Project Road within the Right-of-Way. The services include:
    - water mains;

- overhead electric supply lines;
- gas pipelines; and
- underground telecommunication cables.

C.10.2 - Construction Stage

220. The construction process involves a variety of activities, such as:

- removal of vegetation from the RoW;
- stripping and stockpiling of topsoil until reuse during reinstatement of temporarily disturbed sites;
- removal and stockpiling of subsoil to agreed location until reuse;
- relocation of existing infrastructure (if required).
- grading of the area and laying of cross-drain pipes/culverts. In fill areas, the grading is brought up in layers and compacted. In cuts, the excavation is carried on until the subgrade elevation is reached, and then the earth is compacted;
- base course forming on the subgrade. Soil rolling with machinery. Import of inert materials with trucks, roll (around 500-800 mm) for bed formation;
- surface course forming over the base. This material may be sand, asphalt, blacktop, concrete, or similar materials;
- excavation works;
- concrete works, arrangement of foundations and bridge structures, including arrangement of sheet piles for construction of the piers in the riverbed (see Section **C.10.2.1 - Bridge Construction – Works in the River** for details);
- construction of span bridges;
- providing of road furniture and marking in accordance with international standards; and
- landscape harmonization and tree planting/grass seeding of temporarily disturbed areas according to the Clearance, Revegetation, and Restoration Management Plan.

221. Construction works will be carried out in conformity with valid standards, norms, recommendations, and instructions, in accordance with typical technological diagrams, design specifications, following the Best Available Technology practice.

222. The construction phase is anticipated to take 24 months. The schedule will be developed with consideration of fish migration period to minimize the impact.

C.10.2.1 - Bridge Construction – Works in the River

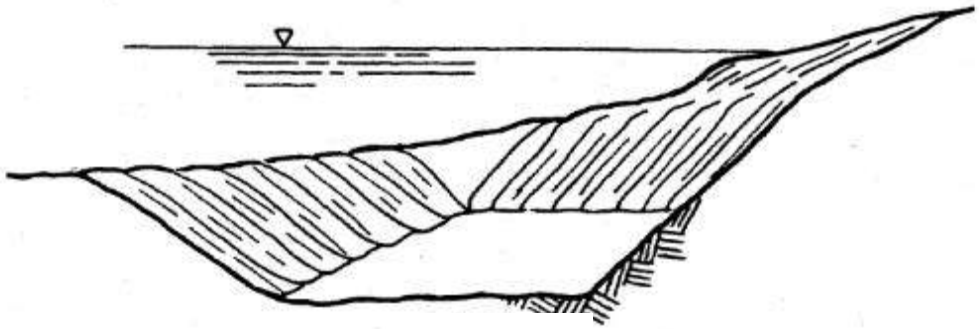
223. The bridge has been designed with seven piers (see Figure 21); three fully within the river (P3, P4, P5); two on the banks of the river that may be submerged or not depending on the water height (P2, P6); and two out of the water (P1, P7).

224. Works will be implemented in stages. Prior to construction of the piers within the river, coffer dams will be constructed using sheet piles so that the work area can be dewatered to the mud line. To carry out piling and pier construction works a platform (island) 42mx16m will be prepared. Work will be carried out in dry environment. To ensure smooth flow in the river during construction of this section of the bridge three box culverts 3x4m will be arranged. The dimensions of the coffer dams for piers 2,3,5,6 are 32 x 34.5 m approximately.[22]

[22] Levan Kupatashvili, Roads Department, pers. comm. 2018

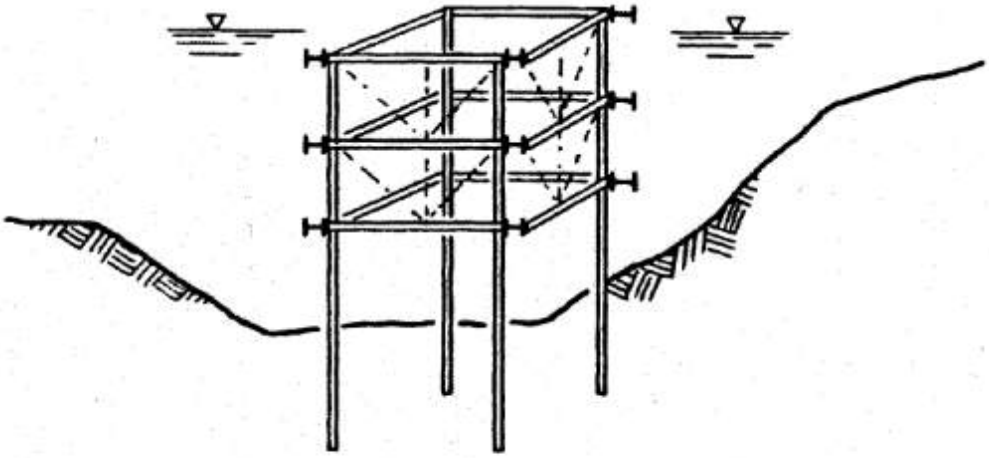
225. Construction of the coffer dams will follow the steps outlined below. The accompanying illustrations in **Figure 20. Cofferdam Construction Sequence Illustrations** [23]are indicative.

1) Pre-dredge to remove soil or soft sediments and level the area of the cofferdam;



Picture (a)

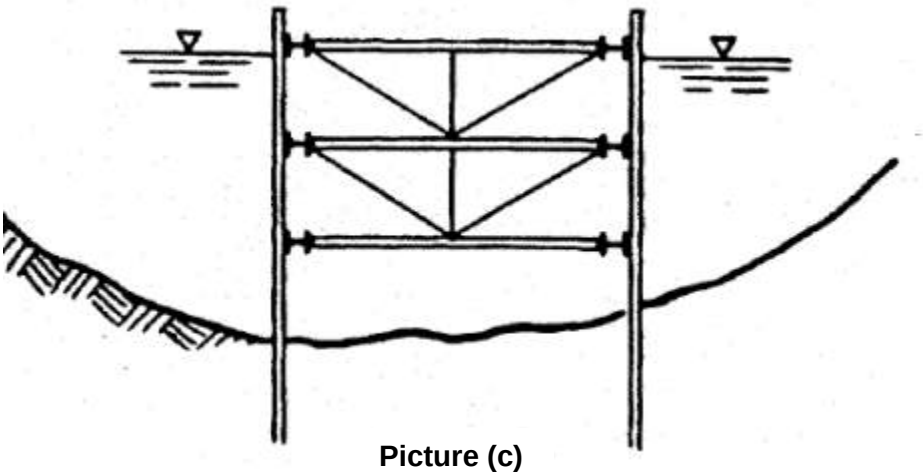
2) Drive temporary support piles;



Picture (b)

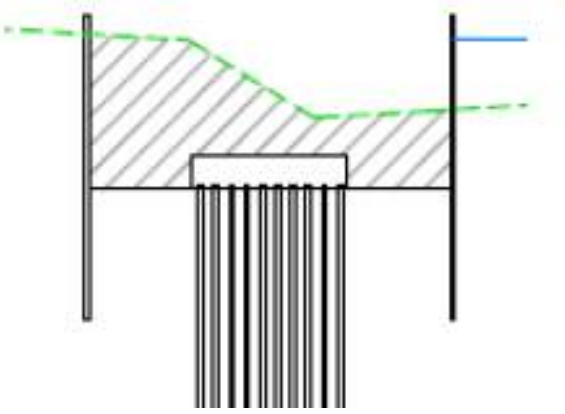
3) Temporarily erect bracing frame on the support piles (see Picture (b));
4) Set steel sheet piles, starting at all four corners and meeting at the center of each side (see Picture (c));
5) Drive sheet piles to grade (see Picture (c));
6) Block between bracing frame and sheets and provide ties for sheet piles at the top as necessary (This may be not necessary, because the maximum free height of the sheet piles (max. depth + overhang) may be around 5.5 + 0.5 = 6.0 m. The total length of the sheets may be around 10-12 m) (see Picture (c));

[23] Tokyo Institute of Technology. Temporary Structures – Cofferdams, Semester 2005



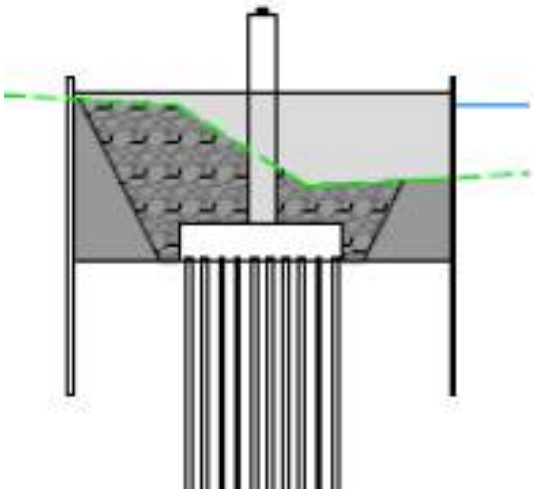
Picture (c)

7) Dewater in order to get an enclosed dry area;
8) Fill the cofferdam with proper soil until a level is established where works can be executed (temporal work platform);
9) Execution of gravel columns and drive piles;



Picture (d)

10) Construct new structure - excavation and execution of the piles cup and execution of the pier;
11) Remove the filling and construct the rip-rap;



Picture (e)

12) Flood cofferdam;
13) Remove sheet piles, first removing the closing sheet and successively the remaining ones; and
14) Remove bracing and proceed to cut and extract the ties using a crane while the divers cut the different joints using thermal lance (In the case where wooden piles are used by the Contractor, extraction is easier, and the piles can be cut instead of extracted).

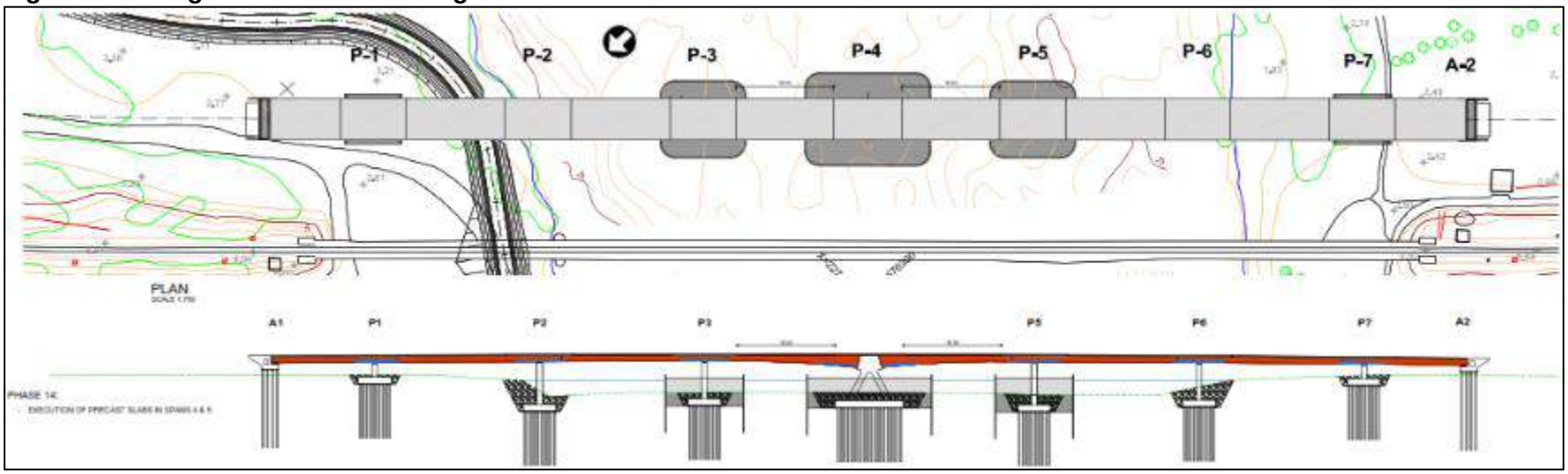
226. Each pier constructed in the river is expected to need its own cofferdam. Construction of piers P3 and P5 together, along with their respective cofferdams, is expected to take approximately three months in total. Construction of the coffer dam and the central pier, P4, is expected to take approximately three months. The dimensions of the cofferdams for piers P3 and P5 will each likely be 25 m in diameter, while the center pier, P4, will likely have a 50 m cofferdam. Cofferdams will not stop or significantly restrict the flow of the Rioni River.

227. The Contractor will propose a schedule of work, however construction within the Rioni River will be limited to the period between September and February to avoid the most sensitive period when sturgeon fish migration occurs (March-August). Construction outside the river will be allowed to proceed throughout the year.

C.10.3 - Operation Stage

228. Operation of the road involves maintenance of the pavement and the road infrastructure/marking; clean up and management of roadside waste; maintenance of the storm water and spill containment chamber; maintenance of compensatory plantations; monitoring of traffic safety; and monitoring of livelihood restoration of project-affected households and communities.

Figure 21. Bridge Construction Design



C.11 - Road Safety

C.11.1 - Overview

229. The following road safety measures have been incorporated into the Project design:

- The layout has been improved in both horizontal and vertical alignments, as well as horizontal and vertical coordination.
- The width of the road is extended from 7.0 to 7.5 m with two lanes of 3.75 m of wide. The shoulders will be 2.5 m wide. Carriageway will include berms of 1.0 m wide.
- Protective ditches shall be provided on the embankments.
- Road access is improved, both in terms of geometry and visibility, which improves the current situation in these areas.
- Safety barriers are provided on embankments over 2 m high, which prevent accidents due to exits of vehicles on the road.
- Metal mesh fending will be in closed urban areas and in spots where animals have the possibility to cross the road.
- Road signs will be updated and improved. New signage will facilitate access to urban areas.
- A T- intersection in PK 0+265 is designed with a third lane of waiting lane. The proposed solution presents triangular traffic islands for the right movements. An additional lane will be provided as a waiting lane for left turns. This lane will facilitate the entry of vehicles from the main road to the secondary road passing in the opposite direction.
- A new road safety audit will be planned every five years.
- Consultations on public information will be taken into account in upcoming road safety.

C.11.2 - Signaling and Defenses

230. Installation of road signs, pavement marking, installation of guide posts and steel guardrails, cast in situ concrete parapets in the dividing strip shall be done under the Project to ensure traffic regulations and safety.

231. Manufacturing and installation of road signs shall be done according to the requirements of standards GOST 10807-78, GOST 17918-80, ISO/ES, ASTM. Signaling design has been performed in strict respect of the directions issued by the RD and subsequently complies with the Georgian Law regarding signaling (in effect from January 2014).

232. Road fencing shall be constructed from steel guardrails (cinol alpol covered) in accordance with requirements of standards GOST 23457-86, GOST 26804-86 and EN 1317. Layout of road signs, road marking, road barriers and guide posts are given on corresponding drawings. The activities and decisions adopted in the design ensure proper traffic regulation and safety.

- Vertical signaling
    - Warning signs
    - Priority signs
    - Prohibition signs
    - Obligation signs
    - Information signs

  - Service marks
  - Additional information signs
- Horizontal signaling
  - Longitudinal lines
  - Transverse lines
  - Stop lines
  - Road markings
  - Directional arrows (see Figure 22. Directional Arrows)
  - Words and symbols marked in the pavement
- Beacons
  - Reflectors
- Defenses
  - Side rails
  - Rigid side barriers
  - Steel guardrails (see Figure 23)
  - Metal mesh fencing (see Figure 24)
- Poly-flex signal posts (see Figure 25)
- Guideposts

Figure 22. Directional Arrows

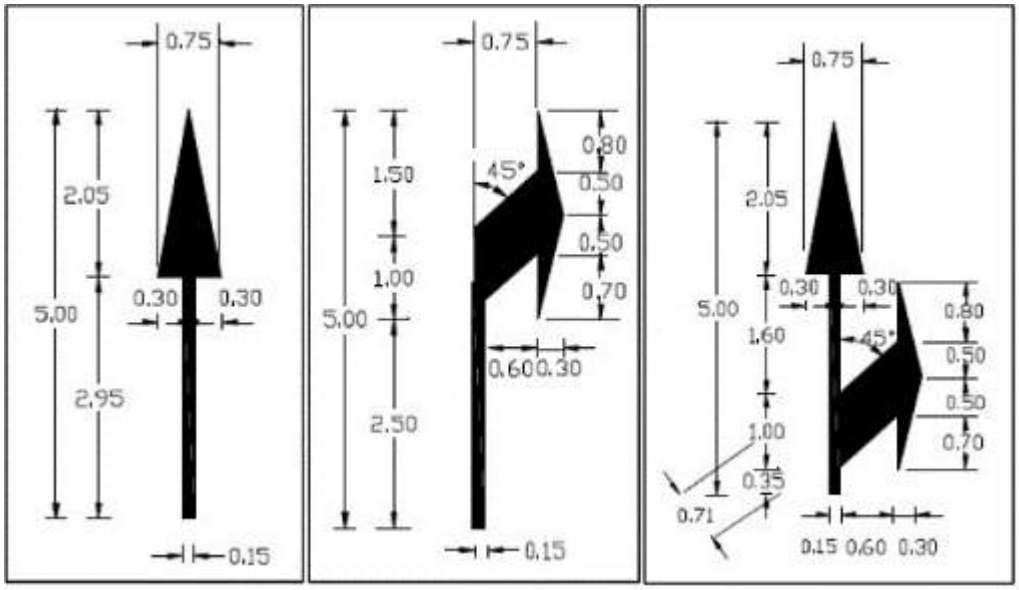


Figure 23. Steel Guardrail Design

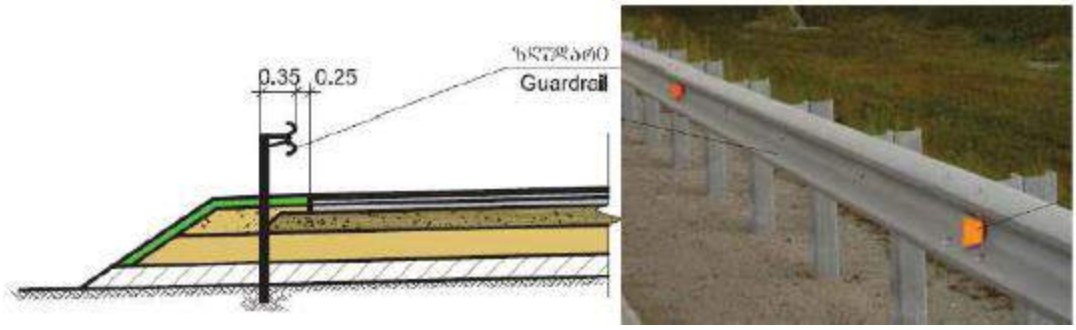


Figure 24. Metal Mesh Fence Details

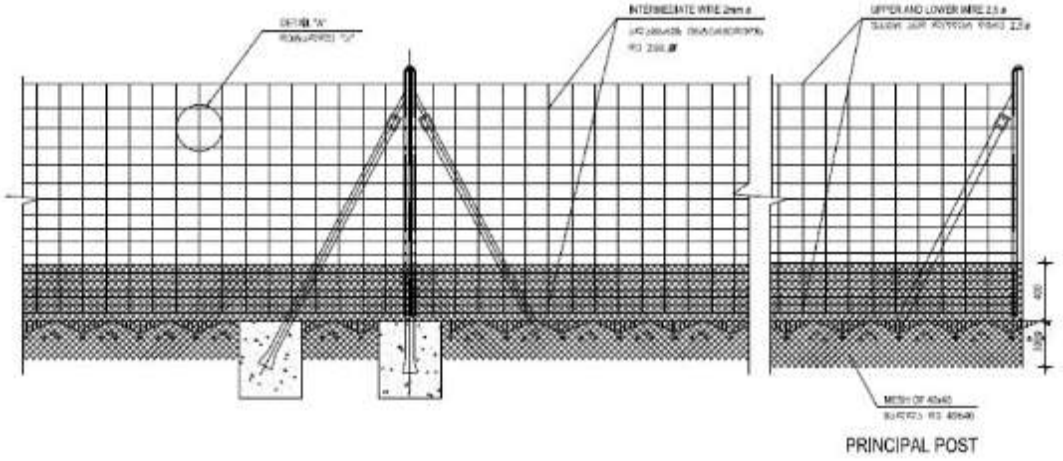
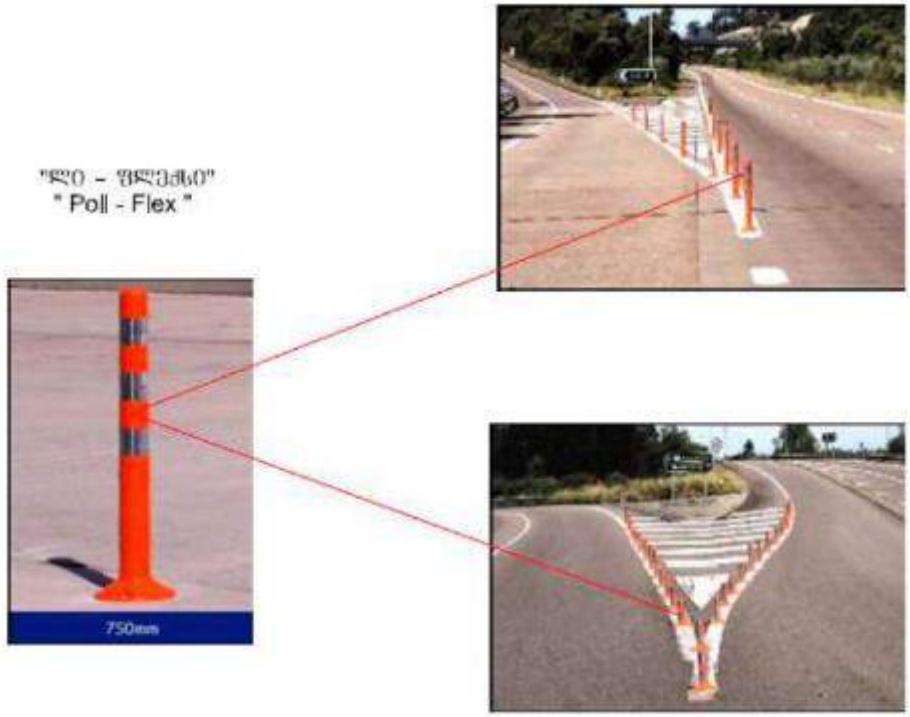


Figure 25. Poly-flex Signal Post Details



C.12 - Traffic Studies

C.12.1 – Road Traffic Baseline

233. Design was developed based on traffic flow data analysis. Information from the Roads Department for 2015, automatic counts (ACC), manual classification (MCC) counts and original destination survey (O/D). The field study was done in winter and summer periods. Traffic flow values (counted) are given below:

Table 21. Traffic Flows (automatic count data) in Winter and Summer Periods, 2016

Location	Winter, working day			Summer, working day		
	LV	HGV	Total	LV	HGV	Total
5 Senaki Poti	5,701	934	6,635	13,051	1,608	14,659

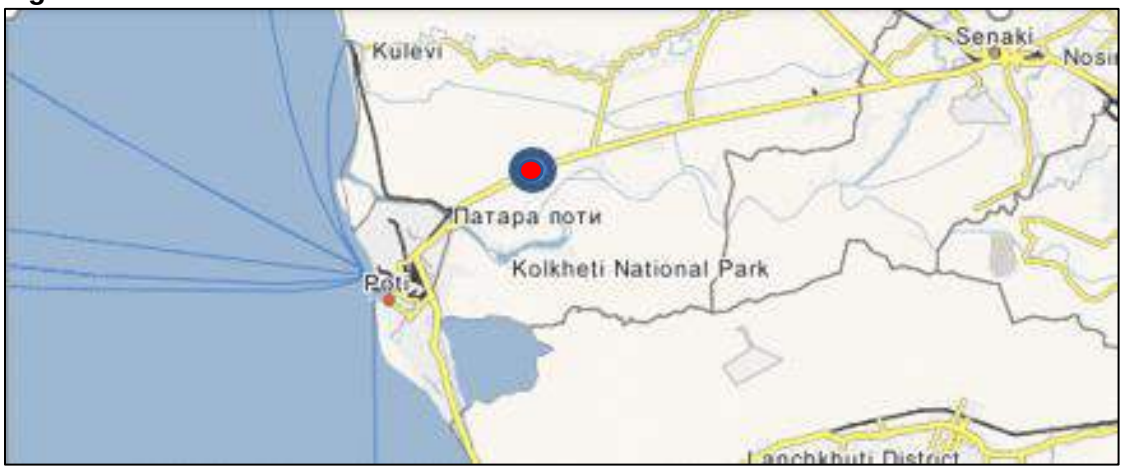
Note: for location of the control points see Figure 26. LV stands for light vehicle, and HGV stands for heavy good vehicle.

234. Manual Classification Counts to collect information were undertaken at one location (see Figure 26) over a two-day period to collect information for expanding the O/D surveys and confirm existing traffic volumes and vehicle composition along the corridor. The following vehicle types were categorized:

- Car - private cars, and all other small vehicles such as 4-wheel drive vehicles, passenger vans etc.

- Van - minibuses and small buses of up to 15 seats being used for the transport of fare paying passengers, vans and pick-ups used predominantly for the transport of goods.
- Bus - standard and large buses with more than 15 seats being used for the transport of passengers.
- Light goods vehicle (4-wheel).
- Light goods vehicle (6-wheel). Six-wheel vans used for the transport of goods.
- Two and three axes goods vehicle. Trucks with a total of two axes and six wheels, or three axe trucks with a single axle at the front and two axles at the rear.
- Four or more axes goods vehicle. Trucks or truck - trailer combinations with four or more axles in any formation.

Figure 26. Automatic Traffic Count Site



235. Both automatic and manual counts showed that traffic in summer nearly double the winter traffic in the coast corridor and some of its access roads. Light cars dominate.

C.12.2 – Traffic Projections

236. Traffic forecasts for the Project area (Patara Poti 0+000 to Airport Area 4+485) are presented below in Table 22. These figures represent projected traffic *without* the development of the rest of the Poti-Grigoleti-Kobuleti Bypass sections included since timing of construction for the remainder of the bypass is unknown. A drop in total vehicles from 2024 to 2025 is anticipated as a result of the E-70 highway being completed and coming into operation. Traffic volumes are expected to steadily increase on the Project road section over time from 2025 forward.

Table 22: Traffic Forecasts

Year	Heavy	Light	Total
2020	1,076	4,965	6,042
2021	1,140	5,242	6,382
2022	1,207	5,535	6,742
2023	1,278	5,844	7,122
2024	1,353	6,170	7,524
2025	896	1,230	2,126

2026	942	1,298	2,240
2027	990	1,370	2,360
2028	1,041	1,445	2,486
2029	1,094	1,525	2,620
2030	1,150	1,610	2,760
2031	1,195	1,676	2,871
2032	1,139	1,465	2,604
2033	1,179	1,516	2,694
2034	1,219	1,568	2,787
2035	1,261	1,622	2,884
2036	1,294	1,665	2,959
2037	1,327	1,708	3,035
2038	1,362	1,752	3,114
2039	1,397	1,798	3,195
2040	1,433	1,844	3,277
2041	1,461	1,880	3,341
2042	1,489	1,917	3,406
2043	1,518	1,954	3,472
2044	1,548	1,992	3,540
2045	1,578	2,031	3,609
2046	1,601	2,061	3,661

D. Alternatives Analysis

D.1 - Overview

237. One of the objectives of an EIA is to investigate alternatives to the Project. In relation to a proposed activity, "alternatives" means different ways of meeting the general purposes and requirements of the proposed activity. The following section provides an assessment of alternative corridors, alignments, and technologies, as well as the 'No Action' alternative.

D.2 - The No Action Alternative

238. The 'No Action' Alternative addresses the likely consequences of not undertaking the proposed action. While it has no environmental and social impacts resulting from construction works, the failure to develop the road sections proposed would result in the continued deterioration of the road and bridge over the Rioni River, thereby impeding the economic development of the Project area and the Poti region. Negative environmental and social impacts from traffic jams, noise, low speed, high emissions, and safety issues related to the use of the existing bridge structure will continue without action. In addition, the existing bridge lacks the capacity to handle increased levels of traffic expected in the future from construction of the Anaklia deep sea port and further development of the Port of Poti.

239. The fact that the RD has no jurisdiction on the existing bridge further complicates matters by limiting their ability to maintain, repair, or upgrade the infrastructure as needed. The diversion dam and the bridge on top of it have had to be rehabilitated several times due to inadequate design, inappropriate gates operation, and a lack of maintenance, most recently in 2018.[24, 25]

240. Local communities would not benefit from the positive effects associated with highway improvement under the Project, including profits resulting from increased cargo turnover and tourism. Therefore, it can be determined that the 'No Action' alternative is not a reasonable option if the overall socio-economic situation in the western region is to be improved.

D.3 - Upgrading the Existing Road Alternative

241. Upgrading the existing road and bridge was an alternative also considered. The bridge provides a flood control function and recently needed repair due to its deteriorated condition. The bridge is also not operated or controlled by the RD, limiting its ability to maintain, repair, or upgrade the infrastructure as needed. The existing road alignment is also inconsistence with TEM Standards. Although there would be cost savings from the civil works if a new alignment was not constructed, it would reduce the effectiveness of road improvements currently being planned for under the Poti-Grigoleti-Kobuleti bypass. There are a large number of residences and businesses which would also be affected if the existing road was upgraded. Accessibility for residents will remain unchanged under the proposed Project as the plan is to keep the existing bridge open for local traffic, thereby retaining connectivity while reducing negative impacts from heavy traffic currently being experienced.

[24] Emergency Underwater Rehabilitation of the Poti Main Diversion Weir, Georgia. Ljiljana Spasic-Gril. Improvements in reservoir construction, operation and maintenance. January 2006, 330-344.
[25] Gocha Kurdgelia, Poti Municipality, pers. comm. 2018

D.4 - Alternative Alignments

242. Alternatives were assessed during the feasibility and detailed design phases based on a multi-criteria analysis approach (MCA) which transforms qualitative assessments in quantitative numbers. The various alternative alignments for Project components were proposed, screened, and studied against functional, environmental, social, technical, and economic criteria. The primary objective with respect to the environmental criteria was to identify and adopt options with the least adverse environmental impacts and maximum environmental benefits. The following key environmental factors were used in comparing alternatives: (i) impact on air quality; (ii) noise; (iii) impact on soil; (iv) impact on surface; (v) impact on biodiversity and ecological integrity; (vi) landscape and visual impact; and (vii) socio-economic impact.

243. Three alternative alignments were proposed for this section: Red; Yellow; and Blue. From all aspects (financial, social, engineering, etc.) the Red alignment gained the highest score and has been identified as the best option. The key features for each candidate alternative alignment are summarized below.

Table 23: Key Features of Alternative Alignments

Alternatives	Length (m)	Radius min (m)	Slope max (%)	Vertical Curve Convex min (m)	Vertical Curve Concave min (m)
1 - Red	2.545,474	850	2,20	22.600	7.700
2 - Yellow	2.687,308	850	2,20	22.600	7.700
3 - Blue	2.703,905	850	2,00	22.600	17.000

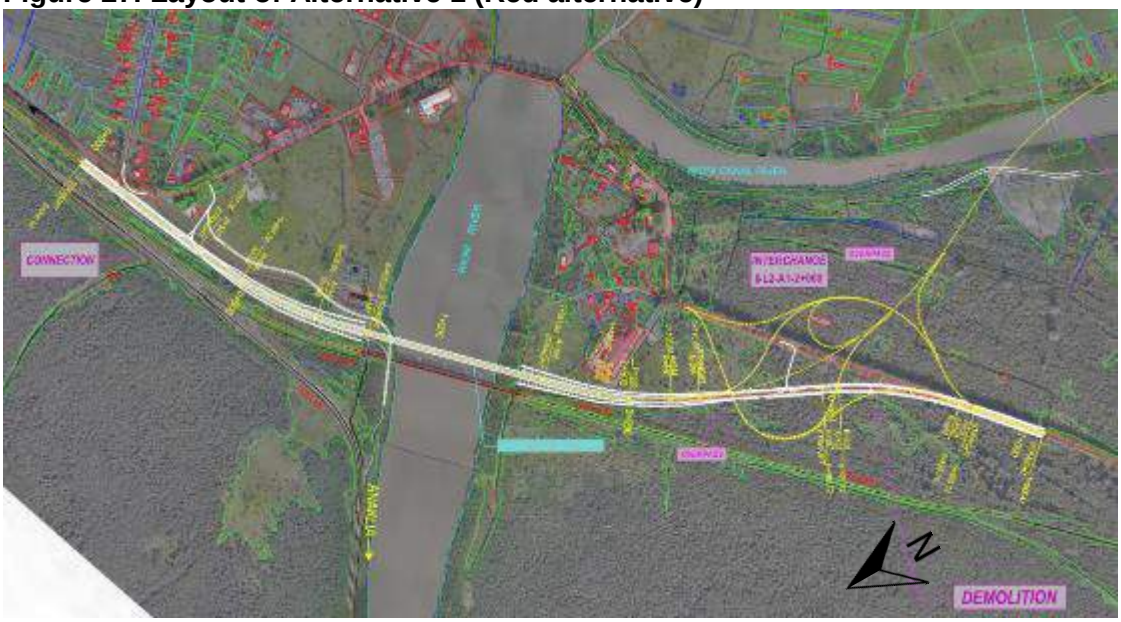
D.4.1 - Alternative 1

244. The alignment starts by connecting with E-60 highway to Senaki in a straight alignment of 360 meters. The new road keeps a straight alignment parallel to the railway (approximately 40 m from the railway line) while crossing Rioni River for 450 m. After crossing the Rioni River, the alignment passes closely to the west side of the Nikora Ltd meat factory before curving south towards the existing road towards Poti.

245. Where the alignment begins, several junctions are planned. At pk 0+250, a triangular traffic island will be constructed to facilitate the entry of vehicles from the realigned secondary road to the main road. allow for right movements and accommodate traffic on the realigned secondary ro. The intersection will be completed with acceleration and deceleration lanes to join the secondary carriageway. A roundabout has also been projected on the road from Patara Poti to Poti to provide access to Patara Poti and to the secondary road leading to the oil terminal. The road finishes at pk 2+500 where the new road joins the exiting road towards Poti.

246. The length of the Alternative 1 (red alternative) bridge is the shortest, consequently the number of piers within the riverbed will be lower compared to other two options. This means that number of piers, duration of works in/near water and, respectively the ‘duration’ of impact on water and risk of water pollution is lower than in Alternatives 2 and 3.

Figure 27. Layout of Alternative 1 (Red alternative)



D.4.2 - Alternative 2

247. The alignment connects with the E-60 highway to Senaki like Alignment 1. By means of two big S-curves the Rioni River is crossed. The road moves away from the railway with a big S-curve before crossing the Rioni River with a bridge of 370 m in length. After crossing the river, the road makes another S-curve and passes east of the Nikora Ltd meat factory before connecting with the current road similar to Alignment 1.

248. A T-intersection would be constructed at pk 0+550 with the same configuration of the waiting lane in the Alignment 1. This intersection allows for relocation of the secondary road which runs to the oil terminal. The second intersection is at the end of the alignment and provides connection to the exiting road towards to Poti.

Figure 28. Layout of Alternative 2 (Yellow alternative)

D.4.3 - Alternative 3

249. The alignment begins with the same layout as Alternative 1 and 2 by connection with the E-60 highway to Senaki in a tangent alignment. This alternative moves away from the railway and crosses the Rioni River in a straight alignment with a 350 m long bridge. Two 850 m radii S-curves matching the current road with a total length of 1,200 m then bring the road into alignment with the existing road. Two underpasses will need to be constructed to maintain access to residences near the meat factory and where the new road crosses over the existing road before it connects to that same road toward the direction of Poti.

250. A T-intersection at pk 0+550 is planned with the same configuration of the waiting lane described in the Alignment 1 which connects Patara Poti with the new road and allows relocation of the secondary road to the oil terminal.

Figure 29. Layout of Alternative 3 (Blue alternative)

D.5 - Alternative Bridge Design

251. A number of structural options were considered in the feasibility and detailed design phases. Several possible solutions were discarded immediately due to their cost and construction difficulties, mainly taking into account the nature of soils present in the area (very soft soils) and the seismicity in the area.

252. The Composite deck bridge option was not considered an option because of the construction cost (around 15-20% over similar concrete bridges) and because of the important maintenance cost in metallic structures, as the sea is very close to the bridge.

253. The Cast in place Cantilever option was also identified as problematic considering that central spans of approx. 100m would lead to a height of the deck over the piers of more than 5m (1/20 of span). This implies that the longitudinal profile over the River would need to be raised, causing problems in the connection with the existing road and, the most important under a cost point of view, causing the need to massively increase the geotechnical treatments to improve the existing soils under the lateral embankments. Also, this kind of bridge deign requires construction methods not easily available in Georgia, and a long construction period. For all the above-mentioned reasons, cable stayed bridges were also not considered further.

254. Based on the considerations described, the choice was narrowed down to precast deck, cast in place box, and voided slab. A number of bridge designs were also considered in addition to bridge typologies. The first iterations of the bridge design favored precast I beams with cast in place slab and 12 total piers, including 8 piers on the river. A major driver for design changes

early in the design phase were concerns with the bridge's overall footprint in the river and the potential for impacts on aquatic fauna, including sturgeon. Consideration for these potential impacts led to design modified resulting in a preferred superstructure design, precast deck bridge, with a total of seven piers, only three of which would be within the river year-round (piers P2 and P6 are seasonally submerged in the river, see Figure 21).

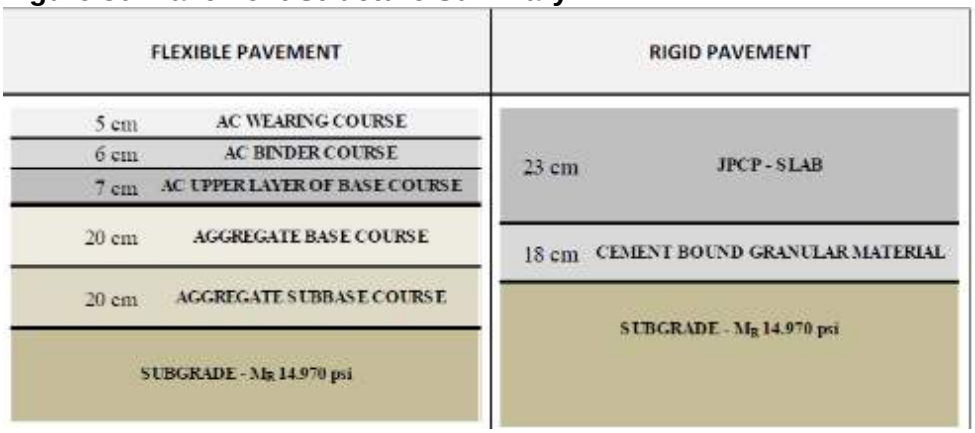
D.6 - Alternative Pavement

255. Flexible (Asphalt concrete) and rigid (cement concrete) pavement structures were considered for the Project. The service life of the pavement structure varies and depends on highway facilities and features. TEM Standards recommend that the design lifetime of flexible pavement is 20 years. On the other hand, that of rigid pavement should be up to 40 years.

256. Rigid pavement has advantages over flexible pavement including having longer service life, requiring less maintenance costs, and more resistant to deformation during construction. However, because of the geological and geotechnical characteristics of the Project area, including the presence of soft soils along the corridor and expected differential settlements, the flexible pavement alternative was chosen as the preferred option.

257. The following table summarizes the pavement thickness calculated for each section and type of pavement:

Figure 30. Pavement Structure Summary



D.7 - Alternative Runoff and Spill Management Solutions

258. In order to protect biodiversity and support sustainable management of living natural resources in the Project area and beyond, various alternatives (e.g., swales, detention basins, incorporated storage within the superstructure, and containment tanks and vaults) were considered to protect water quality in the Rioni River during construction and operation of the bridge.

259. Closed storage facilities typically cost more per unit volume to construct and maintain than detention basins, however the advantage of the system is that it can be placed below ground and can reduce the potential contact of spilled contaminants with the atmosphere, rainwater, or soils. Due to reduced potential for transport and dispersion of hazardous materials to the environment, closed systems are generally recommended for hazardous spill control.

260. While degradation of the Rioni River from pollution owing to accidentally spilled fuel/oil or surface runoff from the bridge represents a smaller and infrequent potential operational impact, it could, if left unmitigated, have overall high consequences if left unmitigated. Therefore, a drainage system which collects water into to two retention chambers (one on each side of the bridge) has been chosen as the preferred option (see Section **C.5.3 - Bridge Runoff and Spill Containment Chamber**). The TOR for the Road Maintenance Contractor for the operations phase will include regular monitoring of retention structures, and safe disposal of contents after any spills.

E. Description of the Environment

E.1 - Physical Resources

E.1.1 - Meteorology and Climate

E.1.1.1 – Existing Climate

261. Western Georgia has prevailing subtropical climate, influenced mainly by dry air masses from the Caspian and Central Asia in the east, and humid air from the Black Sea in the west. The Caucasian ridge, located north-east to the site protects the area from cold air masses coming from the north. At the same time high ridges favor condensation and therefore humidity is rather high. The area is known for high level of precipitations. According to climatic characterizations, the project region belongs to III-b climatic sub-region.

262. Seasonal pattern of wind direction is predetermined by location of Lesser Caucasus and Likhi ridges which are responsible for regulation of air circulation regime. Wind directions are characterized by seasonal variations and depend on topography of the area.

263. The climate of Khobi municipality is warm and humid. Total annual precipitation mainly in the form of rain, amounts to 1,500-1,600 mm and is roughly equally distributed throughout the four seasons. The average monthly temperature in January, the coldest month, is about 4.5 - 4.7ºC, while that of August, the warmest month is 22.4 – 22.6ºC. However, the maximum temperature in August has been known to reach 34ºC. The region is characterized by relatively high humidity and strong winds.

264. The air flow regime is greatly affected by local circulation, resulting from the uneven heating of sea and land surfaces, manifested in breezes, monsoons, and mountain-valley winds. According to multi-year hydrometeorological observations, until the 1990s the mean annual air temperature in the coastal area varied in the range of +14.4-14.5ºC and annual sums of precipitation from 1,400 mm to 2,600 mm (Batumi). In the last half-a-century, hydrometeorological parameters of the Black Sea coastal zone underwent certain changes in relation to the global climate changes. During the past century until the beginning of the 1990s, the air temperature decreased by 0.2-0.3ºC though, for the last 16 years it increased by 0.2ºC. Compared to the 1960s, the precipitation in Poti for the last 15-20 years has grown by 13%, but in Batumi it has declined by five percent. Quite similar to the air temperature, the sea surface temperature had decreased by 1ºC throughout 1924-1996. However, in 1990-2006 it had grown by 1.3ºC, as a result of which the cooling of the sea surface at present equals 0.8ºC, compared to the 1924 value.

265. According to meteorological stations in Poti, east winds dominate in the Project area. The winds have a seasonal character: in winter is characterized north-east whereas in summer south-west winds are prevailing. The wind regime in Poti follows a regular annual cycle. Seasonal \ wind direction patterns are predetermined by location of Lesser Caucasus and Likhi ridges which are responsible for regulation of air circulation regime. Because of its geographic location Poti is usually subject to east winds (air masses coming from Caucasus ridge). In summer south-west and west winds are prevailing, whereas in winter east winds are frequent. Winds directions are characterized by seasonal variations and depend on topography of the area.

266. For Poti area east-west direction monsoon winds are typical, however, west, and south-west winds dominate. Average wind speed is 4.3 m/sec, maximum speed may reach 26 m/sec. In the coastal area of Poti in October-March, strong east winds are common. These winds can be very strong and last several days reaching speeds of 40 m/sec. Such winds are registered in the area from Supsa to Enguri River and in the can be observed off land 10 miles from the shoreline.

267. Climatic characteristics of the Project area, based on Construction Climatology (PN 01.05-08, Tbilisi 2009), are given below:

Table 24. Air Temperature

Location	Average Monthly												Average Annual
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Poti park	5.2	5.8	8.7	12.0	16.6	20.3	22.9	23.0	19.8	15.9	11.8	7.1	14.1
Poti port	5.7	6.4	8.8	11.9	16.4	20.3	23.1	23.5	20.5	16.5	11.9	7.9	14.4

Location	Abs min	Abs max	Aver max, hottest month	Coldest month 5-day aver	Coldest month aver	Coldest period average	Period with average monthly T<8C		Aver T at 13:00	
							Duration day	Aver T	Coldest month	Hottest month
Poti Park	-13	41	27.3	-2	-5	5.0	91	5.9	7.9	26.2
Poti Port	-11	41	26.9	-3	-5	5.3	83	6.5	7.9	26.2

Table 25. Air Temperature Amplitude

Location	Average monthly ^{0}C												Max monthly ^{0}C											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Poti park	7.0	7.5	8.5	9.2	8.6	8.0	6.7	7.2	8.5	9.1	8.3	7.0	14.5	14.7	16.9	18.6	17.6	15.8	14.0	15.1	16.7	18.5	17.0	15.1
Poti port	6.5	7.0	7.9	8.0	7.7	7.2	6.3	6.9	7.9	8.5	7.8	6.8	16.5	17.2	18.0	18.5	17.6	17.0	16.8	17.0	17.5	19.0	18.0	17.2

Table 26. Relative Humidity

Location	Relative air humidity, %													Average relative humidity at 13:00		Aver. daily amplitude of relative humidity	
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Aver Annual	Coldest month	Hottest month	Coldest month	Hottest month
Poti park	74	74	75	78	80	82	83	84	85	81	75	72	79	65	74	14	16
Poti port	72	73	75	78	82	82	83	83	83	79	73	70	78	64	73	15	15

Table 27. Precipitation

Location	Precipitation per year, mm	Daily maximum, mm
Poti park	1865	223
Poti port	1720	268

Table 28. Snow Cover

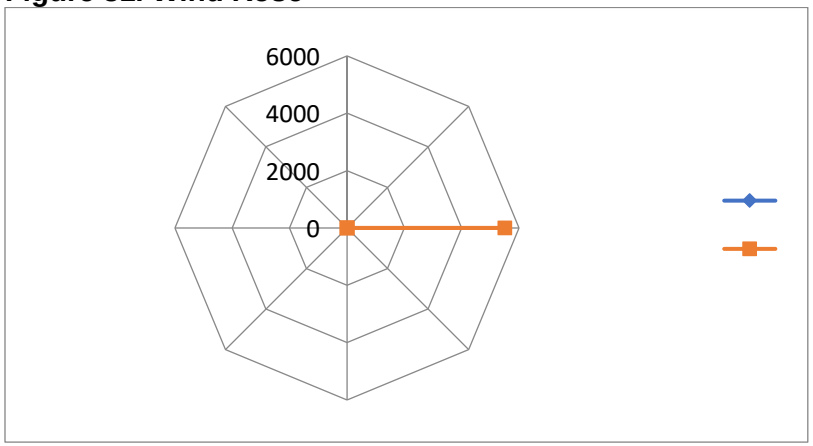
Location	Weight of snow cover, kPa	Days with snow cover	Water content in snow layer, mm
Poti park	0.50	6	-
Poti port	0.50	6	-

Ground freezing depth. 0

Table 29. Wind Characteristics

	Max speed once in 1,5,10,15,20 yrs, m/sec					Recurrence of direction (%) January, July								Aver. max & min velocity, m/sec		Wind direction and calm recurrence (%) per year								
	1	5	10	15	20	N	NE	E	SE	S	SW	W	NW	Jan	Jul	N	NE	E	SE	S	SW	W	NW	Calm
Poti park	21	27	29	31	33	2/2	17/8	53/8	5/4	3/11	6/31	9/26	5/10	7.8/2.4	3.5/1.7	4	12	30	5	7	17	17	8	14
Poti port	26	32	34	37	38	1/2	8/3	62/12	4/4	3/10	7/37	11/27	4/5	8.3/3.5	4.6/2.0	3	7	37	4	6	21	17	5	8

Figure 31. Wind Rose



268. Soil temperature is maximal in July and August and reaches 26-25ºC respectively. The soil temperature exceeds the average air temperature value by several degrees. In winter, soil and air temperatures are similar which presumably is conditioned by the presence of the Black Sea. Soil freezing depth is zero cm.

E.1.1.2 – Climate Change

269. During the last 50 years average annual temperature on the whole territory of Georgia showed an increasing trend. Its maximum increment in West Georgia (+0.60ºC) was registered in Poti. According to forecast, by 2050, as compared with 1986- 2010, warming will mostly occur in coastal zone and mountainous regions of Adjara (1.6-1.7^{0}C), and by 2100 the biggest increment of temperature (+4.2^{0}C) is anticipated in Batumi. In general, precipitation increased in most regions of West Georgia. Up to 2050, according to the forecast, sustainable trends of increase of precipitation is anticipated. Decrease by 10-20% will begin until 2100. Relative humidity of air in the period of 1961- 2010 increased by two percent on the entire territory of Georgia, although change of this trend in declining direction is anticipated in the region under consideration in 2050-2100. Average annual wind speed significantly decreased on the whole territory and according to the forecast, this decrease will continue till the end of the century.

270. A recent U.S. Agency for International Development (USAID) publication[26] assessed future climate change (years 2020-2050) for the Lower Rioni Pilot Watershed Area (including Khobi Municipality) according to the regional PRECIS model[27], in which the ECHAM4 global model[28] and two (A2, B2) scenarios[29] of the world socio-economic development were used. Mean values of total average air temperature and total precipitation were calculated by ECHAM4 and HADCM3 models. The scenarios of climate parameter changes were reviewed through ECHAM4, A2, B2 and HADCM3 A2 models. Results indicated the following:

- According to both scenarios, **yearly values of average temperature** show an increase in all seasons. Increased temperature is projected especially in summer (2.50C). In other seasons average temperature rises by 20C.
- Values of **average maximum of atmospheric temperature** also increase according to both scenarios in all seasons and, accordingly, yearly. The minimum increment in spring equals 0.90C, while in other seasons this parameter is 20C. According to the B2 scenario, the annual increase of average maximum temperature is 20C, and by the A2 scenario, maximum temperature increase is greatest in autumn (1.40C), while it warms up by 10C in other seasons.
- **Average minimum temperature**, except transitional seasons, experiences more warming in all seasons than the maximum temperature. The annual minimum is expected to rise by 1.3-1.90C. By both scenarios, in winter minimums will warm up by 2-2.40C. In all other seasons minimum parameters repeat the character of the maximum variations. According to the B2 scenario, this parameter raises more than according to A2 one. In this case winter and summer experience more warming. By the A2 scenario, this warming is less than 10C per each season, and annual minimum rises by 1.30C.

[26] GLOWS-FIU. 2013. Technical Report 20: Assessment of Natural Disasters and Climate Change for Lower Rioni Pilot Watershed Area, Plan of Mitigation & Adaptation Measures
[27] The PRECIS climate model (stands for "Providing REgional Climates for Impacts Studies") is an atmospheric and land surface model of limited area and high resolution which is locatable over any part of the globe. https://www.metoffice.gov.uk/research/applied/international-development/precis
[28] https://www.ipcc-data.org/sim/gcm_clim/IS92A_SAR/echam4_info.html
[29] http://sedac.ciesin.columbia.edu/ddc/sres/

- **Total annual precipitation** that increases between two observation periods, according to the B2 scenario and A2 will be increased by 8% and 21% respectively. Precipitation in winter and summer will increase by 30-37%. According to the B2 scenario rainfalls intensify by 4% in autumn and lessen similarly in spring. In winter and summer the value of total seasonal precipitation raises by 21-16%.
- **Winters** will become warmer with fewer freezing days and with increased total and intensive precipitation.
- **Spring** is expected to be warmer and moderately dry, with an increased amount of extreme precipitation.
- **Summers** will be much hotter and extremely rainy.
- **Autumn** is expected to have considerable risk of heavy precipitation; though it will be warm with less risk of freezing.

E.1.2 - Geomorphology

271. Study area is located within Kolkheti accumulated lowland. This area represents a geotectonic depression, where a large number of terrigenous materials are accumulated. Geologically, the lowland is constructed through the 10 km thick Mesozoic and Tertiary sedimentary cliffy rocks. These deposits are covered by relatively recent Pliocene terrigenous material, with thickness of one km. Kolkheti tectonic submergence is continuing in the modern geological epoch, accordingly, sand-clayey sediments formation is on-going. The main role belongs to the lacustrine marshy sediments, the capacity of which in some places is 35-40 m. The following types of terrain are separated within the area of Kolkheti lowland:

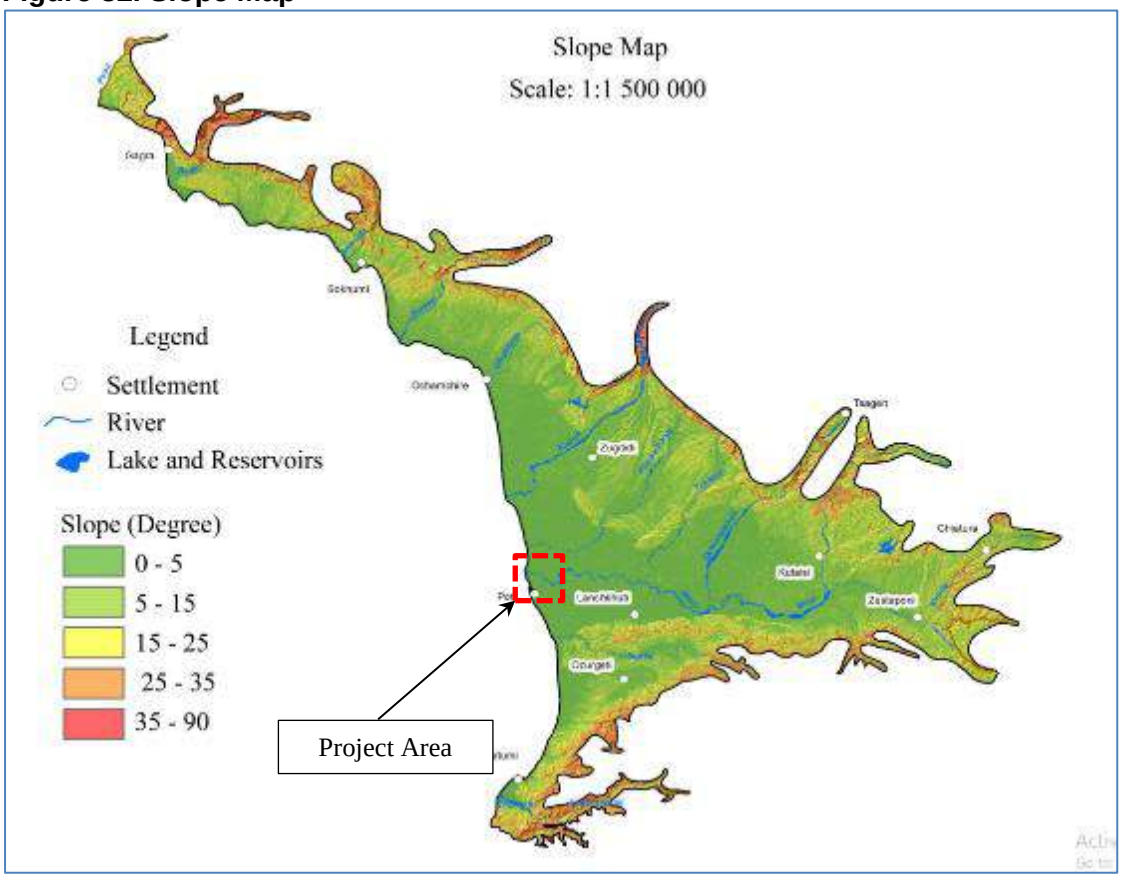
a) The coastal dune strip, which follows the sea cost and consists of 1-3 m high and 30-100 m wide sand dunes;
b) Alluvial lowland of the Rioni River, with flat, slightly westwards descended (0.0003-0.0005) terrain and absolute altitudes of 0-18 m; and
c) Alluvial and alluvial-marine lowland with almost flat surface dissected by old river beds and interfluve depressions, slightly outlined riverbeds and drainage canals.

272. The lowland is slightly inclined towards the sea; its average slope is 0.0005 m (see Figure 32). Western part is composed of wetlands. From the east to the west its absolute altitude varies from 10-18 m to 0-3 m. Within the boggy deposits, the terrain is composed of the peat domes elevated 3.04 m higher above the wetland surface.

273. The selected geographical location for construction of the project belongs to Kolkheti Lowland by its geo-morphological view point. Due to the geotechnical location it belongs to the Kolkheti sub-district of the western depression zone of the Georgian Block. The geological structure of the region is composed of quaternary deposits, which are attributed to the alluvial soils due to the genetic origin, with thicknesses exceeding several tens of meters.

274. Many areas in Kolkheti Lowlands are prone to subsidence, which is exacerbated by human activity, such as drainage of peatland and river impoundment. The subsidence rate of the region varies from 2 - 6 mm per year. Subsiding cities like Poti and Batumi are facing inundations by the sea already.

Figure 32. Slope Map



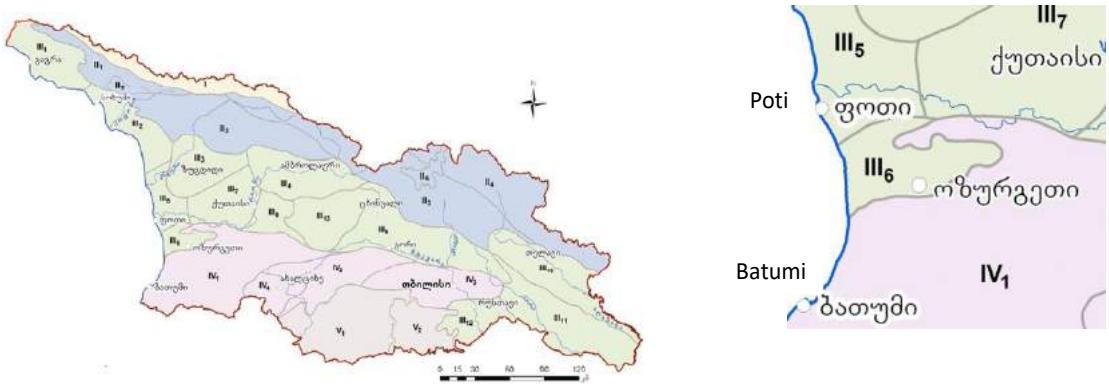
E.1.3 - Hydrogeology

275. According to hydrogeological zoning of Georgia, the project area belongs to the fractured and fractured/karstic artesian water basin of Dzirula crystalline massif.

276. The project region belongs to artesian basin zone of Georgian belt. In particular: III5 Porous, fractures and fractured/karstic artesian basin of Kolkheti and III6 Porous and fractures water artesian basin of Guria. Syncline structure, vertical succession of ancient and modern sediments, alternation of water-bearing, and impermeable strata favor formation and accumulation of pressure waters therein.

277. Fissured and cavernous character of water-bearing layers in recharge area causes infiltration of atmospheric water and formation of strong water-bearing horizons and complexes. Tectonic structure of artesian basin favors water accumulation and migration processes.

Figure 33. Hydrological Zoning Map

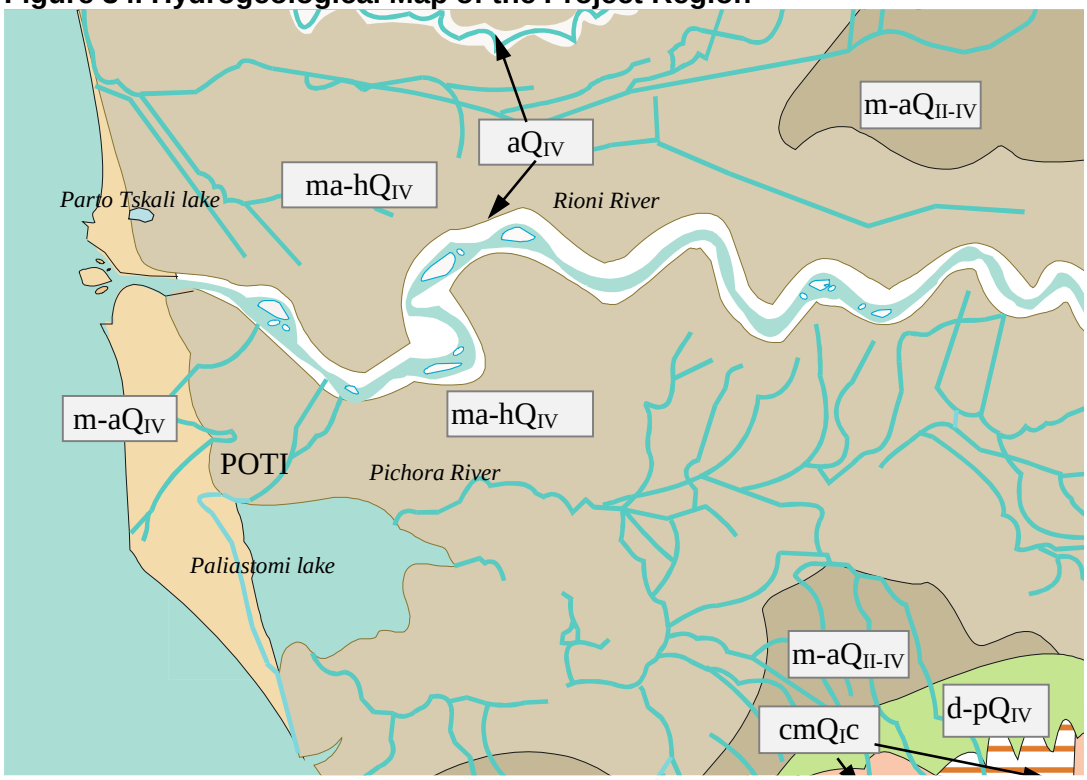


278. The Project area comprises the southern part of Kolkheti arterial basin. The aquifer within the area includes: (i) aquifer of modern alluvial formations (alQIV); (ii) Black Sea coastal aquifer of modern marine and alluvial deposits (amQIV); and (iii) aquifer of modern marsh formations (bQIV). Groundwater level in the project area varies from 0.3 cm to 2.0 cm, depending on the site.

279. Although groundwater is considered to be naturally protected from human impact, pollution has been observed in the areas around the Project site caused by non-point[30] sources. Water is supplied to Patara Poti via a centralized water supply system and groundwater testing was not conducted as part of this study. Pollution is due to hydraulic connection of the groundwater with polluted surface waters, landfills, or stocks of industrial wastes, fertilized agricultural lands, industrial facilities etc. Similar to other lowlands and intermountain regions with shallow subsoil and pressure waters, the boundaries of Kolkheti lowland are at risk of pollution caused by industrial, infrastructure development and other developments in the area. In Guria artesian basin, for instance, concentrations of phenols, nitrates and nitrites was found to exceed the maximum permissible levels. In areas like Poti and Supsa risk of pollution with petroleum products exist.

[30] Non-point sources are: surface wastes from agricultural fields; storm runoff from cities and landfills; municipal wastes from cities and settlements pollute water with organic matters, nitrogen and phosphorus compounds.

Figure 34. Hydrogeological Map of the Project Region



Legend

m-aQII-IV	Water bearing complex of middle-upper and modern quaternary sediments (pebble-boulders with sand interlayers, clays, clayeys)
ma-hQIV	Water-bearing complex of marine alluvial and lake-morass sediments (sands, clayeys, silt, clay with peat interlayers)
m-aQIV	Water-bearing horizon of modern marine and alluvial sediments (pebbles, sands, clayey, clays)
d-pQIV	Water-bearing horizon of modern deluvial-proluvial sediments (boulders, shingle, with sandy-clayey matrix)
cmQIc	Water-bearing horizon of continental-marine (Chaudian horizon – conglomerates, sandstones, clayey, clays)
aQIV	Water-bearing horizon of modern alluvial sediments (sands, clayey-sand lenses, boulders, pebbles

280. Water-bearing horizon of modern alluvial formations (alQ1V). This is a narrow, 1-2.5 m wide strip along Rioni riverbed. Lithology – water-bearing gorge and riverbed sediments presented by sands, clayey, seldom boulders. Capacity – 10-15 m. Properties of horizon depend on granulometric composition of rocks: pebble-boulders (5-10 l/sec); sands (1-10 l/sec) and sandstones (1 l/sec). Total mineralization is low (0.3-0.5 g/l); by chemical composition the water belongs to the hydrocarbonate-calcium, calcium-magnesium type. Total hardness 5-15 mg/eqw, temperature 14-18. The aquifer is in direct hydraulic connection with lower seated water-bearing horizons, mainly with Quaternary alluvial marine water-bearing complexes. Recharging is accomplished by infiltration of atmospheric water. Groundwater

regime is tightly connected with alternation of riverbed level. The higher the water level the higher the groundwater level and vice versa. Groundwaters are less safe bacteriologically since there is no protective level on their top.

281. Water-bearing complex of the coastal modern marine and alluvial sediments (amQ1V). Aquifer runs along the coastal strip. The zone is composed of dunes. Wateriness of aquifer is about 50 m/daily, for sandy-loam formations the figure is lower. Specific flows make 0.05-0.1 l/sec. Within the limits of sandy dunes fresh water lenses are met. In conditions of heavy rainfalls the lenses are expanding, while in dry weather they tend to shrink. The horizon is characterized by hydrochemical zoning; the deeper one goes the higher is the chloride content and so increases the salts content of the water in general. In conditions of intense exploitation mineralization of the fresh water lenses increases. The reason of this phenomena is inflow of chloride-sodium waters from beneath. Undergroundwater table is at about 1-3 m below the surface. and recharge is accomplished mainly at the expenses of atmospheric water infiltration. Discharge takes place both into the sea and in the lower points direction. Drinking water properties are good, however, due to the poor natural protection of the water body water is less safe microbiologically.

282. Water bearing horizon of modern morass formations (BQ1V). The aquifer is widely spread in the limits of Kolkheti lowland. From a lithological point of view it is composed of complexes: sandstones, clayey, clays and peats. Sequence of the rocks alters. Lenses are characteristic. Water bearing properties of the rocks can be different. They are hydraulically connected and form a united aquifer. The aquifer is 5-30 m (seldom 50 m) thick. Capacity raises in east, south east to west, north-west direction. Underground waters are bound with lenses formed in the sand strata. The lenses are located at different depths and are under hydraulic pressure. The filtration coefficient varies from 0.05 to 1-3 m/daily. Total mineralisation amounts to 0.3-0.7 g/l, wateriness is 0.1-1.0 /sec, total hardness1.7-3 mg/eq, of carbonaceous type. According to the chemical composition waters are hydrocarbonate-calcium-sodium type, the taste and odor is unpleasant. Recharge – atmospheric water, surface water and inflow of pressure water. The regime is predetermined by duration and volume of atmospheric water (rain and snowfall). The aquifer is polluted with organic matters.

E.1.4 - Hydrology

283. Kolkheti lowland has dense network of rivers with various types of feeding, morphology, and catchment capacity. Over 150 large and small rivers with their numerous tributaries discharge to the Black Sea. The rivers play vital role for the functionality of Kolkheti wetlands. The Kolkheti National Park is covered by dense network of the rivers. The larger rivers, like the Rioni and Khobi, run across the park territory. The smaller rivers include the Pichora, Dedabera, Tsiva, and Churia and originate in the lowland marshes or in the band of hills or small mountains and are mainly fed by rain water. The other surface water bodies include Paliastomi, Imnati, Patara Paliastomi, and Parto Tskali Lakes.

284. The main surface water bodies in the section of interest is the Rioni River. The Rioni River is the biggest river of the West Georgia and has a total catchment area of 13,400 km2, which is approximately 20% of the Georgian territory. The Rioni Basin is separated from Enguri basin by Svaneti ridge; from the Mtkvari basin - by Surami and Meskheti ridges; and from the Supsa – by Guria watershed ridge. The basin comprises Ambrolauri, Oni, Lentekhi and Tsageri municipalities of the Racha-Lechkhumi region; Tkibuli, Sachkhere, Khoni, Vani, Badgati, Kharagauli, Tskaltubo, Samtredia, Zestaphoni municipalities and the city of Kutaisi of the Imereti region, partially - Abasha, Senaki, Martvili, Khobi municipalities and the city of Poti of the Samegrelo-Zemo Svaneti region and, a small part of Chokhatauri and Lanchkhuti municipalities of the Guria region.

285. The Rioni River is 327 km long and originates from two sources on a southern slope of the Main Caucasus range at 2,960 m before ruining into the Black Sea near the city of Poti. In its upper reaches (Racha region) it proceeds in a narrow, deep gorge with a width of 50-70 m. Here its length is 115 km with a 7.2-degree gradient. After passing through Kutaisi it flows on a wide area of the Kolkheti lowland (plain). The river discharges into the Black Sea through multiple channels, but the majority of the flow passes through a bypass channel constructed in 1939 to protect Poti from flooding. The main tributaries of the river include Chishura, Khvargula, Jejora, Lukhunis tskali, Ritseula, Lajanuri, Tskhenistskali, Laskanura, Sakraula, Kvirila, Dzirula, Khanistskali, and Chkherimela.

286. The average flow depth of the water in the river is 635 cm, and the maximum depth amounts to 745 cm (hydro station at Sakochako - 1956). The Rioni has an average annual flow of more than 100 m3 /second.[31] The maximum recorded water flow in the north branch of the river is 1,400 m3 / sec. The river is navigable along its 95 km long section upstream of the mouth.

287. The river is not classified as mudflow hazard in the project area. Average velocity of the stream is low; accumulation zones constitute of fine material; and no coarse debris are observed in the riverbed. The riverbed strata consists of soft clay and saturated silt layers, which are prone to large consolidation of settlements. The river has an important role in the formation and morphology of the coastal strip of the Black Sea and in preservation of ecological and biological balance of the continental shelf.

288. The Rioni River frequently experiences flooding which impacted habituated areas and infrastructure. Every year during the spring flood seasons land plots along the both banks of the river were being washed away due to violent meandering of the river. In response to this problem a bank protection dam was built in 1939 to reduce the flooding effects. Its structure consists of two parts: (i) Main weir on river Rioni; and (ii) Left bank regulator on Poti channel. In 1977 the Vartsikhe reservoir was built which allowed for regulating the flow in the downstream section.

289. Major issues for the Rioni River include surface water pollution by wastes and unsustainable water use. Water pollution is connected with human activity. It comes from point[32] and non-point sources. Man-caused impact on the Rioni River quality is significant. Along with industrial sites present in the catchment area, the hotspots include: landfills, former military sites, abandoned industrial sites (e.g., sawmills, barite, asphalt, building material, manganese, ferrous-alloys, arsenic production facilities, and fish processing facilities), waste water discharge points, port of Poti activity, including oil shipment facilities, dumpsites. Due to natural processes, in spring, particularly during the rapid increase in flow rate, total suspended solids increase significantly reducing visibility in the water column. Concentration of SiO2 and Mn+2 on such occasions may reach 4.1 mg/dm3 and 1.2 mg/dm and the salt content can reach as high as 300 mg/dm.

[31] Jaoshvili Sh. The rivers of the Black Sea. European Environmental Agency. Technical report no. 71. 2002

[32] Point sources include: municipal wastes from cities and settlements; industrial wastes; wastes from hospitals, recreation and other health centres.

Table 30. Rioni River Water Discharge - Observation data, hydrostation Sakochakidze, m^3/sec

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Average monthly	295	365	458	646	660	539	394	297	242	301	327	352
Average Of instantaneous maximum	773	916	1,086	1,399	1,267	1,292	994	927	631	932	1,080	1,198
Average Of daily maximum	696	834	982	1,261	1,206	1,151	909	814	570	862	947	1,055
Observed instantaneous maximum	1,840	2,280	2,520	4,650	2,280	3,000	2,580	3,520	1,590	2,140	3,330	2,780
Observed daily maximum	1,840	2,210	2,390	3,430	2,280	2,580	2,340	3,310	1,360	2,040	3,160	2,480

Note: In order to determine flood and freshet risk periods on the Rioni River, observation data from 1947-1986 at the Sakochakidze village hydrological station were used. The observations were carried out on water discharges in the years 1938-1946, with the exception of some years; from 1947-1986 the data is continuous.
Source: GLOWS-FIU. 2013. Technical Report 20: Assessment of Natural Disasters and Climate Change for Lower Rioni Pilot Watershed Area, Plan of Mitigation & Adaptation Measures

Table 31. Rioni River Water Discharge - Flood Recurrence Intervals, m^3/sec

Rioni River Section	Basin area, km2	Flood Recurrence Interval			
		100	50	20	10
Rioni River – Poti (northern branch)	13,300	3,150	2,950	2,500	2,200
Rioni River – Poti (southern branch)	13,300	250	250	250	250

Source: SakTsqalProekti Design Institute (Georgian hydroengineering institute)

290. **Sediment Loads in the Rioni River.** The area of the Rioni River delta totals 20 km^2. The average amount of sediments discharged into the Black Sea on a yearly basis is 13,000,000 m^3 per year. The sediment transported by the river is distributed by means of lock-distributor between the Rioni channel and the city channel (the former riverbed of Rioni river). 28% goes to the city channel whereas the rest 72% to the Rioni channel.

291. The sediments carried by the river are of great importance since they have considerable impact on the sea coast evolution and affect the preservation of the beach. Quantitative characteristics of river alluvium predetermine dynamics of the shore, stability of the sea bed and the shelf area, define sediment migration patterns, etc. Because of the sediment transport in the new delta, the port of Poti needs to dredge approximately one million tons of accumulated sediment every year in the port area in order to maintain access. Characteristics of sediment flow of the main rivers in the project area are given in Table 32.

292. Density of the Rioni River water, even in conditions of the maximum turbidity, is less (1006 km/m3). Grain size analysis of suspended matters shows that for Rioni River sandy-silt sediments are characteristic. The grain size in case of high and low water is <0.1 mm (50-80%) and <0.05mm (70%) respectively.

293. On average, Rioni River sediments contributes to 10% of the suspended solids transport. The total amount of sediments in the Rioni channel amounts to 3.39 million tons per year, while for the city channel the figure is 2.63 million tons per year.

Table 32. River Load: Rivers of the Eastern Littoral, Georgia

River	River Discharge			Coastal Deposits	Marine Deposits
	[x10^3 t/year]	[x10^3 m^3 / year]	[m^3 / km^2 year]	[x10^3 m^3 / year]	[x10^3 m^3 / year]
Psou	158	90.8	215	38	52.8
Khashupse	80.5	46	230	23.8	22.2
Zhove-Kvara	53.7	30.7	426	15.3	15.4
Bzyb	767	445	295	133	312
Mchishta	20.2	11.7	69.2	2.2	9.5
Khipsta	34.4	19.7	119	11	8.7
Aapsta	37.7	21.6	88.8	9.5	12.1
Gumista	264	153	265	46	107
Besleti	12	6.85	84	2.5	4.35
Kelasuri	84.2	48.5	220	27.4	21.1
Madzharka	15.9	9.05	79.3	5	4.05
Kodori	1295	754	371	362	392
Tumush	3.35	1.9	30.5	0.85	1.05
Dgamysh	9	5.1	42.5	1.85	3.25
Mokva	46.8	27.5	81.9	8.3	19.2
Galidzga	94.7	54.6	113	21.6	33
Okumi	34.5	19.7	74.5	7.2	125
Khobi	221	130	97	40	90
Rioni-north	3390	1990	264	610	1380
Rioni-south	2630	1550	-	450	1100
Supsa	246	143	126	46	97
Natanebi	146	84.9	129	36.2	48.7

Kintrishi	22.3	12.6	43.2	6.9	5.7
Chakvistskali	19	10.6	61.4	8.5	2.1
Chorokhi	8440	4920	222	2310	2610

Source: Jaoshvili, 2002

E.1.5 - Geology

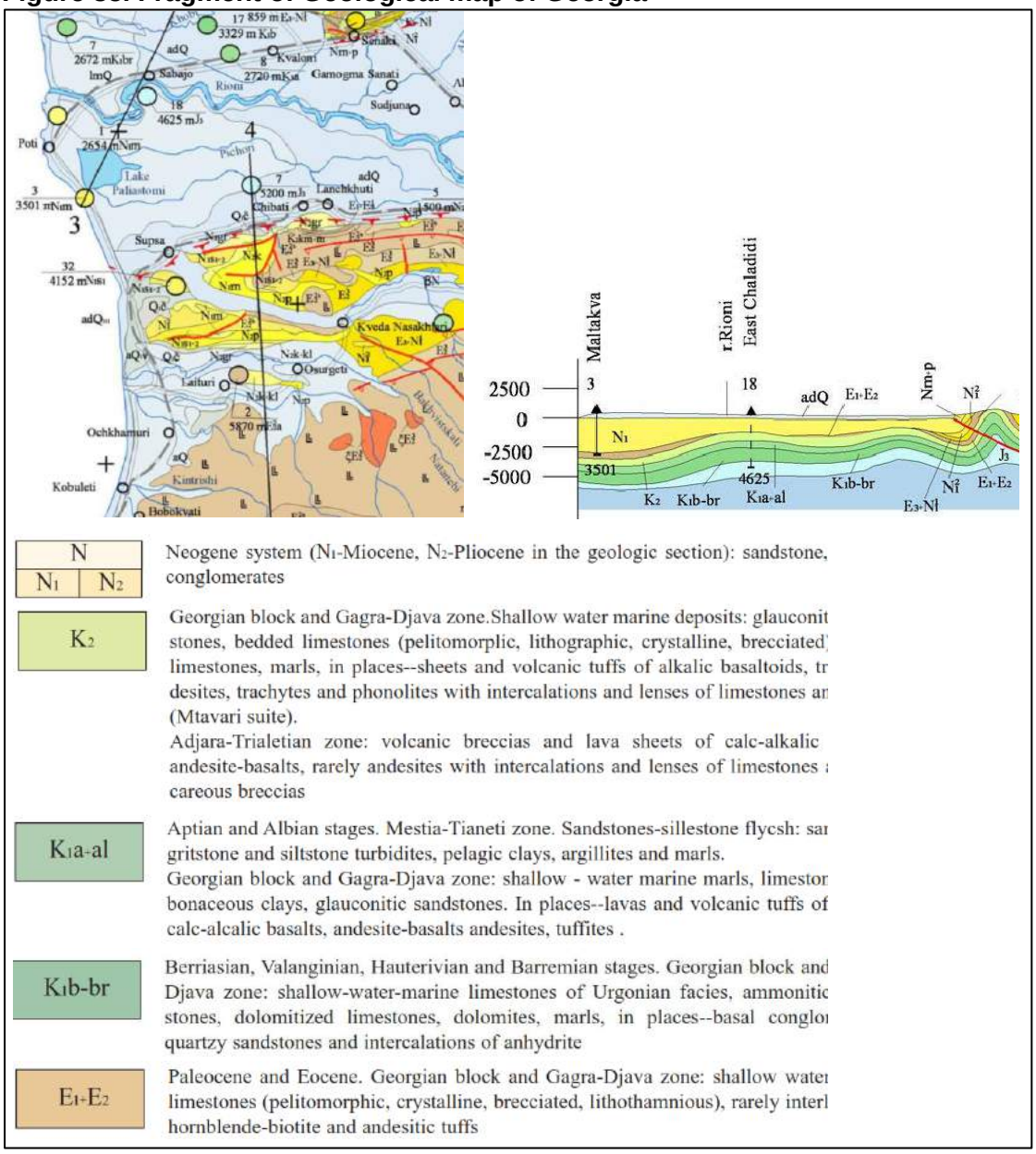
294. The geological structure of the district is represented by Quaternary deposits, over several tens of meters thick alluvial soils. The Quaternary deposits are represented by marine and continental accumulations. Marine sediments are found mainly in the coastal zone and are overlaid with alluvial, proluvial, and morass sediments. Moving toward the east these accumulations are substituted for continental faces. Alluvial sediments are found north of the coastal area, while morass sediments are present in the coastal strip of the Black Sea and Rioni River lowland.

295. Marine sediments - Chaudian strata (Q1cd) lithology consists of grey clays, sandstones, and seldomly conglomerates. In lowlands the upper part of the strata is composed of dark and grey clays, and sandstones with coarse grain sandy interlayers. Capacity of Chaudian layers is raising in the east to west direction with a maximum in the outskirts of Poti. Lower Euxinic layers overlay Chaudian strata and consist of sandy clays and fine grain sands. Capacity attains 100 m and increases in the north to south and the east to west direction. Uzunlar horizon in Poti city area is 6 m thick. Caragane layers are found in Paliastomi lake environs. The strata is composed of sandy clays and is 27 m thick. Upper Euxinic horizon is presented by grey and black clays and sands (Capacity 80-100). Lower Black Sea strata is composed of clays, black sandy clays and pebbles (20-25 m).

296. Continental sediments - Quaternary sediments (Q1-3) consist of pebble – boulders, sandy clays, and clay formations. In the east part of Kolkheti lowland pebble – boulders are widespread. In sea direction these formations are dipping. They are covered with clayeys and dismembered. Capacity – 10-70 m. At the same time, the rocks are substituted for sands and clay formations. Similar pattern is characteristic for Paliastomi lake area (up to 70-80 m depth). Dominating are sandy and clayey formations. Overall capacity of the Quaternary sediments is 300 m and higher. Capacity raises from the periphery towards the central area and in east to west direction, where capacity is changing in compliance with the structure of pre-Quaternary sediments.

297. Modern alluvial sediments are widespread in the ravines of Supsa and Rioni rivers. 15-20 m capacity pebbles, sands, clays, and clayeys are found here. Upper Quaternary alluvial and alluvial marine sediments are covered with morass lowland sediments composed of silt and sandy clayey formations substituted with humus substances. Peat lenses and layers are formed. The latter are present at 10-12 m depth.

Figure 35. Fragment of Geological map of Georgia[33]



298. Overall capacity of these sediments is 30-40 m. Modern alluvial-marine formations are located along the littoral strip. Lithologically they are presented by medium and large grain sands and pebbles, whereas in river confluences clayey small grain sands and clays are found. The dunes are 3 - 4 m high. Frequent winds cause inland transition of dunes. Dunes are wedging in marshes.

299. The geology of the Poti and Supsa area (Kolkheti depression) is dominated by sedimentary deposits from the Holocene period which are of lacustrine origin. These sediments form the entire central part of the lowland and reach several hundred meters in thickness. Lithologically, these formations consist of clays, silts, and peat, whereas the underlying strata include sands, silty sands and silts. The main founding strata of the diversion structure are the silts with occasional lenses of sand and peat.

[33] Georgian State Department of Geology and National Oil Company "SAQNAVTOBI", 2003.

E.1.6 - Soils

300. The territory is basically structured by recent (Q4) – new black marine, old black marine (Holocene) and upper quaternary Q3 – new Euxine, beach, and deltaic loose quaternary deposits. In the region, gathering deposits were connected to transgressions and regressions. Gathering deposits from about 30 m to 100 m are connected to new Euxine regression, but gathering younger deposits (from 15 m to 30 m) are connected to Pontic and Kolkhian regressions; as for the upper layer gathering deposits to 15.0 m depth are connected to Lazian transgression. The soils are structured by quaternary deposits; their thickness is more than 100 m.

301. Description of the study area is given below:

<table>
<tr>
<td>QUATERNARY. Delta deposits (QD)
Represent the products of erosion and drift from the hills. They are composed of gravel, sands and silt. The lithological column greenish grey muddy clay with interleaves of vegetal rest, fine sands with gravel interlayers have been observed.

 
Silty clay extract from the BH-6</td>
<td>QUATERNARY. Paludal deposits (QP)
These deposits have formed in anoxic conditions which favored degradation and conservation of organic matter. They are represented mainly by peat. Peat and moisture loving plants are spread on the surface.

 
View of peat from Pit-8</td>
</tr>
<tr>
<td>QUATERNARY. Alluvial deposits (Qal)
These deposits are found in the fluvial courses (such as the Rioni, Supsa and Natanebi rivers). They are formed by gravel, sands, silt and clays
  </td>
<td></td>
</tr>
</table>

302. Georgia is notable for diversity of soils. According to the features of soils, there are primarily three different soil areas, with sub-areas, zones, and regions which can be distinguished.

303. The Western Georgia soils are represented by:

I. Sub-area of Intermountain Plains - Zone of podzol and swampy soils of the western Georgia:
- The region of swampy soils of the western lower part of the Kolkheti lowland;
- The region of podzol and alluvial soils of Abkhazia-Samegrelo;
- The region of podzol and alluvial soils of the eastern part of the Kolkheti plain (Imereti); and
- The region of podzol and alluvial soils of the southern part of the Kolkheti plain (Guria-Ajara).

II. Sub-area of the Greater Caucasus –

a) The zone of red and yellow soils of hilly foothills
   - The region of yellow and humus-carbonate soils of the foothills of Abkhazia;
   - The region of yellow, red and humus-carbonate soils of the foothills of the southern Abkhazia-Samegrelo;
   - The region of red soils of the Okriba depression; and
   - The region of humus-carbonate soils of the Imereti hills.

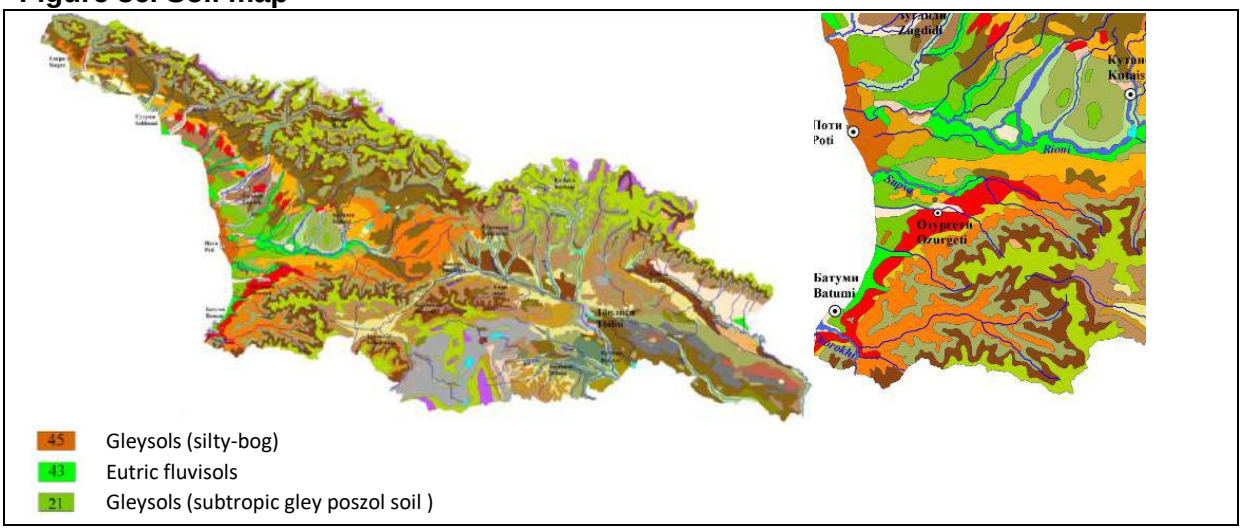
b) The zone of mountain-forest soils
   - The region of humus-carbonate soils of the karst-limestone belt of the southern slope of the Greater Caucasus;
   - The region of mountain grey and podzol soils of the medium mountainous zone of the western part of the Greater Caucasus;
   - The region of grey, podzol and humus-carbonate soils of Zemo Imereti and the Surami ridge; and
   - The region of humus-carbonate and forest grey soils of Racha-Lechkhumi.

c) The zone of mountain-meadow soils
   - The region of mountain-meadow turfy, turf-peaty and primitive soils of the high mountainous crystal massif of the western part of the Greater Caucasus (Abkhazia, Svaneti); and
   - The region of mountain-meadow soils of the Samegrelo-Racha ridges (Zemo Imereti).
   - Sub-area of Transverse Ridges of the Southern Highlands - The zone of red and yellow soils of hilly foothills
   - The region of yellow, mountain grey and humus-carbonate of the northern slope of the Meskheti ridge;
   - The region of red soils of hilly foothills of Adjara-Guria;
   - The region of mountain grey soils of the medium mountainous zone of the Meskheti ridge;
   - The region of mountain grey soils of the medium mountainous zone of Adjara-Guria and the Shavsheti ridge; and
   - The region of mountain-meadow turfy and turf-peaty soils of the high mountainous zone of the Adjara-Imereti and Shavsheti ridges

304. In the project area, the soils are represented by sub-area of intermountain plains – the region of podzol and alluvial soils of the southern part of the Kolkheti Lowland (Guria-Ajara). In the area of interest gleysols dominate, in narrow strip along the Supsa River – Eutric fluvisols are present.

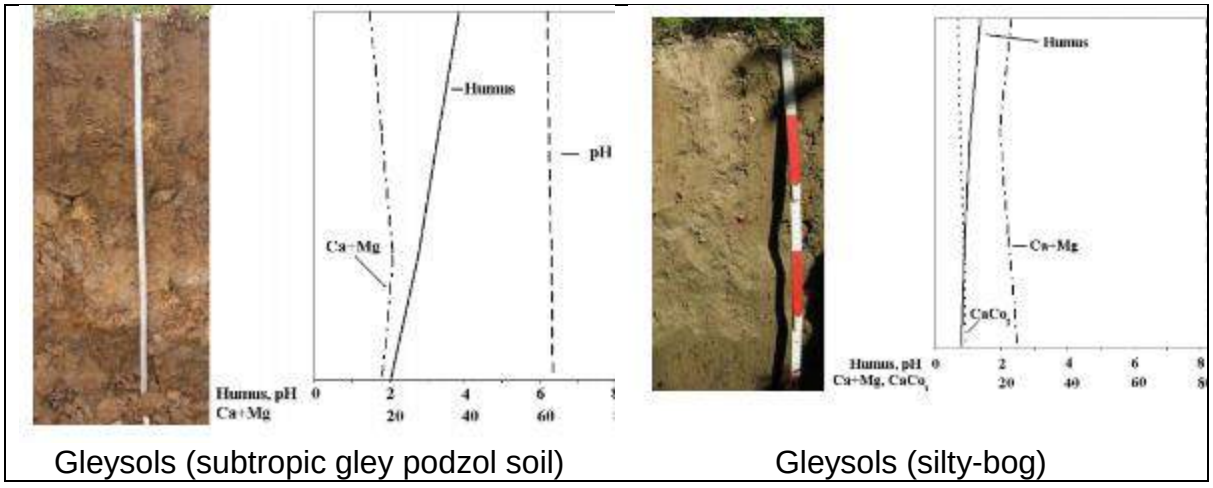
305. Gleysols (subtropic gley podzol soil) account for 1.8% (119.04 ha) of the total area of Georgia. Humus content is moderate. Moderate is content of hygroscopic water. Specific weight is in 1.24 - 1.41 interval. Content of hydrolyzable nitrogen is moderate or low. Soils are rich in absorbed phosphorus and poor in exchangeable potassium. Natural pollution with radionuclides is often observed.

Figure 36. Soil map



306. Gleysols (silty-bog) are typical for Kolkheti lowland. They account for 0.6% (417km^2) of the total area of Georgia. Are poor with total nitrogen (moderately or rich in hydrolysable nitrogen, poor or moderately in phosphorus, poor in total and exchangeable potassium. Natural pollution with radionuclides is often observed.

Figure 37. Soils in the Project Area



Gleysols (subtropic gley podzol soil) Gleysols (silty-bog)

307. Silty podzol soils are typical for the uplift areas of Kolkheti lowland. In Grigoleti, Maltakva and towards the north, peat fen soils are registered. North and south to the Supsa delta, in the narrow strip along the coastline, meadow sod sandy soils are present. Within the terraces of the riverbeds alluvial soil dominates. All of the mentioned soils in the flat areas are water saturated or waterlogged.

308. The topsoil in most of the areas around the Project is from 0.03-0.55m thick. According to the suitability[34] for agriculture (crops such as citrus and tea), the soil belongs to medium class.

309. For identification of the background quality of the soil along the road, samples were collected. Taking into account that the area is mostly rural and no significant sources of pollution, except for the road itself are available, four average samples were collected. The samples were collected from the sampling depth of 0-10cm. The total amount of soil collected from one site was 1 kg. Prior to sampling, the sampling spots were cleared of grass and stones. Samples were collected in plastic bags, labelled, and delivered to the lab for testing. The samples are dried, averaged and sieved. Samples were analyzed by Gamma lab.

Table 33. Methods of Soil Analysis

Cu, Zn, Pb, Ni, Co, Co, Cd	ISO 11047, ISO 11466 - Aqua Regia extract Determination of Cu, Mn, Fe, Mn, Co, Pb, Cd, Ni, Zn, Cr, Ni. Al
As	ISO 2590 - General method for the determination of arsenic – Silver diethildithiocarbamate photometric method

310. Soil quality in the project area was tested in two locations. The map showing location of the sampling points and typical soil quality data are given below.

Figure 38. Soil Sampling Points

Note: sampling points are identified with red pushpin symbols

Table 34. Soil Quality Data

	SP- 1	SP- 2	Allowable limit, mg/kg, Georgian Standards	CD 86/278/EEC, Limit values, mg/kg
Copper, Cu, mg/kg	41	39	3-132*	50-140
Zinc, Zn, mg/kg	100	90	37-220*	150-300
Lead, Pb, mg/kg	40	30	32-130*	50-300
Nickel, Ni, mg/kg	25	25	4-80*	30-75
Arsenic, As, mg/kg	0.8	0.8	10	30-60**

*Note: * guidance allowable limit (GAL). MPC and GAL values are indicated according to the Georgian regulations – Source: regulation 2.1.7. 004-03*
*** Technical WG3 fertilizers2012/Inorganic fertilizers FGW 2014*
Source: Gamma Consulting

[34] Cadastre and land register project co-funded by KfW

311. The guidance values of arsenic in soil differs around the world. Soil action levels for Arsenic in selected countries according to various references is provided in the table below.

Table 35. Soil Action Levels for Arsenic in Selected Countries

Country	Guide value (mg/kg)	Land use	Source
Argentina	20	Agricultural	
Belgium	45	Agricultural	Soil Remediation Act (1995)
Canada	20	Agricultural	CCME, 2001
Germany	200	Agricultural	German Federal Protection Act (1998)
Germany	50	Agricultural, partcially reducing conditions	German Federal Protection Act (1998)
Germany	50	Grazing land	German Federal Protection Act (1998)
New Jersey, USA	20	Agricultural	
Norway	20	Limito f Good soil status	Hansen and Danielsberg (2009)
USA	43	Allotment	US EPA (2009)

Source: Tarvainen, Timo & Albanese, Stefano & Birke, M & Poňavič, Michal & Reiman, C & Andersson, M & Arnoldussen, A & Baritz, Rainer & Batista, M & Bel-lan, A & Cicchella, Domenico & Demetriades, Alecos & De Vivo, Benedetto & Dinelli, Enrico & De Vos, Walter & Ďuriš, Miloslav & Dusza-Dobek, A & Eggen, Ola & Eklund, M & Zomeni, Zomenia. (2013). Arsenic in agricultural and grazing land soils of Europe. Applied Geochemistry. 28. 2-10. 10.1016/j.apgeochem.2012.10.005.

312. The concentrations of elements meet the requirements of both national and international standards.[35] All values are within allowable limits set by Georgian law and in accordance with international guidance values.

E.1.7 - Land Use and Landscapes

313. The landscape of Kolkheti lowland is comprised of lowland landscapes with swamp alder forest and sphagnum bogs. In the foothills of the Kolkheti lowland are hornbeam oak forests alternating with beech-chestnut, oak-zelcova, and poly-dominant forests with evergreen underwood.

314. Since 1992, the process of privatization of agricultural lands has been introduced in the country. At the end of the reform, most fertile land will be transferred to private owners. Arable lands make 2/5 of Kolkheti lowland. Land per capita in the area is lower than the average for Georgia. The main crops are cereal, beans, maize, tobacco, vegetables. The share of perennial plants accounts for about 34%.

315. In transitional economies, including Georgia's, most of the soil erosion is due to the fact that farmers are new to the market and business orientations in agriculture and therefore lack the necessary background to implement sustainable agriculture. The situation is worsened by the poor economic conditions of the majority of farmers which force them to meet the immediate needs rather than adopting a longer-term vision towards the environment. Climatic conditions are favorable for agriculture.

[35] The EU Directive 86/278/EEC (1986) and its recent implementations, regulates the use of sewage sludge in agriculture disposal so as to prevent harmful effects on soil, vegetation, animals and humans. Aiming at a correct management of the sludge from sewage treatment plants, the EU regulation prohibits farmland disposal of sludge unless specific requirements are fulfilled, including compliance with limit values for concentrations of a range of trace elements.

E.2 - Environmental Quality

E.2.1 - Air Quality

316. Air quality in the Patara Poti area, where sources of industrial emissions are not present, is generally good. Vehicle emissions are comparatively low because of low traffic volumes, and air pollution is rapidly dispersed due to winds. The quality of the ambient air in the study area is primarily affected by exhaust gases from vehicles moving along the E60.

317. There are no permanent air quality measurement stations in the Project area. To obtain the baseline information on air quality in the project area, one-time measurements were done by the Consortium's EIA team (equipment used: CO2 monitor Green LIFE 7787 (range 10-10,000ppm), Carbon monoxide meter (range 0-100ppm) and Air quality UNI-T UT938C (range 0-500)).

318. For the needs of this EIA, air quality was measured where the proposed alignment will reconnect with the E-60 (indicated with a red 'X' on the map in Figure 39). The results, which provide a 'snapshot' of the air quality in the Project area, show that ambient air quality meets the national standards for dust, CO, TSP, NO_2, and SO_2.

319. It is noted that air quality can vary due to a range of parameters that are different on given days and periods of the year. Even following IFC averaging periods we would still only reveal a 'snapshot' of one day during the year which would not give a clear understanding of air quality in the Project area throughout the year. Accordingly, national standards were followed for baseline data collection. However, given that none of the values exceed national limits, it is expected that international standards would also not be exceeded. Particularly given the volumes of traffic on the road, the coastal location, and the lack of other anthropogenic or natural sources of air pollution in the vicinity to the Project.

Figure 39. (a) Emission Sources in the Project Area; (b) One-time Air Quality Measurement Sites (mg/m^3) (marked with numbers); (c) Air Quality Measuring Point (marked with a red 'X')

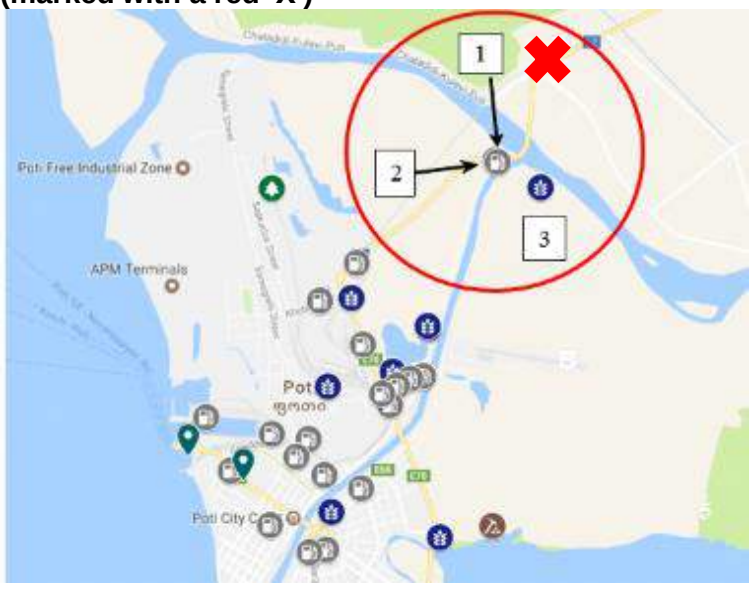


Table 36. Stationary Sources of Emission in the Project Area

1	Name	Ecoil Ltd	Parameters and Values	
	Activity:		PM: 0	CO: 0

	Fuel storage and sale			
	Address: Poti, km7		SO2: 0	VOCs: 0.0024
			NO2: 0	CO2: 0
2	**Name**	**Frego Ltd**	**Parameters and values**	
	Activity: Fuel storage and sale		PM: 0	CO: 0
	Address: Poti, km7		SO2: 0	VOCs: 0.0077
			NO2: 0	CO2: 0
3	**Name**	**Zgvis produktebi (Sea Products) Ltd**	**Parameters and values**	
	Activity: Food product (fish and sea products) production, oil, flour processing		PM: 0	CO: 11.264
	Address: Patara Poti Village, Khobi Municipality		SO2: 6.69	VOCs: 0.64
			NO2: 0.243	CO2: 0

Table 37. Air Quality Measurement Data

Coordinates		**Dust, mg/m^3**	**CO, mg/m^3**	**NO2, mg/m^3**	**CO2, mg/m^3**
X	**Y**				
723731.21	4675055.69	0.077	1.81	0.029	0.0221
Max. permissible one-time (volley) concentration according to Georgian Standards		***0.5***	***5***	***0.2***	***-***

Note: The location where air quality was measured is indicated with an 'X' in Figure 39.

E.2.2 - Surface Water Quality

320. For this EIA study, testing of the surface water quality in the Rioni River was carried out. The samples were collected near the river mouth (see Figure 40). The analysis of the waters included: total nitrogen (TN), total phosphorus (TP), analysis for the total petroleum hydrocarbons (TPH). In addition, physicochemical parameters such as temperature, pH, and conductivity.

Figure 40. Surface Water Sampling Points

321. Samples were collected in 1.5-liter capacity plastic bottles. One liter glass bottles were used for Total Petroleum Hydrocarbon analysis of water. Samples were labelled and delivered to the lab the same day. Analyses were performed in compliance with the ISO and EPA standards. Results are presented below:

Table 38. Methods of Surface Water Analysis

Parameter	Method
pH	ISO 10523-2008
Conductivity	ISO7888:1985
Turbidity	ISO 7027-99
Hardness	Gost 23268.5-78
Chemical oxygen demand, COD	ISO 6060-89
Chlorine, Cl	GOST 23268.17-1978
Bicarbonate, HCO3	GOST 23268.1-91
Sulphate, SO4	ISO 9280-1990

Parameter	Method
Potassium, K	ISO 9964-3-1993
Calcium, Ca	GOST 23268.5-1978
Magnesium, Mg	GOST 23268.5-1978
Sodium, Na	ISO 9964-3-1990
Total P	ISO 6878-04
TPH	EPA 418.1-1997
Nitrite, NO2	ISO 6777; ISO5664
Nitrate, NO3	ISO7890

Table 39. Water Quality Data

Suspended solids (mg/l)	376.5
Turbidity, FTU	>100000
pH	7.75
Dry residue	163.491
Cations	**mg/l**
Ca, mg/l	36.000
Mg, mg/l	10.000
Na, mg/l	4.400
K, mg/l	1.210

Conductivity (sim/m)	0.02042
Hardness mg-eqv	2.623
COD (mg/lO)	<15
TPH	<0.04
Anions	
Cl, mg/l	6.381
HCO3, mg/l	122.000
SO4, mg/l	30.400
NO2, mg/l	nd
NO3, mg/l	3.100

322. The Rioni River is typically characterized by 'slow' flow and high turbidity. Total suspended solids average approximately 295mg/l.

323. Mineralization depends on water abundance and in low flow conditions higher values are observed. Values can vary from around 195 mg/l to almost 420mg/l, depending on the flow. Since water flow is normally abundant, fluctuation of macro-chemical composition seldom occurs.[36]

324. Water quality requirements according to Georgian national standards depends on the category of the water body (ref. Technical regulations of protection of surface water from pollution, approved by decree #425 of the government of Georgia, 31/12/2013). The categories are: a) household water use, b) domestic water use and c) fisheries. The latter, in its turn, splits in highest, first and second categories (see Table 6).

325. A comparison of the measured values with national standards show the following:

- SS: The measured value when compared with data from other surveys in the area carried out by Gamma for various projects does not show significant change[37]
- No floating matter registered
- Color and odor were registered as normal
- pH of 7.75 is within allowable limits
- DO of 6.3mg/l is slightly above the limit (6 mg/l) with saturation between 73 - 92%
- COD is <15, which is within limits for household water use[38]
- NO3 is 3.1 mg/l, which is below the allowable limit
- TPH is <0.04 where the allowable threshold is0.3

326. The bottom sediments are fine grain represented by sand and silt. In the lower flow the particles >2mm are not registered. 0.1 mm grain size particles account for 80% of the sediment composition. Content of metals measured in river sediments is as follows:

Tests, 2017	**Ni, mg/kg**	**Cu, mg/kg**	**Zn, mg/kg**	**As, mg/kg**	**Cr, mg/kg**	**Fe %**	**Mn %**	**Al %**	**C org, %**
Aug	35	30	75	10.8	88.5	3.45	0.185	2.53	1.26
Sept	65	40	105	13	75.5	3.8	0.150	6.35	1.22

327. The values are almost at Clark level, which is identical to Kolkheti lowland soil values.[39]

E.2.3 - Noise

321. A noise and vibration study was developed for the Project in line with national legislation and in accordance with the limits provided in the IFC's EHS Guidelines for noise. Findings and analysis from the noise and vibration study have been incorporated into this EIA.

[36] Gamma survey data
[37] It should be noted that the limit indicated in the Georgian National Standard is a bit vague (see Table 6: Water Quality Requirements by Water Use Category).
[38] COD limits are not identified within Georgian National Standards.
[39] Gamma survey data

322. A 24-hour long noise monitoring was started at 12:00 pm on 20 March 2019 at the backyard of a first row house. Traffic on E-60 highway was the primary sources of noise in the study area. Measurement results indicate that the highway noise levels in adjacent residential areas exceed acceptable daytime/night-time noise limits specified by IFC for the entire 24 hours. Figure 41 shows the measurement location on a map and Figure 42 a picture of the measurement site.

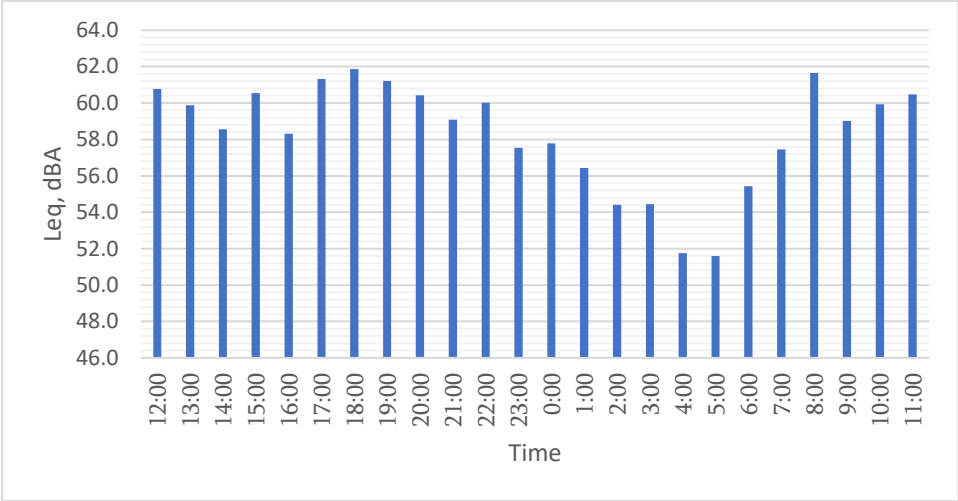
Figure 41. Noise Measurement Point

Figure 42. Noise Measurement Site Photo

323. A RION NL-52 digital sound level meter, which is a class I instrument was used for conducting the long-term noise measurement. Sound level meter was field calibrated before and after the measurements and a wind screen was used. During daytime it was sunny and there were no noticeable winds during the entire measurement period. Average noise levels (L_{eq}) were measured and saved in the sound level meter for every 15 minutes intervals. Review of the measured data indicated that there were extraordinary noise levels during four 15-minute intervals; therefore, those four intervals were deleted and then hourly L_{eq} levels were calculated. Figure 43 shows a table and graph of hourly L_{eq}. The highest measured hourly L_{eq} for the daytime hours (07:00 to 22:00) was 61.9 dBA and for the nighttime hours (22:00 to 07:00) was 60.0 dBA.

Figure 43. Measuree Hourly Leq

Time	Leq, dBA
12:00	60.8
13:00	59.9
14:00	58.6
15:00	60.6
16:00	58.3
17:00	61.3
18:00	**61.9**
19:00	61.2
20:00	60.4
21:00	59.1
22:00	**60.0**
23:00	57.5
0:00	57.8
1:00	56.4
2:00	54.4
3:00	54.4
4:00	51.8
5:00	51.6
6:00	55.4
7:00	57.5
8:00	61.7
9:00	59.0
10:00	59.9
11:00	60.5



Note: Gray area represent nighttime hours.
Bold numbers are peak daytime and nighttime measured levels.

E.3 - Ecological Resources

E.3.1 - Protected Areas

324. There are two protected sites in the vicinity of the Project: Kolkheti National Park and the Wetlands of Central Kolkheti Ramsar Site. These two sites cover the same geographic area, were designated in the same year (1998), and have the same IUCN Management Category (II). For the purposes of this EIA, both are referred to as "Kolkheti National Park". This area is also being proposed as an Area of Special Conservation Interest (or "Emerald Site") by the national government under the Bern Convention.[40, 41] A proposal for extension of the National Park south to cover the Rioni River is currently being considered by parliament. Boundaries of that extension are unclear but may extend as far east as the railway bridge neighboring the Project.

[40] NACRES (2014) Development of Emerald Network in Georgia in 2013. Unpublished report by Centre for Biodiversity Conservation and Research (NACRES). Available at: https://pjp-eu.coe.int/documents/1461016/4159207/Report_2013_Emerald_developments_NACRES.pdf/d0ded329-fcdd-49a2-aac5-46db6fe3cf60.
[41] MoEPA pers. comm. 2018

325. A large "Colchis Wetlands and Forests" World Heritage Site, overlapping the Project area, was proposed by the government in 2007.[42] This is now being revised for resubmission as a more select set of areas, which will still include Kolkheti National Park and thus parts of the Project area.[43, 44, 45]

326. The internationally recognized Kolkheti Important Bird Area (also de facto a Key Biodiversity Area) also occurs within the Project area. Although the IBA boundaries are currently being reassessed, it seems likely that the IBA will continue to be designated – at least for White-headed Duck (see Bap, Section **3.2 - Priority biodiversity**).

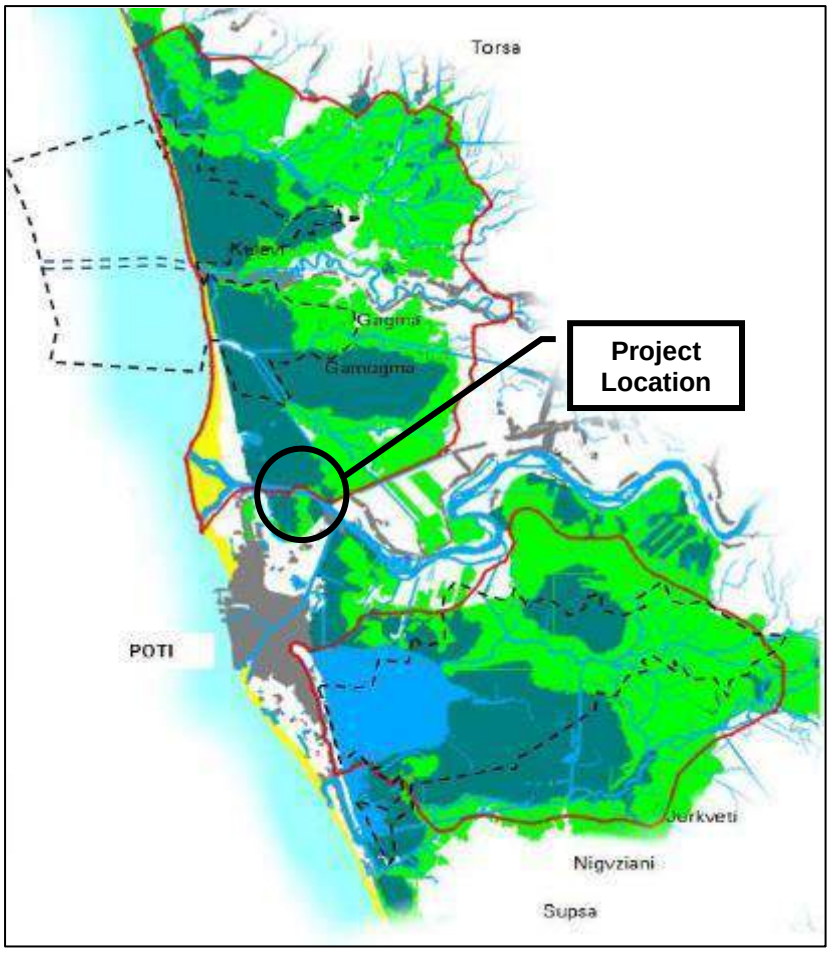
327. Following IFC[46] and ADB SPS[47], Kolkheti National Park, the Wetlands of Central Kolkheti Ramsar Site, and Kolkheti Important Bird Area all likely qualify the Project area as Critical Habitat, since they are all 'internationally and/or nationally recognized areas of high biodiversity value'.

328. The National Park includes the areas with well-preserved wetland ecosystems: Anaklia-Churia (13,713 ha, between the coastline sections of ravines of the Churia River and the Khobistskali River), Nabada (10,697 ha, between the western sections of the ravines of the Khobistskali River and the Rioni River) and Imnati (19,903 ha, between the western sections of the ravines of the Rioni and the Supsa Rivers). The protected area also includes the sea water area located between the estuaries of the rivers of Rioni and Churia. In total, the land area of the National Park is 28,571 ha, and the sea water area is 15,742 ha. Geographically the National Park area belongs to five administration districts – Zugdidi, Khobi, Senaki, Abasha, and Lanchkhuti municipalities. The National Park began full-scale operation in 2000. According to reference information, over 194 different bird species are found in the region, including 21 species of migratory birds.[48]

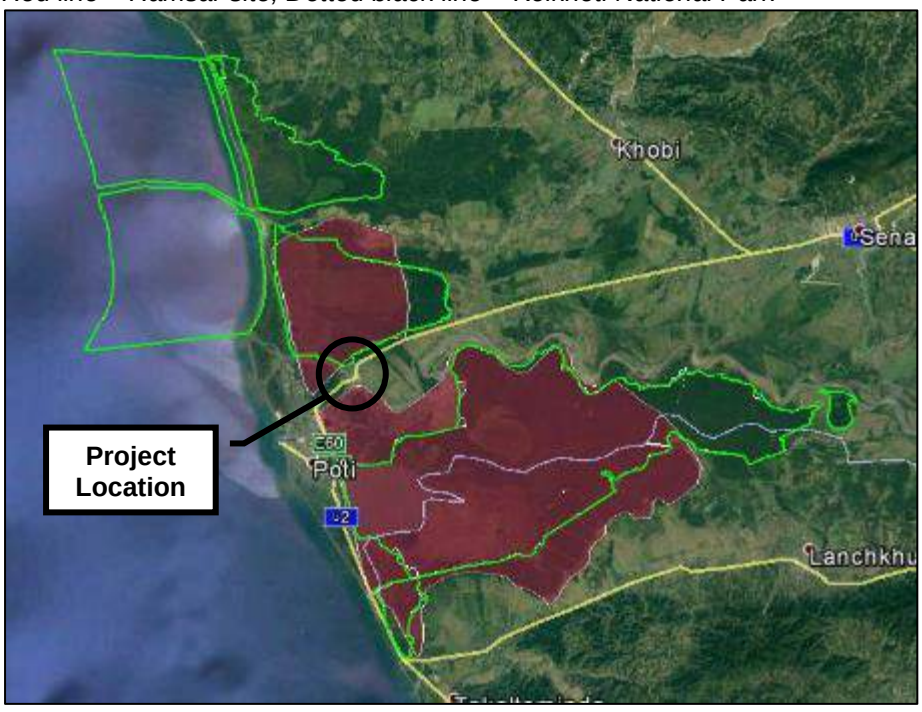
329. Kolkheti mires are important for their relict origin. This lowland is a remainder of the tropical and subtropical landscapes, which were stretched along entire Eurasian continent as continuous belt in Cenozoic age about 10 million years ago.

[42] UNESCO (undated) Colchis Wetlands and Forests. Available at: https://whc.unesco.org/en/tentativelists/5223.
[43] Garstecki, T. (2017) *Feasibility assessment for a World Heritage nomination of the Colchic Forests and Wetlands under the natural criteria*. WWF, Tbilisi.
[44] Guchmanidze, A. (2017) Current status of sturgeon stocks in the Georgian Black Sea waters and their tributaries. Abstract from a talk given at the 8th International Symposium on Sturgeon, Vienna. Available at: http://www.vniiprh.ru/sites/default/files/file/page/17/11/a._guchmandize.pdf.
[45] Archil Guchmanidze, MoEPA pers. comm.
[46] IFC (2012b) Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. International Finance Corporation, Washington DC.
[47] Critical Habitat is defined in the ADB's SPS (2009) on Page 35, Appendix 1, Para 28, footnote 5.
[48] Agency of Protected Areas, MoEPA. http://apa.gov.ge/en/biomravalferovneba/kolxetis-erovnuli-parkis-biomravalferovneba

Figure 44. Kolkheti Protected Area, Ramsar Site and IBA



Red line – Ramsar site; Dotted black line – Kolkheti National Park



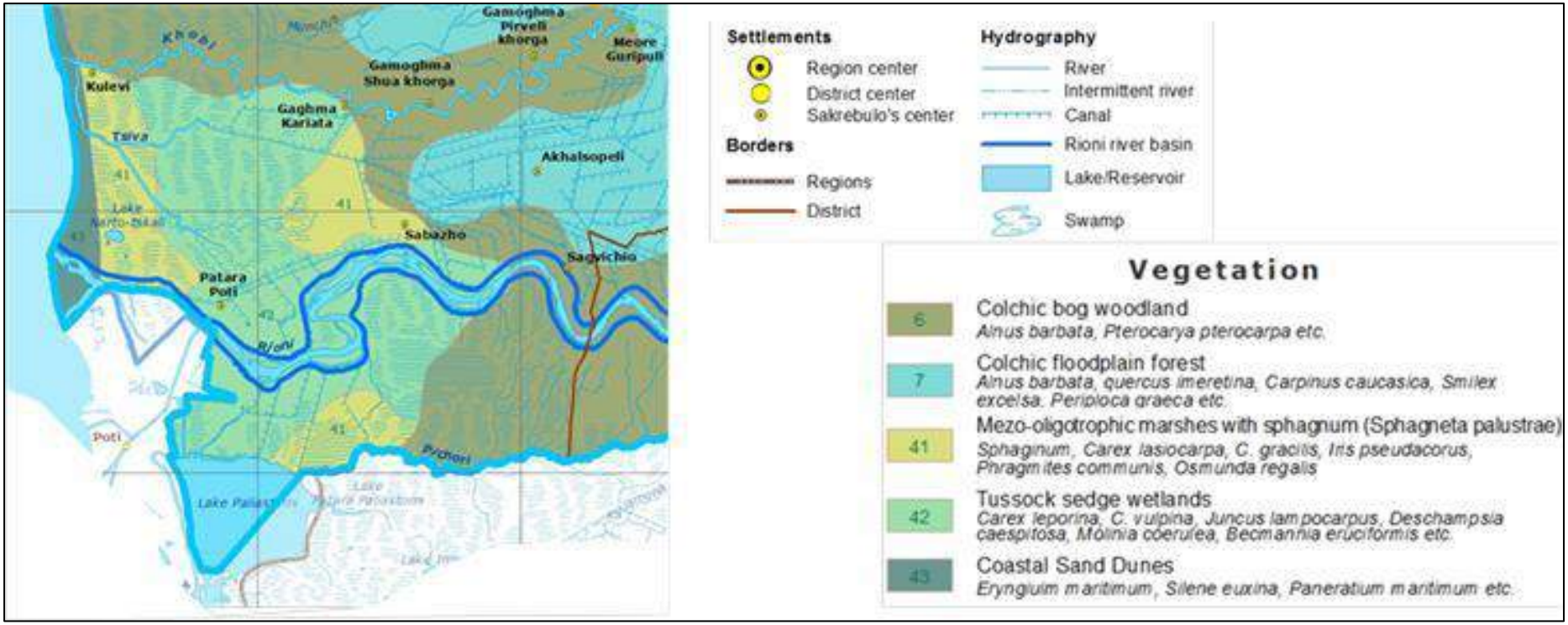
Green line – Kolkheti National Park; violet contour – Important Bird Area (IBA)

330. The Kolkheti National Park area is notable from botanic point of view. The complexes of phytocoenosis rich in quite diverse, relict, and endemic species, and various compositions have remained there till present – they are the different plant communities of the mires, swampy forests and sand dunes located along the coastline. Vegetation characteristic for swampy ecosystems of tundra and taiga of the far North; boreal species such as *Sphagnum mosses, Sp. palustre*, Round-leaved sundew, Woollyfruit sedge; plants of alpine zone - Sedge and Pontic rhododendron, etc. are widely met.

331. Swampy and humid forests include: Alder trees, Caucasian wingnut, Imeretian oak and Colchis oak with well-developed evergreen underbrush. In the sandy zone of dunes grow Sea-buckthorn and Jerusalem thorn. Composition of species of algae is diverse. Plant species include: Spurge, Eringo, Colchis sedge, Imeretian cogongrass, Astragalus, Marsh woundwort, Catchfly, etc. Along the lakes and marsh rivers in the wetlands: Colchis water-lily and Yellow water-lily, Colchis water chestnut and Lesser duckweed are present. In the peaty mires together with the north tundra species Royal fern and Imeretian sedge can be met.

332. The area is the place where Georgia Red List species: Yellow poppy, Water lily, Colchis oak (*Quercus hartwissiana*), Caucasian wingnut (*Pterocarya pterocarpa*), Colchis box-tree (*Buxus colchica*) is preserved. Tree species are represented by Maple (*Fraxinus exscelsior*), Georgian oak (*Quercus iberica*) and Alder (Alnus barbata). In the forest, along the peripheral belt of peaty mires and the ravines of the marshrivers Colchis-Hyrcanic alder groves, sometimes mixed with Wingnut, Imeretian oak or Maple, Beech, Ash-trees, and Hornbeam are registered.

Figure 45. Kolkheti Protected Area, Vegetation Map (Poti environs)



333. Among large mammals, Jackal (*Canis aureus*), Wild boar (*Sus scrofa*), Roe deer (*Capreolus capreolus*) and Eurasian otter (*Lutra lutra*), Coypu (*Myocastor coypus*) can be found. Swamp cat (*Felis chaus*) can be seldom registered. Of small mammals, the Striped field mouse (*Apodemus agrarius*), European water vole (*Arvicola terrestris*), Caucasian mole (*Talpa caucasica*), Least weasel (*Mustela nivalis*), and European hedgehog (*Erinaceus europaeus*) are in the area.

334. The marine mammals are presented by three species of dolphins (Aphalina – the Bottle-nose Dolphin (*Tursiops truncatus*), White-sided Dolphin (*Delphinus delphis*) and Common Porpoise (*Phocoena phocoena*)). The Park gives shelter to six species of fauna listed on the Red List of Georgia.

335. Paliastomi lake (a part of the protected area), is the former gulf of the Black Sea now isolated from the sea by sand dune several thousand years ago – it provides a vital environment for many fish species, invertebrates and plankton.

336. At the closest, the current extent of the National Park is approximately 150 m from the Project footprint but is at all times separated from the Project by an existing railway track and right of way, and a high voltage powerline. The Kolkheti IBA is bisected by the E-70 and E-60 and is approximately 450 m from the Project footprint at its closes point.

337. An amendment bill to the Georgian Law on the "Establishment and Management of the Kolkheti Protected Areas" has been developed and which extends the area of Kolkheti National Park and creates a new protected area called the Rioni Managed Reserve in Samtredia Municipality. Expansion of the Kolkheti National Park will cover the section adjoining the Rioni River confluence, the river confluence, and its adjoining sea area. Boundaries of that extension may reach as far east as the railway bridge neighboring the preferred alignment under this Project, however the exact extent is unknown at this time. The Rioni Managed Reserve will comprise the territory within the administrative borders of Samtredia Municipality with the total area of 624 ha, where remaining spawning grounds of the Sturgeons remain. As of the development of this EIA, the draft bill has been provided to different ministries for comment. Once the final version is developed, the final bill be submitted to the Parliament of Georgia for approval.

E.3.2 - Field Survey of Project Corridor

E.3.2.1 - Overview

338. The results from field surveys conducted by the Consortium during feasibility and detailed design phases for Lot 2, Stage 1 of the Project road section (i.e., the scope of this EIA) are provided below.

339. As mentioned, the development of this EIA has also been informed by a BAP (see Annex 1. **Biodiversity Action Plan (BAP)**) which (i) assesses the presence of Critical and Natural Habitat in the Project area; (ii) evaluates potential impacts on priority biodiversity; (iii) outlines Project commitments to mitigation and management measures to achieve at least no net loss for Critical and Natural Habitat; (iv) and summarizes an approach to monitoring and evaluation to give assurance of Project performance. That assessment concluded that the Project is situated in a landscape of varying land use and land cover, comprising a matrix of Natural and Modified Habitat. A full Critical Habitat Assessment (See Bap, **Appendix A. Critical and Natural Habitat Assessment**) identified the Project area to be likely Tier 1 Critical Habitat for one globally Critically Endangered water plant (Colchis Water-Chestnut *Trapa colchica*), and likely or actual Tier 2 Critical Habitat for four freshwater fishes (Stellate, Russian and Beluga Sturgeon *Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*; and

Grusinian Scraper *Capoeta ekmekciae*), one bird (White-headed Duck *Oxyura leucocephala*), one additional plant (*Hibiscus ponticus*), as well as the Kolkheti National Park, Ramsar Site and Important Bird Area.

E.3.2.2 - Priority Biodiversity and Habitat Qualification

340. Results from the full Critical Habitat Assessment developed as part of the BAP (see BAP **Appendix A. Critical and Natural Habitat Assessment**) identified the Project area to be likely Tier 1 Critical Habitat for one globally Critically Endangered water plant (Colchis Water-Chestnut), and likely or actual Tier 2 Critical Habitat for four freshwater fishes (Stellate Sturgeon, Russian ("Colchic") Sturgeon, Grusinian Scraper, and Beluga), one bird (White-headed Duck), and one additional plant (*Hibiscus ponticusc)* (**Annex 1. Biodiversity Action Plan (BAP)**, Table 1). Some uncertainty remains in the conclusions of this assessment, given extremely limited recent information on a number of species in the Project area. Although in some cases conclusions could be refined by further studies, on a precautionary basis the features listed in Table 1 of the BAP (**Annex 1. Biodiversity Action Plan (BAP)** should all be considered priority biodiversity for the Project.

341. Figures 1 and 2 provided in the BAP (**Appendix A. Critical and Natural Habitat Assessment**) summarize the location of Natural and Modified Habitat in the Project area. The entire aquatic DMU qualifies as Critical Habitat. Data are sufficiently sparse (e.g., on the distribution of *Hibiscus ponticus* and Colchis Water-Chestnut *Trapa colchica*) to preclude detailed mapping of terrestrial Critical Habitat. On a precautionary basis, it should therefore be assumed that all Natural Habitat may also qualify as Critical Habitat (BAP). Brief profiles for Critical Habitat-qualifying biodiversity are also provided in the BAP (see **A.2 - Assessment of biodiversity which may qualify the area as Critical Habitat**), focusing on where and when each is likely to occur in the Project area.

342. There is a very slim possibility that Atlantic (European) Sturgeon (*Acipenser sturio*) and/or Ship (Fringebarbel) Sturgeon (*Acipenser nudiventris*) also still regularly occur in the Rioni River. Both Atlantic and Ship Sturgeon were still thought to regularly spawn in low numbers in the Rioni just ten years ago, and other species have declined dramatically – for example, Beluga may be on the verge of no longer spawning in the Rioni (if, indeed, it still does), yet just ten years ago it was estimated that 35-44 individuals spawned in the river each year (BAP).

E.3.2.3 - Vegetation

Context

343. The Project area is part of the Colchic region where warmth and humidity was a stable refugium during the Pleistocene, particularly for eastern European flora (WWF undated). The complex of temperate wetlands, swamps, wet Alder (*Alnus*) forests, and bottomland broadleaf deciduous forests present in the vicinity of the Project is one of the best remaining representative extents of an ecosystem that was formerly much more widespread in Europe (UNESCO undated). Elsewhere, similar fertile low-lying areas have been extensively logged, drained and converted to agriculture. As a result, the broad "Caucasus-Anatolian-Hyrcanian Temperate Forests" region – stretching from Istanbul in the west almost to Afghanistan in the east and into southern Russia in the north – has been considered highly threatened (Olson & Dinerstein 2002). Although there is limited endemism, several relict plants are found only in this region (BAP).

Project Area

344. Collection of the floristic data on the study area covered two components: 1) collection of the highly detailed data on the vegetation diversity of the study area and 2) field sampling of the vegetation of the study corridor for obtaining precise empirical data.

345. Detailed review of the vegetation diversity of the study area was performed based on the field verification of data from existing on flora in the targeted area. For identification of the plant species, information on the flora of Georgia from Ketzkhoveli & Gagnidze, 1971-2011; Czerepanov, 1995; and Gagnidze, 2005 was used. Information on the species distribution in local habitat types was collected from the following literature sources: Ketzkhoveli, 1960; Doluchanov, 2010, Akhalkatsi, Tarkhnishvili, 2012; and Nakhutsrishvili, 2013. The 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 IUCN guidelines (2003) and The Red List of Georgia (2006).

Location: lot 2, stage 1; v. Patara Poti – Poti bridge; UTM: T 37. 723044 m E 4674622 m N 6 m a.s.l. Vegetation cover: 50% Habitat type: **River bank forest of the Rioni river; Alluvial forest (#91E0).**			
Species list/ Species cover (%)			
Alnus barbata	5	*Bidens tripartita*	1
Salix excelsa	3	*Batrachium aquatile*	5
Crataegus pentagyna	2	*Lycopus europaeus*	5
Carpinus orientalis	3	*Rhynchospora alba*	5
Carex remota	5	*Potamogeton pectinatus*	+
Arundo donax	5	*Sparganium erectum*	+
Sesleria alba	5	*Solidago canadensis*	10
Juncus efusus	10		
Typha latifolia	5		

Note: Sporadic or few – '+', Few, with small cover (pronounced 'cross')

346. In general, the natural vegetation around the Project area has been transformed because of anthropogenic impact and development of the area. The natural floristic composition is strongly altered: part of phytocenosis is impoverished; in other areas vertical and horizontal structures are affected; in some – native floristic composition has been altered to include alien invasive species. In most cases primary phytocenosis are fully 'replaced' by grasses, shrubs and weeds - secondary cenosis, agricultural lands, elements of industrial landscapes or abandoned. Among introduced species, *Amorpha truticosa, Ambrosia artemisiafolia*, *Amaranthus retroflexus, Sorghum halepense, Setaria glauca, Digitalis,*

Plantago maior, etc. are present. In the project corridor, water, forest, and secondary meadow plant communities can be found.

347. Photos showing vegetation and landscape view within the Project area are shown below:

Figure 46. Views of vegetation in the Project Area

Alder with rush and sedge meadows

Drainage canal overgrown with amorpha

Patara Poti area – under impact of the project

Area adjacent to Patara Poti (right bank of the Rioni River

Larch alley

Alder with weeds

Blackberry – smilax

Vegetation along the E-60

Vegetation under railroad bridge

Vegetation near railroad bridge

Wider Project Area

348. To provide additional context, below is a description of vegetation for the wider Project area based on secondary sources and site surveys conducted by the Consortium along other road sections of the proposed Poti-Grigoleti-Kobuleti Bypass corridor.

349. Wetland vegetation. Wetlands are located in the lowest-sited sections of the Rioni River basins, in depression adjacent to the littoral dune and other areas where drainage is poor or does not happen at all. Wetland vegetation is represented by grasses, shrub-grass, and grass-forest ecosystems.

350. Weterlogged areas are mainly found in the lower reaches of Rioni River, around Paliastomi lake, Grigoleti area and along Grigoleti-Supsa road (on the north-west side to the latter), near Kobuleti. In the 'narionali' area wetland vegetation is dominated by: flowering rush (*Butomus umbellatus*), sedge (*Carex gracilis*), paleyellow iris (*Iris pseudacorus*), common rush (*Juncus effusus*), Water-pepper (*Polygonum hydropiper*), broadleaf cattail (*Typha latifolia*), Dropmore Purple (*Lythrum vurgatum*), summer snowflake (*Leucojum aestivum*), etc. Wetlands with domanane of Common Reed (*Phragmites communis*), broadleaf cattail (*Typha latofolia*), sedge (*Carex gracilis*), common rush (*Juncus effusus*) are also met. Bi-dominant wetlands (common reed-bulrush, bulrush-iris, Juncus-Rush) swamps are seldom.

351. Aquatic vegetation. Aquatic vegetation of lakes and canals are particularly diverse, small communities are present in almost all, even shallow surface water bodies and bank of the rivers in latent flow areas. These are 'floating' and/or 'dipped' plants. The floating plants sometimes use to 'combine' with lemna (*Lemna minor, Spirodela polyrhiza, Salvinia natans, Hydrocharis morsus ranae*, etc.). These groups are usually in latent flow water sections of the river, edges of canals and ponds mixed with marsh vegetation.

352. Aquatic plants are present in the wider Project area and Kolkheti lowland in general. In this zone two ecological groups can be marked out: 1) holophytic - ditch grasses (*Ruppia spiralis, R. maritima, Zostera Marina*), found in ponds and water bodies of the Black Sea coastal area; 2) fresh water plants widely spread in Kolkheti lowland - Eurasian Water-Milfoil (*Myriophyllum spicatum*), pondweed (*Potamogeton pusillus, P. natans, P. crispus, P.perfoliatus*), water lily (*Nymphaea colchica*) (Red List), yellow water lily (*Nuphar luteum*) (Red List), Colchis Water-Chestnut (*Trapa colchica*) (IUCN_CR, Red List), Maleev's Water-Chestnut (*Trapa maleevii*) (IUCN_VU, Red List). During the site survey aquatic plants were found to be widely met in the project impact area. In the area of interest yellow water lily (*Nuphar luteum*) have not been registered.

353. Forest vegetation. Forest in the wider Project area is hygrophylic type – a kind of forested wetland. Vegetation is mainly represented by Alder (*Alnus barbata*) developed on the humid alluvial ecotopes, which distinguishes this kind of forest from the bog-peat alder one. Floristic composition is poor, represented by trees such as: willow, poplar, hornbeam, hazelnut, hawthorn, pear; lianas: blackberry (*Rubus sp*.), greenbrier (*Smilax excelsa*) and ivy (*Hedera*). In other area: fern (*Pteridium tauricum*), dane weed (Sambucus ebulus), and other grasses unfit for cattle grazing are found.

354. During the site survey in the underbrush and shrub area, *Lythrum vulgatum* and *Dictamnus caucasicus (Georgian endemic species)* were registered. In underbush sedge (*Carex gracilis*) dominates. The cutover areas are regrown with blackberry (*Rubus sp*.) and greenbrier (Smilax *excelsa).* Along with wetland and forest grasses in the edges of forests and meadows advent plants – in particular *Paspalum dilatatum* and *Oplismenus undulatifolius* are widely met.

355. Secondary grass and bushes. Secondary vegetation is developed in the lowland forest cutover areas. Dominant are alder shrubs, wing nut, blackberry, amorpha, ferns, meadow and forest herbaceous plants. Waterlogged meadows with rush-knotgrass vegetation and knograss filling up the spaces between sedge are to be mentioned. In the areas like that south Caucasian endemic - *Rhamphicarpa medwedewii* can be found. Knotgrass swamped meadow community uses to develop in the cutover sites, roadside areas, near the homesteads. The dominance of weeds, in particular white-felted thistle (*Cirsium incanum*), Johnson grass (*Sorghum halepense*), rough cocklebur (*Xanthium strumarium*), Iberian knapweed (*Centaurea iberica*) and Moor grass (*Molinia litoralis*) is common.

356. In the wider Project area, the landform of the meadow-like landscape is raised and poorly drained. On the clay and podzol soil dallisgrass (*Paspalum dilatatum*) is dominant. These meadows were formerly forested, but now are used as hayfields, for keeping and grazing cattle.

357. In the Kolkheti lowland, various citrus species and ornamental plant have been introduced. Along the roads lines of pine, plane tree, cedar, oleander, eucalyptus, cypress, and ornamental shrubs are planted. Some of these plants have been introduced to drain the waterlogged areas. Some of the mentioned plants (*Eucalyptus sp.*) are used for healing purposes and, on the same time, act as windbreak.

E.3.2.4 - Fauna

Context

358. The Rioni River originates on the southern slopes of the Great Caucasus and is the largest river of Western Transcaucasia. Its high sediment load, deposited in the western lowlands in and around the Project area, results in a complex and meandering river with islands and multiple channels. There is relatively high endemism among fish in the region (Bogutskaya undated). Most of these are broadly distributed within Western Transcaucasia, but at least one that occurs in the Project area can be considered truly restricted in range (Georgian Bitterling) (BAP).

359. The region also presents an important flyway for migratory soaring birds breeding in Europe and Russia (WWF undated). During migration, these are concentrated in the region by the Black Sea to the west and the Lesser Caucasus to the east (Verhelst *et al.* 2011).

Project Area

360. The fauna survey conducted by the Consortium during the feasibility and detailed design phases was organized with the purpose of verifying the data obtained from the literature on the animal species composition and areas of occurrence. A simple methodology of surveying including registration of animal footprints, droppings, and dwellings was applied to collect information on key species of mammals and birds in the project impact area. The results of the survey are provided below.

361. Fauna in the Project area is rather poor keeping in mind proximity to the road and the railway line acting as a 'repellent' due to noise and traffic. Small mammals are sometimes registered including voles, mice, and hedgehogs.

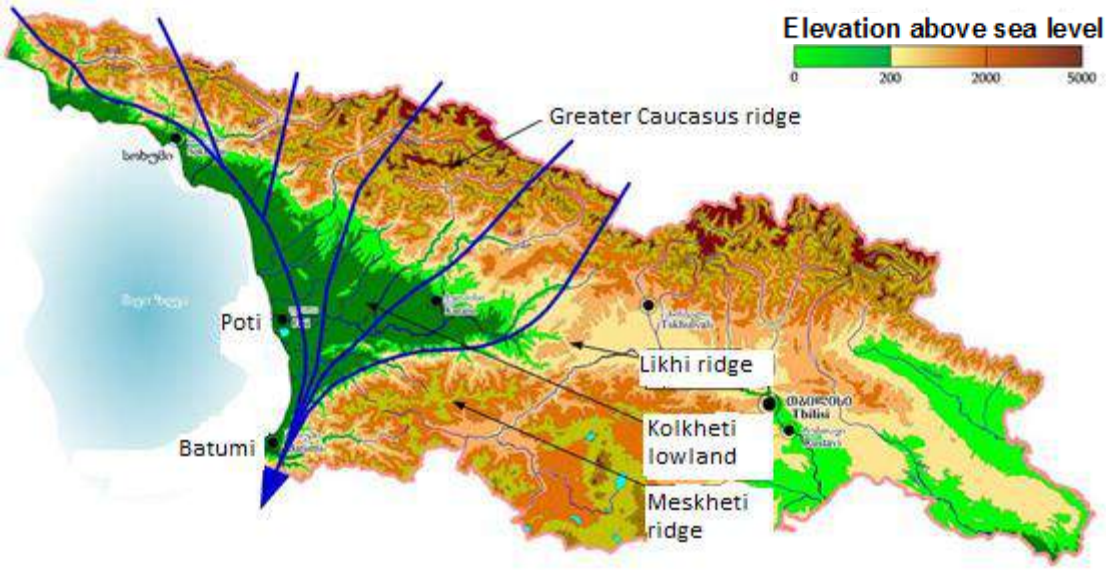
Poti-Grigoleti road (lot 2, stage 1) – Poti bridge **Site #10. Coordinates: T37 0722906- X; 4674273-Y- 0722527-X; 4673658-Y (Altitude from the sea level - 4 m).**
Habitat of alluvial alder forest bog formed by low grasses and lianas; Local fauna: Sparrowhawk (*Accipiter nisus*) – one individual; Great Spotted Eagle (*Aquila clanga*) – one individual; Common Wood Pigeon (*Columba palumbu*) – one individual; Eurasian Skylark (*Alauda arvensis*) – two individuals; Eurasian Jay (*Garrulus glandarius*) – three individuals; Common Raven (*Corvus corax*) – one individual; Eurasian tree sparrow (*Passer montanus*) – 23-25 individuals; Brambling (*Fringilla montifringilla*) – 9 individuals; European Goldfinch (*Carduelis carduelis*) – 13 individuals. Mammals – Golden Jackal (*Canis aureus*) – 1 individual. Marsh Frog (*Pelophylax ridibundus*).

Wider Project Area

362. To provide additional context with regards to fauna, the information below describes the wider Project area based on secondary sources and site surveys conducted by the Consortium along other road sections of the proposed Poti-Grigoleti-Kobuleti Bypass corridor.

363. Avian. Avian fauna is rich. The wider Project area is located at closest approximately 150 m from the Kolkheti National Park area, where, as mentioned earlier, 194 species of birds are known to be found. The National Park area is the resting place for migratory birds. The Black Sea coastal region is important for avian fauna – including migratory raptors and waterfowls.

Figure 47. Transcaucasian Flyway of Migrant Birds (raptors, passerines, and waterfowl)



364. From spring and late summer the bird species found in the area include quail (*Coturnix coturnix*), European turtle dove (*Streptopelia turtur*), Eurasian Goshawk (*Accipiter gentilis*), Eurasian Sparrowhawk (*Accipiter nisus*), Short-eared Ow (*Asio flammeus*), Common Moorhen (*Gallinula chloropus*), Eurasian Woodcock (*Scolopax rusticola*), Baillon's Crake (*Porzana pusilla*), Northern Lapwing (*Vanellus vanellus*), Grey Heron (*Ardea cinerea*), ducks (*Anas sp.*), gulls (*Larus sp.*), cormorants (*Phalacrocorax sp.*), etc. Passerines are represented by:

Common blackbird (*Turbus merula*), Great tit (*Parus major*), European robin (*Erythacus rubecula*), Common starling (*Sturnus vulgaris*), Common raven (*Corvus corax*), carrion crow (*Corvus corone*), and Barn swallow (*Hirundo rustica*), etc.

365. During the migration period (October), a wide diversity of sea birds can be registered. A similar situation in Spring (April-May) occurs, however the quantity of individuals is lower. A rough figure indicates that from 25,000 to 1 million birds winter in the Black Sea and the near Mediterranean.[49]

366. The number of species which are reproducing are likely to include the Great crested grebe (*Podiceps cristatus*), Great cormorant (*Phalacrocorax carbo*), and Mallard (*Anas platyrynchos*)*, Tufted duck* (*Aythya fuligula*)*.* The mentioned species reproduce in fresh water reservoirs located nearby. All of them feed in the adjacent Black Sea. It is possible that Black-headed gull (*Larus ridibundis*) and yellow-legged gull (*Larus cachinnans*) are nesting in the area since young specimen are sometimes met. Mediterranean shearwater (*Puffinus yelkouan*) have large feeding area and are often detected here, although always offshore.

367. Black-throated loon (*Gavia arctica*) appears in the wider area during the migration, while *G. stellata* winters there. Usually these birds do not live in large groups and are distributed along the coast making difficult to quantify their abundance, however larger groups can be found where there is abundance of food.

368. Representatives of Great crested grebe (*Podiceps cristatus*) are present along the shoreline in winter. Large flocks accumulate near the confluence of rivers, Mediterranean shearwater is met along the whole Black Sea littoral, far from the coast, seldom in the nearshore water and Great cormorant (*Phalacrocorax carbo*) usually inhabits the sea coast area. Other migrating visitors include members of the Caradriidae family.

369. Several species of gulls (*Laridae*) are present in the Black Sea they include Pallas's gull (*Larus ichthyaetus),* common gull (*Larus canus*)*,* Little gull (*Larus minutus*) Slender-billed gull (*Larus genei*), *Larus melanocephala*. Except during the reproduction period presence of Black-headed gull (*Larus ridibundus*) and Caspian gull (*Larus cachinnans*) is detected*.* The latter follow fishing boats.

370. In winter, the groups of ducks, geese, and swans fly in from the north. Woodcock, Eurasian curlews with long and hooked beaks, common coots, grebes, White-fronted geese, Mute and Whooper swans, Dalmatian Pelican, Greater Spotted Eagle, etc. can be also found in the wider area. Pheasant is present, but seldom seen.

371. Pygmy cormorants (*Phalacrocorax pygmaeus*) and Little egrets (*Egretta garzetta*) and Passerines were met in various sections of the larger Poti-Grigoleti-Kobuleti Bypass alignment.

372. Mammals. Among large mammals in the swampy floodplains, forests, and shrubs of Kolkheti Jackal (*Canis aureus*), Wild boar (*Sus scrofa*), Roe deer (*Capreolus capreolus*) and Eurasian otter (*Lutra lutra*), Coypu (*Myocastor coypus*) can be found. Swamp cat (*Felis chaus*) can be seldom registered. Of small mammals Striped field mouse (*Apodemus agrarius*), European water vole (*Arvicola terrestris*), Caucasian mole (*Talpa caucasica*), Least weasel (*Mustela nivalis*), European hedgehog (*Erinaceus europaeus*).

[49] Rose, P.M. & Scott, D.A. (1994). Waterfowl Population Estimates. IWRB Special Publication No.29. IWRB, Slimbridge, U.K. 102 pp.

373. Amphibians. Among amphibians, the Common tree frog (*Polypedates leucomystax*) and Marsh frog (*Pelophylax ridibundus*), European tree frog (*Hyla arborea*), European green toad (*Bufo viridis*) are registered. Besides, Smooth newt (*Triturus vulgaris*) and Banded newt (*Triturus. vittatus*) Newts can be found.

374. Ichthyofauna. The area of the marine part of Kolkheti National Park is considered as one of the most productive sections of the Georgian Black Sea coast, being important wintering, feeding, and breeding grounds for many valuable fish species, including sturgeon, anchovy, flounder, red mullet to name a few. Anadromous fish species, mainly sturgeons and salmon, enter the rivers of Western Georgia form the Black Sea to spawn. The above-mentioned species are included in the Red List of Georgia.

375. Ichthyofauna of the National Park is presented by 88 species, out of which 23 are transiting, 21 species live in fresh water and 44 species live in the Black Sea. As mentioned above, among the cartilaginous fish, the Stellate Sturgeon (*Acipenser stellatus),* Russian ("Colchic") Sturgeon (*Acipenser gueldenstaedtii), and* Beluga Sturgeon (*Huso huso)* can be distinguished, and among the bony fish – the Black Sea salmon, Herring, Striped mullet, Pike, Bonito, etc. are present. Six fish species (three sturgeon species, Sea trout, Sand goby, Roach) are protected under the Red List of Georgia.

376. Ichthyofauna of Paliastomi Lake have changes in the recent over years, resulted by rising of salinity level cause by the presence of a canal and penetration of sea waters into the lake. In 40-ths of XX centuries ichthyofauna of Paliastomi Lake was presented by 40 species (Puzanov, 1940). At present the species composition of fish is in the range 11– 16 species (correlated to salinity water). Increase in water salinity stipulated adaptation of marine and semidiadromous fish to brackish water. Therefore, productivity, especially of mugilidae and some other fish species, rose.

377. The list of fish species in the rivers in the Project corridor impact zone is given in the table below.

Table 40. List of Fish Species – Rioni River

	Common name	Latin name	Protection Status
1	White bream	Blicca bjoerkna (Linnaeus, 1758)	IUCN_LC
2	Zander	Sander volgensis (Gmelin, 1789)	IUCN_LC
3	Eastern mosquitofish	Gambusia holbrooki (Girard, 1859)	IUCN_LC
4	Spined loach	Cobitis taenia (Linnaeus, 1758)	IUCN_LC
5	Wild Common Carp	Cyprinus carpio (Linnaeus, 1758)	IUCN_VU A2ce
6	Tench	Tinca tinca (Linnaeus, 1758)	IUCN_LC
7	European eel	Anguilla Anguilla (Linnaeus, 1758)	IUCN_CR A2bd+4bd
8	Zarte	Vimba vimba (Linnaeus, 1758)	IUCN_LC
9	Bleak	Alburnus alburnus (Linnaeus, 1758)	IUCN_LC
10	Russian ("Colchic") Sturgeon **	Acipenser gueldenstaedtii (Marti, 1940)	IUCN_CR A2bcde, Red List, CR
11	White-eye bream	Ballerus sapa (Pallas, 1814)	IUCN_LC
12	Brown trout	Salmo trutta fario (Linnaeus, 1758)	Red List, VU, A1d
13	Bream	Abramis brama (Linnaeus, 1758)	IUCN_LC
14	Crucian Carp	Carassius carassius (Linnaeus, 1758)	IUCN_LC
15	Leaping Mulle	Liza saliens (Risso, 1810)	IUCN_LC
16	Wild Common Carp	Cyprinus carpio (Linnaeus, 1758)	IUCN_VU A2ce
17	Minnow	Phoxinus colchicus	IUCN_LC
18	Black Sea Roach	Rutilus frisii (Kutum) (Nordman, 1840)	IUCN_LC, Red List, VU, B2a
19	Flathead Mullet	Mugil cephalus (Linnaeus, 1829)	IUCN_LC
20	Wels Catfish	Silurus glanis (Linnaeus, 1758)	IUCN_LC

21	Blue Bream	Ballerus ballerus (Linnaeus, 1758)	IUCN_LC
22	European flounder	Platichthys flesus lussus (Pallas, 1814)	IUCN_LC
23	Black-striped Pipefish	Syngnathus abaster (Risso, 1827)	IUCN_LC
24	Roach	Rutilus rutilus (Linnaeus, 1758)	IUCN_LC
25	Black Sea Roach	Rutilus frisii (Kutum) (Nordman, 1840)	IUCN_LC, Red List, VU, B2a
26	Black Sea salmon	Salmo labrax (Pallas, 1814)	IUCN_LC, Red List, EN, A1d
27	Ukranian Brook Lamprey	Eudontomyzon mariae (Berg, 1931)	IUCN_LC
28	Threespined Stickleback	Gasterosteus aculeatus (Linnaeus, 1758)	IUCN_LC
29	Beluga	Huso huso (Linnaeus, 1758)	IUCN_CR A2bcd, Red List. EN
30	Ship Sturgeon*	Acipenser nudiventris (Lovetsky, 1828)	IUCN_CR A2cde, Red List, EN
31	Atlantic Sturgeon*	Acipenser sturio (Linnaeus, 1758)	IUCN_CR A2cde; B2ab(ii,iii,v), Red List, CR
32	Riffle minnow	Alburnoides bipunctatus (Bloch, 1782)	IUCN_LC
33	Stellate Sturgeon	Acipenser stellatus (Pallas, 1771)	IUCN_CR A2cde, Red List, EN
34	Bitterling	Rhodeus sericeus (Pallas, 1776)	IUCN_LC
35	Transcaucasian nase	Chondrostoma colchicum (Derjugin, 1899)	IUCN_LC
36	Swordfish	Xiphias gladius (Linnaeus, 1758)	IUCN_LC
37	Pike-perch	Sander lucioperca (Linnaeus, 1758)	IUCN_LC
38	Rudd	Scardinius erythrophthalmus (Linnaeus, 1758)	IUCN_LC
39	Northern Pike	Esox lucius (Linnaeus, 1758)	IUCN_LC
40	Dace	Leuciscus leuciscus (Linnaeus, 1758)	IUCN_LC
41	Palaeostome shad	Alosa caspia palaeostomi (Sadowsky, 1934)	Red List, VU, D2
42	Perch	Perca fluviatilis (Linnaeus, 1758)	IUCN_LC
43	Caspian shemaya	Chalcalburnus chalcoides (Guldenstadt, 1772)	IUCN_LC
44	Asp	Aspius aspius (Linnaeus, 1758)	IUCN_LC
45	Monkey goby	Neogobius fluviatilis (Pallas,1814)	IUCN_LC, Red List, VU, B2a
46	Barbus	Barbus tauricus rionica (Kamensky, 1899)	IUCN_LC
47	Gudgeon	Gobio lepidolaemus caucasica (Kamensky, 1901)	IUCN_LC

Key: LC-Least Concern, VU-Vulnerable, EN-Endangered, CR-Critically endangered
*Note: * There is a very slim possibility that Atlantic (European) Sturgeon (Acipenser sturio) and/or Ship (Fringebarbel) Sturgeon (Acipenser nudiventris) also still regularly occur in the Rioni River (See BAP, Section **3.2 - Priority biodiversity**). Due to the current status of these species however they are considered functionally extinct according the critical habitat analysis included in the BAP (see **Appendix A. Critical and Natural Habitat Assessment**).*
*Note: ** Colchic Sturgeon (A. g. colchicus), which has at times been considered a subspecies of A. persicus or a separate species. Recent genetic studies have found no evidence for distinctiveness of A. persicus and A. gueldenstaedtii (Birstein et al. 2000; Ruban et al. 2008), so this taxon is currently considered a subspecies of A. gueldenstaedtii by IUCN (Gessner et al. 2010b; Arne Ludwig, IUCN Sturgeon Specialist Group, in litt. 2018), though it is still considered as A. persicus within Georgian legislation (Government of Georgia 2014b).*

378. During the field surveys in the section of interest, Barbel, Bream, and Common chub were registered. According to the local residents and fishermen, the quantity of Catfish in catches has decreased with time.

379. Reptiles. The is not a rich presence of reptile species in the Project area. The species registered here are mainly those related to water reservoirs. Out of 53 species registered in Georgia nine can be found in the Project region. These are: Slow worm (*Anguis fragilis*), Sand lizard (*Lacerta agilis*), Derjugin's Lizard (*Lacerta derjugini)* (IUCN NT), Dice snake (*Natrix tesselata*), Grass snake (*Natrix natrix*)*,* Aesculapian snake (*Elaphe longissima*)*,* Large-headed water snake (*Natrix megalocephala*)*,* Smooth snake (*Coronella austriaca).* In all ponds and wetland areas, the European Pond Turtle (*Emnus orbicularis*) (IUCN_NT) can be found.

380. Invertebrates. The following groups can be found in the project area: Nematoda, Hirudinea, Mollusca, Crustacea, Arachnida (lites, ticks, scorpions, spiders) and Insecta. The endemic Euscorpius migrelikus and migrant form Italian Scorpio (*Euscorpius italikus*) are only present in narrow coastal strip of the Black Sea, outside the project area. The area is rich in the representatives of double-winged insects, in particular mosquitoes and flies.

E.4 - Natural Hazards

381. Natural disasters take place on quite a large scale in Georgia and with a high frequency of recurrence due to the complex geological and geographical conditions. The frequency of natural disasters has increased in the recent past and this increase is considered to be a consequence of the effects of global climate change as well as human activities, such as deforestation, overgrazing of pastures, land use changes without proper evaluation etc. In general information on geohazards is available from reference information. For the area of interest flooding is the main hazard. Additional analysis on flooding risks to the Project area are provided in Section **F.2.10 - Climate Change Risks and Adaptation**.

382. The Kolkheti lowland, and respectively the study area, have negative tectonic movement. Sinking is accelerated due to deep unconsolidated Quaternary depositions. According to various data, the land may be sinking by 1-2 mm a year.

383. Georgia is located within the Mediterranean seismic belt in the active seismic zone of the Caucasus. Its architectonical movement and activity is connected with the movement of the neighboring Eurasian and Afro-Arabic rocks. Seismicity magnitude in the Project area varies from seven to eight units MSK64 scale. (see Table 41).

Table 41. Seismicity Within the Project Area

Settlement	Region	Municipality	Community	A-Seismicity coefficient	Magnitude (MSK64 scale)
Ureki	Guria	Ozurgeti	Ureki	0.12	8
Poti	Samegrelio-Zemo Svaneti	Poti Municipality	Poti	0.15	8
Grigoleti	Guria	Lanchkhuti	Supsa	0.11	7
Maltakva	Guria	Lanchkhuti	Supsa	0.11	7
Shekvetili	Guria	Ozurgeti	Natanebi	0.14	8
Tskaltsminda	Guria	Lanchkhuti	Grmaghele	0.11	7

Figure 48. Landslide, Mudflow, Drought, High Wind Speed, Risk of Avalanches

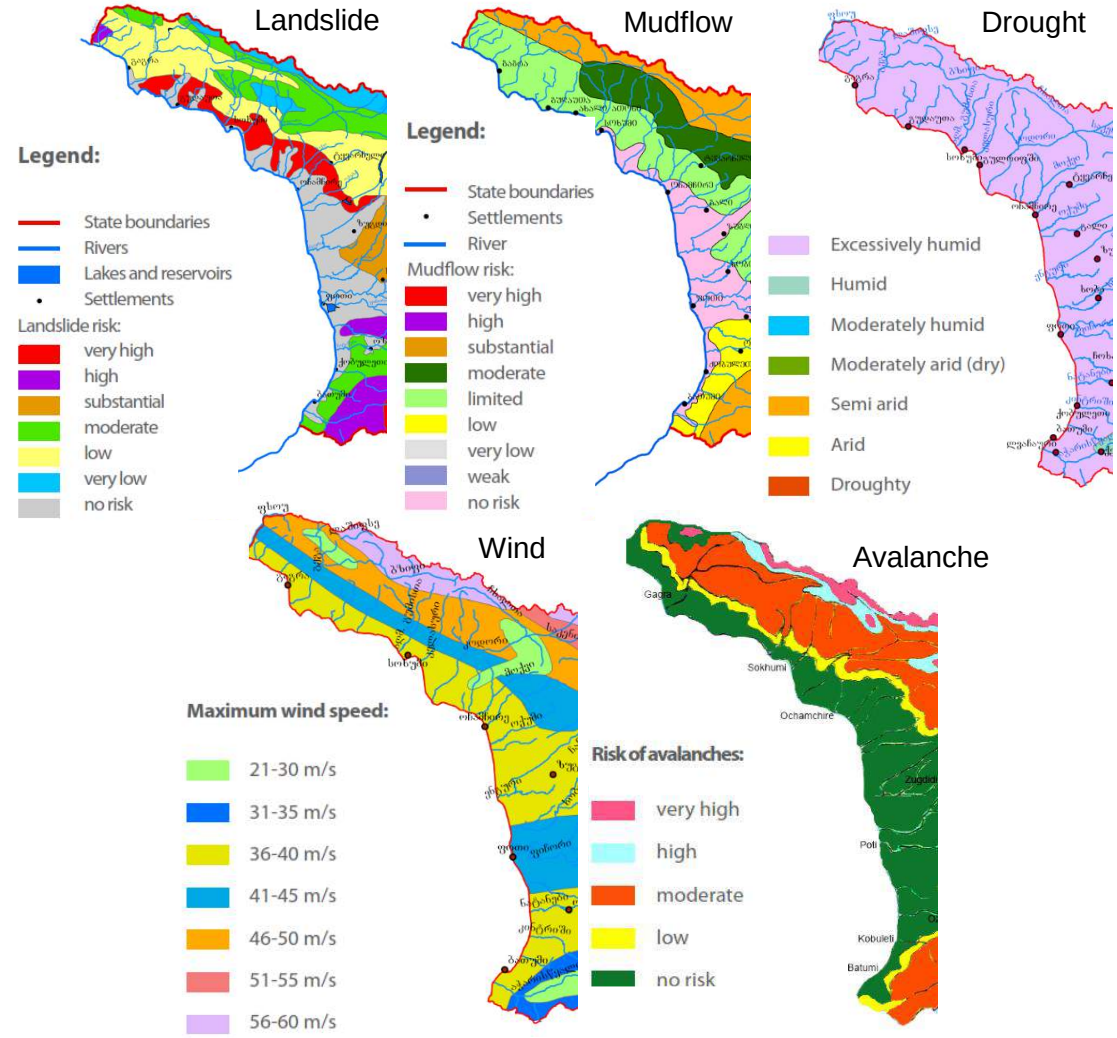


Figure 49. Flooding risk

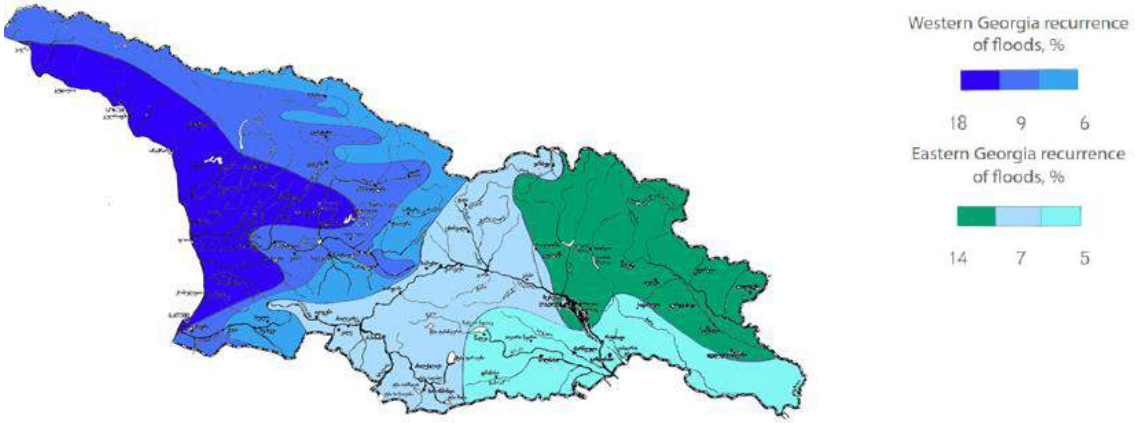
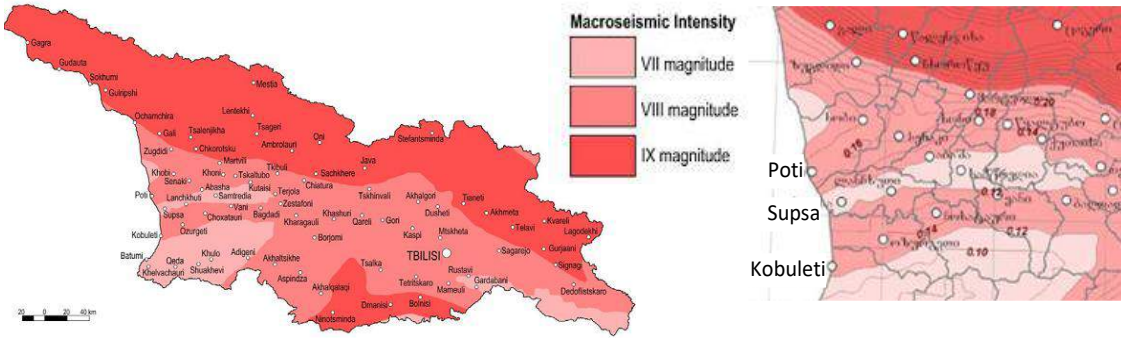


Figure 50. Seismic zoning map



Maps Source: National Report on the State of environment of Georgia for the Period of 2007-2009

E.5 - Social, Economic, and Cultural Profile

E.5.1 – General Profile

E.5.1.1 - Population and Gender

384. The Project belongs to Khobi municipality and Poti areas and residential areas closest to the Project site are Poti and Patara Poti.

385. According to the National Statistics Office data by the state from January 2016, the population in Poti and Khobi municipality was 41.7 thousand and 29.5 thousand respectively, including 942 residents in Patara Poti. Ethnic composition of Poti population is shown below.

Table 42. Poti Population by Ethnic Composition

Ethnicity	% Composition
Georgian	94.2
Abkhaz	0.1
Osetian	0.1
Armenian	0.4
Russian	4.0
Azeri	0.1
Greek	0.1
Ukrainian	0.6
Other	0.4

386. According to official statistics, there is an even split between males and females in Patara Poti. In Poti city, females account for 52.85 percent of population, and males 47.15 percent.

E.5.1.2 - Employment and Sources of Income.

387. According to official statistics, the 2016 unemployment rate in the regions was 10%. Majority of population is self-employed. Employment data is shown in Table 43**.**

Table 43. Employment/Unemployment in the Region (2016 data, In Thousands)

	Kakheti	Tbilisi	Shida Kartli	Kvemo Kartli	Adjara A/R	Samegrelo and Zemo Svaneti	Imereti	The remaining regions	Georgia
Active population (labor force), total	192.7	440.1	149.4	209.7	189.4	211.4	376.7	229.0	1998.3
Employed	182.3	343.1	135.6	191.7	164.9	190.2	335.9	219.6	1763.3
Hired	49.7	290.1	41.9	61.0	75.2	66.4	108.9	52.2	745.4
Self-employed	132.5	53.1	93.6	130.6	89.7	118.9	225.4	167.2	1010.9
Not-identified worker	0.1	0.0	0.1	0.2	0.0	4.9	1.6	0.2	7.0
Unemployed	10.4	96.9	13.8	17.9	24.5	21.2	40.8	9.4	235.1
Population outside labor force	71.6	335.7	63.5	90.9	86.0	86.5	155.1	73.8	963.2
Unemployment rate (percentage)	**5.4**	**22.0**	**9.2**	**8.6**	**13.0**	**10.0**	**10.8**	**4.1**	**11.8**
Economic activity rate (percentage)	**72.9**	**56.7**	**70.2**	**69.7**	**68.8**	**71.0**	**70.8**	**75.6**	**67.5**
Employment rate (percentage)	**69.0**	**44.2**	**63.7**	**63.8**	**59.9**	**63.8**	**63.2**	**72.5**	**59.5**

Source: National Statistics Office of Georgia

388. A majority of the population is employed in transport and communication sectors. Average monthly remuneration of population in the region is 645 GEL.

Table 44. Number of Employed Persons by Field of Activity

Field of Activity	Number of Employed (persons)					
	2010	2011	2012	2013	2014	2015
Electricity, gas, and water supply	42	148	248	342	315	62
Fishing	208	169	81	178	199	188
Mining and Quarrying	181	204	316	152	269	249
Education	595	1,100	738	757	873	853
Real estate, renting and business activities	863	1,302	1,245	761	1,178	904
Community, social and personal service activities	605	742	729	537	529	1,171
Hotels and restaurants	318	641	705	858	778	1,229
Health and social work	3,361	3,057	2,212	2,399	2,895	2,144
Agriculture, hunting and forestry	245	963	1,163	1,835	1,971	2,167
Construction	2,618	2,890	3,171	2,646	2,627	2,498
Manufacturing	2,844	4,294	3,564	4,036	3,972	3,906
Wholesale and retail trade; repair of motor vehicles and personal and household goods	2,547	4,546	3,875	3,661	5,092	5,315
Transport and communication	5,460	5,183	5,661	5,842	6,011	6,616

389. As per the unemployment rate in the Samegrelo region, the rate of unemployment in Poti exceeds the rate of unemployment in many of the other municipalities and equals to 10%.

390. Poti is considered to be one of the busiest transport hubs in Georgia. Poti sea port is one of the largest sea ports in the Black Sea basin. Due to its location and capacity it represents the largest segment of transit and transport network of the Caucasus. Poti is

developing and in April 2008 a free economic zone was established in the area. The railway-ferry connecting Poti to the ports of Ukraine, Turkey, Romania, Bulgaria, and Russia is especially important. It should be mentioned that the port is one of the largest employers in the region.

391. The key sectors of the economy in Poti include: transport and communications (3,410 persons employed); industry (1,100 persons); and trade and service (1,050 persons are employed). The number of employed population in Patara Poti accounts for 229, of them 45 – in public, 184 – in private sector.

E.5.1.3 - Agriculture

392. In Samegrelo-Zemo Svaneti, agriculture is a leading sector. Tea and cereal are cultivated, and the region has also started growing exotic fruits including Kiwi and Pheikhoa, accounting for 700-800ha of cultivated areas. In accordance with official statistics, distribution of agriculture areas of the municipality located in the Rioni Basin was as follows:

- Martvili Municipality: Total agriculture areas amounted to 32,703.3ha, with 11,254.6 ha arable lands (annual croplands), 4,995.7ha perennial croplands, 163.0 ha hey fields and 16,290.0 ha pastures.
- Senaki Municipality: Total area of agriculture lands amounted to 22,531.2ha, with 11,808.3ha arable lands, 3,457.6ha perennial crops, 26.0ha hey fields, 7,071.3ha pastures and 168.0 unsown areas.
- Abasha Municipality: Total agriculture areas amounted to 20,105.0 ha, with 12,451.0 ha arable lands, 1,695.0 ha perennial croplands and 5,959 ha pasture;
- Khobi Municipality: Total agriculture areas amounted to 29,160.1 ha, with 14,755.8 ha arable lands, 5,322.6 ha perennial croplands, 11.2 ha hey fields and 9,070.5 ha pastures.
- Poti: Total agriculture areas amounted to 1,014.3 with 182.6 ha arable lands, 329.0 ha perennial croplands, 66.4 ha hayfields and 225.3 ha pastures.

393. Overall, the Rioni Basin's share of Samegrelo-Zemo Svaneti region's total agriculture lands (268,311.60 ha) was over 39% (105,513.90 ha). The largest areas were covered by arable lands (64,856.60 ha) – over 92% of total arable lands (70159.3 ha), followed by pastures (38,616.10 ha) – about 26% of total pastures (15,0403.1 ha) and, perennial croplands (15,799.90 ha) – about 26% of total perennial croplands. As for the perennial crops, including nut growing, the municipalities of the Rioni Basin were not the leaders and lagged behind the municipalities located outside it.

394. Khobi municipality is the leader in total number of cattle in the region, followed by Martvili, Abasha, and Senaki. In terms of the number of pigs, Martvili was the leader, followed by Khobi, Abasha and Senaki. In terms of poultry, Khobi was the leader, followed by Martvili, Abasha and Senaki. Overall, the total number of the cattle, pigs, and poultry of the Rioni Basin amounted to 80 percent of the entire Samegrelo-Zemo Svaneti's cattle heads, 72 percent of pigs and 70 percent of poultry. In total, 33.6 percent of agricultural lands are under the private ownership in the region, with about 79 percent of annual croplands and over 62 percent of perennial croplands privatized. On the contrary, almost 100 percent of pastures and hayfields are under the state ownership. Produce is sold by sub purchaser at the farmers markets in the region.

395. The majority of arable land is private. Land registration process finished in 2002 when relevant certificates were handed over to the owners. Pastures that were not privatized are under common ownership. Farmers are also allowed to lease or buy land from the state.

396. Land reform started in 1991 and in 1992 a resolution allowing privatization of land was enacted. In 1996 the Parliament of Georgia passed the law on the proprietary rights on agricultural land. Each household and permanent resident of the rural area could privatize 1.25 ha plot, while the quota for employees was set as 0.75 ha. However, in some villages, because of the shortage of land, households received smaller plots (around 0.7 ha). Information on registered plots can be obtained from the offices of the national agency of the state register.

397. According to interviews, a minimum of 10 households in Poti (Nabada community) per month are busy with subsidence fishing. People fish in both the sea and in the Rioni River using a variety of methods including gill nets. Amateur fishing is important for Patara Poti residents.

E.5.1.4 - Industry

398. In the Samegrelo-Zemo Svaneti section of the Rioni Basin, mostly small to medium-size enterprises are presented. These include food production and processing industries (meet production, milk and other diary production, mills, bakeries, tea production, nut processing, bay leave processing, etc.), textile factories, wood processing, paper production, extraction, and processing of construction materials.

399. Large enterprises are concentrated in the city of Poti, which is the Black Sea port of international importance. There are large food processing and production (fish, meat, milk production, granaries, etc.), wood processing, ship repair and oil processing factories, Kulevi oil terminal. Construction of the deep-sea port in Anaklia is in the pipeline. Among medium and small-size enterprises, transportation, transit, and cargo storage facilities dominate.

400. Trade in recent years didn't play a significant part (11 to 12 percent) in the gross regional product, though it is intensive in municipal centers and in Poti particularly. It is represented by small to medium-size retail shops, whole sale markets, hotels, etc., local branches of almost all major banks operating in Georgia.

401. According to available statistics the number of businesses in Samegrelo-Zemo Svaneti region ranks third, coming after Tbilisi, Imereti, and Adjara AR (2017 data).

Table 45. Businesses

#	Enterprise	Field	Employed personnel
1	ASV gas Ltd	Natural gas trade	8
2	K.K.K and company Ltd	Motor transportation	20
3	Aikhantrans Ltd	Car parts trade, goods transportation	15
4	Arsi Ltd	Motor transportation	20
5	Geofish factory Ltd	Fish processing	40
6	Caucasian expedition company Ltd	Car transportation	17
7	Monolittransi Lrd	Car transportation	40
8	Prime betony Ltd	Production of construction materials and construction	30
9	Ritsa Ltd	Mean and fish warehousing	4
10	Petroleum Georgia Lts	Petroleum product trade	15
11	Trabsco Ltd	Motor transportation	70
12	Poti Industria Ltd	Production of construction materials	5

Source: National Statistics Office of Georgia, 1 March 2017

E.5.1.5 - Vulnerable Groups

Table 46. Recipients of Subsidence Aid

Location	Number of recipients of subsidence		Percentage of subsidence recipients from total population	
	Household	Individuals	Household	Individuals
Sanegreli-Z.Svaneti	12,533	45,394	11.5	13.7
Poti	761	2,068	7.0	5.0
Zugdidi	1,863	5,843	11.3	13.5
Municipalities				
Abasha	832	2,932	12.7	13.3
Zugdidi	1,857	7,579	7.8	12.2
Martvili	1,761	7,095	17.9	21.2
Mestia	1,127	4,039	34.3	43.4
Senaki	1,420	4,738	11.8	11.9
Chkhorotsku	798	3,174	12.2	14.3
Tsalenjikha	1,333	5,031	13.5	19.1
Khobi	781	2,895	7.9	9.5

Source: Social Service Agency

402. According to information published by the Ministry of Labour, Health and Social Affairs of Georgia, total number of persons receiving social aid in the region of interest, by the state of December 2016, is 14.5 thousand. The split by category is given in below.

Table 47. Number of Persons Receiving Social Aid – Breakdown by Groups

Location	Handicapped	Families headed by women	Politically repressed	State compensation recipients	Household subsidies recipients	Total
Samegrelo-Z.Svaneti	12,788	2,962	11	592	405	16,758
Poti	1,197	308	2	106	75	1,688
Zugdidi	1,535	491	2	125	54	2,207
Municipalities						
Abasha	876	178	-	37	21	1,112
Zugdidi	2,180	710	-	91	93	3,074
Martvili	1,963	210	1	43	20	2,237
Mestia	367	124	-	8	-	499
Senaki	1,556	278	2	89	45	1,970
Chkhorotsku	919	217	-	33	31	1,200
Tsalenjikha	1,058	228	2	27	31	1,346
Khobi	1,137	218	2	33	35	1,425

403. In May 2017, the number of pensioners in Poti was 7.725 (of them 1,162 are IDPs); in Khobi municipality 6,539 (including 464 IDPs) pensioners were registered.

404. There are families with more than four children in the Project impact area.

E.5.1.6 - Migration and Internally Displaced Persons

405. Statistical data on migration from the region are not available. Migration includes economical migration to other regions/towns and abroad, migration of youth for education. Main destinations for migrants are Turkey, Greece, Spain, etc. Some seasonal migration is also observed.

406. According to the Ministry of Internally Displaces Persons from the Occupied Territories, Accommodation and Refugees of Georgia, the number of IDPs currently living in municipalities of Samegrelo-Zemo Svaneti region is the following:

Table 48. Main Settlement and Population in the Project Impact Zone

Locality	Number of IDPs	Number of Families
Samegrelo-Zemo Svaneti - Region	87,220	26,620
Poti	10,866	3,229
Mestia	801	210
Ckhorotisku	2,052	689
Abasha	2,417	778
Khobi	3,433	1,042
Martvili	2,705	902
Senaki	8,340	2,709
Tsalenjikha	9,055	2,690
Zugdidi	47,551	14,371

407. In Patara Poti there are 2 internally displaced families (4 people).[50]

408. According to information obtained in Patara Poti, 13 residents have moved to Turkey, 10 – to Greece, five – to Russia, two – to Italy and one to Germany.

E.5.1.7 - Education

409. There are 260 public schools, 225 state and 23 private kindergartens in Samegrelo-Zemo Svaneti. Vocational schools are available in Poti, Khobi, Zeda Etseri and Mestia. Higher education is represented by one state and one private university.

410. There are 26 public and one private school in Khobi municipality. 11 public and three private schools in Poti.

Table 49. Number of Schools and Students

Location	Number of Schools		Number of Pupils	
	2015/2016	2016/2017	2014/2015	2015/2016
Samegrelo-Z. Svaneti	263	263	43,288	43,293
Poti	14	14	,5992	6,022
Municipalities				
Abasha	24	24	2,722	2,681
Zugdidi	57	57	13,885	14,031
Matvili	39	39	4,194	4,130
Mestia	25	25	1,491	1,470
Senaki	27	27	5,161	5,190
Chkhorotsku	19	19	2,609	2,609
Tsalenjikha	31	31	3,471	3,451
Khobi	27	27	3,763	3,709

Source: Education management information system/GeoStat

411. There are 31 kindergartens in Khobi municipality, of them one in Patara Poti (address: 119 St. Barbare street); and 15 kindergartens in Poti. A grade school is also located in Patara Poti (address: 209 St. Barbare street). The schools located in Patara Poti are not within the Project Area and there is a minimum distance from the proposed alignment of 2.3 km. In total

[50] Gamma Consulting Ltd

there are 11 musical, five sport, and five chess schools in Samegrelo-Zemo Svaneti region. Tertiary training facilities are provided in the Professional Education Centre of Khobi Municipality.

E.5.1.8 - Healthcare Facilities

412. Khobi municipality district is well served with medical facilities including a total of 109 doctors and 158 nurses. There are four hospitals in municipal centre Khobi, outpatient clinics in 14 settlements, including Patara Poti (address: 129 St. Barbare street). The clinic in Patara Poti is more than 2.3 km from the Project Area. Each community is served by village doctor. Medical staff is the village healthcare facilities is rather limited. The area is covered by Emergency aid service.

413. According to the Ministry of Labour, Health and Social Affairs, there are 21 medical institutions and private practitioner physicians in Poti. The healthcare facilities are financed from the Central Budget or by insurance companies or patients' payments.

414. All large drugstore networks are present (e.g., PSP, Aversi, GPC, and Pharmadepot) in the region.

E.5.1.9 - Cultural Resources

415. There are 27 museums in Samegrelo-Zemo Svaneti including the Dadiani Palace and architectural museum in Zugdidi, Svaneti museum, and Ethnographic museum in Ushguli, Poti museum of Colchian culture, Kheta ethnographic museum, and Georgia folk song museum.

416. The region is very rich in archaeological sites and cultural monuments dating BC as well as in churches, monasteries, castles, and forts from the medieval period, as well as modern museums. Of particular importance is the Nokalakevi, also known as Archaeopolis, (place where a town was built), located in Senaki municipality. Archaeological studies have demonstrated that the site was inhabited in the early 1st millennium BC. The settlement grew larger in the 5^{th}-4^{th} centuries BC. The majority of the visible structures were built between the 4th to the 8th centuries AD when Archaeopolis functioned as the capital of Lazica. A total of 60 human burials of Hellenistic and Byzantine periods have been excavated from the site ranging from Byzantine to early Hellenistic periods as well as ruins of buildings. Various artefacts have been found as well including beaded paste and glass necklaces, silver and copper alloy bracelets, arrows, and knives of the 4th through 6th century AD, fragments of painted wall plaster, ceramics and building materials, a fragment of cross with Greek inscription (dated to the 6th century AD), and a small gold enamel object.

417. The region is abundant with ruins of old fortresses, castles, and cultural buildings as well as with churches.

418. The area is particularly interesting from archaeological point of view. There are typical ancient settlements in the Kolkheti lowland, called locally "Dikhagudzuba", which are still identifiable on aerial imagery. Their structure, physical dimensions and locations were analyzed from aerial and on-site studies. Data from existing archaeological studies and recent field works were analyzed to create a reliable database on the distribution of Bronze Age settlements.

419. A range of archaeological sites has been discovered in the late 20th century when Baku-Supsa oil pipeline was laid. Burials dated 7th-6th centuries B.C. and remains of ancient settlements (vil.Nigvziani); medieval artefacts (vil.Akhalsopeli); remains of ancient settlements (vil.Tabanati, vil.Khidmaghala); remnants of the dune settlement and workshop, the 7th-6th

centuries B.C, ruins of the dune settlement dated to the 6th-4th centuries B.C., dune settlements dated back to the 8th-7th centuries B.C. (vil.Grigoleti).

420. Presence of old settlements along Kulevi – Poti – Ureki coastal areas is known. These include: The Late Bronze – Early Iron period settlements in the estuary of the Khobi river (north of Poti); 6th– 4 th century B.C. settlement at the Tsiva river, at the estuary of the Supsa river, south to Poti. Natekhebi, located south of Poti, near the small bay of Paliastomi lake is the place where some artefacts have also been unearthed, among them fragments of amphorae on the bottom of which semi-solid petroleum waste of asphalt-pitch was registered. An early period Sinopean amphora (rim diameter - 12cm) with tubular neck (15cm high), solid handles (ovoid in section) on the shoulder was uncovered near the Supsa river canyon in the sea. Another Heraclea Pontica amphora dating from the 4th century BC was found again in the sea at Maltakva. Ureki and its surroundings are well-known with accidentally explored treasures (golden earning, necklace, buckle, rings, bracelets, coins and chains from late antique age).

421. Among the important architectural monuments of the project region are:

- Khobi Convent (XIII-XIV);
- St. Nino Church in vil. Chaladidi;
- Zemo (Upper) Bia Archangel's Church (XIX);
- Khibuli fortress (XVII);
- Kheta fortress (XVII);
- St. Sophia's church (XVII);
- Jegeti St. George's monastery (XVII);
- St. Kvirike's church Cheokhvame (IV-VII);
- St. Tevdore's Church (XIX);
- Poti (Niko Nikoladze) tower (XIX);
- Poti cathedral (XIX); and
- St. Nickolas church in Poti (XIX).

422. There are two theatres in Zugdidi; one in Poti (Poti Valerian Gunia state professional theatre); one in Senaki (A,Khorava state drama theatre); public theatre puppet theatre and Khobi; theatres in Tsalanjikha and Chkhorotsku.

423. There are no registered or known cultural heritage sites/monuments within the direct impact zone of the Project.

E.5.1.10 - Tourism

424. In Samegrelo section of the Rioni River Basin, tourism potential is high, especially ecotourism and cultural tourism. Kolkheti National Park with about 28,571 ha of land and 1,574 ha marine area is a major attraction for Georgian and foreign tourists. The shallow Lake of Paliastomi located in the park, is of 182 km^2 is rich in fish. Furthermore, Paliastomi is one of the important areas of Africa-Eurasia water and wetland migratory birds. The sight is designated a Ramsar category of internationally important wetland. Hence, bird watching is one of attractions in the area.

425. The area is also unique and rich in flora - relict and unique species specific to Colchic refugium. Infrastructure of Kolkheti National Park has been improved with financial aid of the World Bank. In addition to this, the close location of the park to archaeological sites makes the area more attractive.

426. Other attractions and types of entertainment and leisure for tourists are visits to karst caves Khobi, horse-riding, sports fishing, hiking in woods, etc. Foot prints of dinosaurs and remnants of gigantic carnivore lizard mosasaur found in one of the gorges of the local river in Martvili region has also become one of the major attractions for visitors.

427. There is a range of hotels and family hotels in the region. Most of them are in the seaside areas, including Poti, Ureki and Shekvetili. Hotels work seasonally – mainly in summer.

E.5.2 – Project Affected Population

428. This LARP was prepared by RD under the assistance of the international social safeguards (resettlement) specialist hired by ADB included a census of 100% of the affected households (AHs) available on site was conducted to enumerate the APs. A sample socio-economic survey was undertaken in the Project area covering 8 households which is approximately 61.5% of the total AHs covered in census (A total of 12 households will be affected by the Project). The objective of the socioeconomic survey was to gather general information on socioeconomic condition of the affected people. The socioeconomic information of the affected population as per census and socioeconomic survey is presented hereunder.

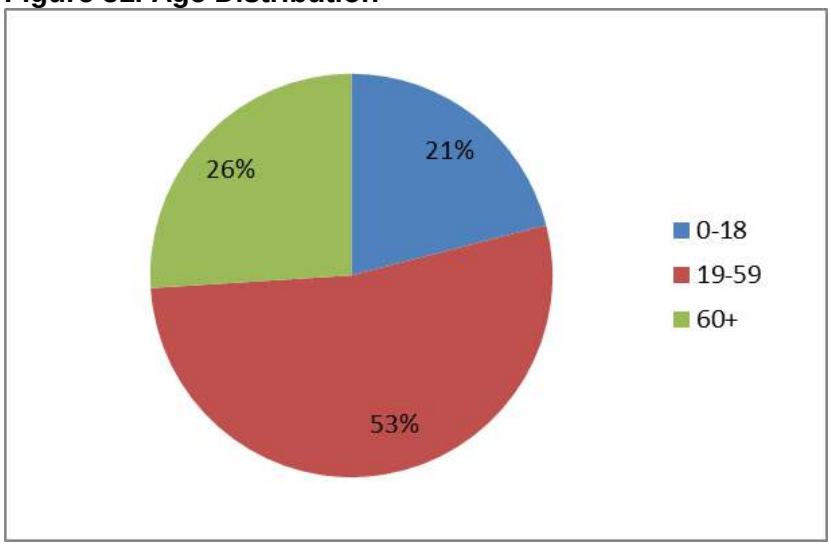
429. Gender profile of the interviewed households is as follows: 18 (47%) are male and 20 (53%) female. Information about affected persons is given in Table 50.

Table 50. Information about population

Number of surveyed people	Number of surveyed households	Average number of family members in surveyed households	Surveyed men	Surveyed women
38	8	5	18 (47%)	20 (53%)

430. According to the obtained information, 47 APs are up to 6 years old, 94 APs are between age of 7 to 18, 460 are 19-59 years old and 178 –more than 60 years old. Age distribution is shown on Figure 51.

Figure 51. Age Distribution



431. As for marital status, 50% (19) of village residents are married, 2 of them are widowed. Detailed information is given in Table 51.

Table 51. Marital Status

Status	Number	%
Married	19	50%
Single	17	45%
Divorced	0	0%
Widowed	2	5%
Total	38	100%

E.5.2.1 – Affected Household Ethnicity

432. AHs are all Georgian (100%). None of the usual ethnic minority groups in Georgia including Russians, Armenians, Jews or Ukrainian are affected in the project. Ethnic diversity does not mark any difference in overall national development in Georgia and the minorities are mainstreamed as a common nation.

E.5.2.2 - Urban Rural Proximity

433. The project road is located in semi-urban area of Poti city suburbs. Survey of the 17 sampled households shows that only 12.5% of the AHs reside in rural areas, while 25% reside in semi-urban suburbs of Poti city and 62.5% in Poti City (Table 52). Project impact on urban and rural households will tend to change their investment priorities.

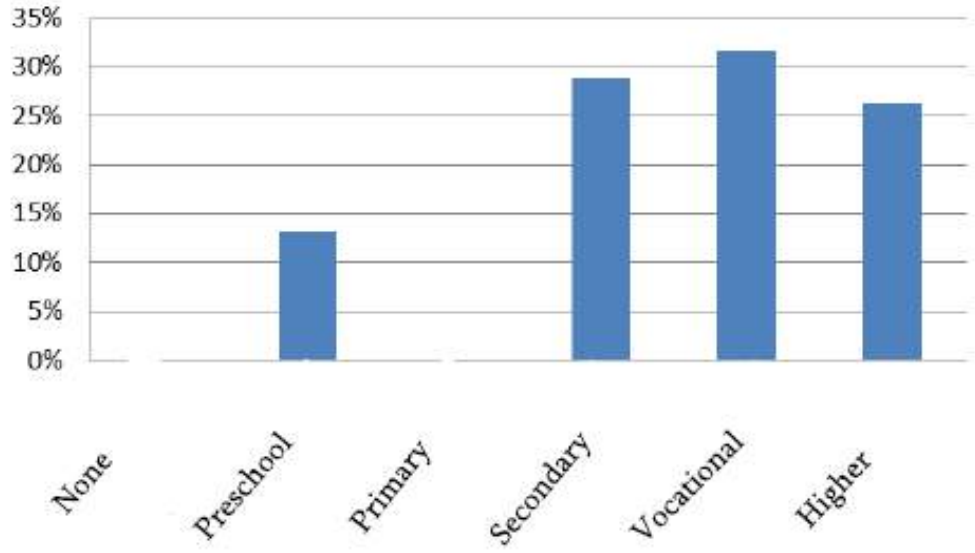
Table 52. Urban Rural Distribution of AHs

Sl. No.	Type of Settlement	Total No. of Households	% Age
1	Rural	1	12.5
2	Semi-urban area (Suburbs)	2	25
3	Town (Urban)	5	62.5
	Total	8	100

E.5.2.3 - Level of Education of APs

434. The majority 29% of interviewed APs has secondary education, 26% has higher education and 32% graduated the vocational college. In Figure 52 information about educational level of APs by villages is shown. Data is obtained from socio-economic survey, carried out within the project.

Figure 52. Education level of APs



E.5.2.4 - Agriculture and Land Resources

435. Land Holding Status. The AHs are all land holder of some quantum. Minimum land holding comes out to be 1395 sqm and maximum 5006 sqm. Only 1 of the affected AHs has another additional land plot in rural area. 11 AH have only one land plot as they are living in Urban area.

436. Major Cropping Pattern. The affected households live mostly in Poti and its suburbs. Only 1 AH lives in v. Sagvichia, has an agricultural land there and is cultivating hazelnut trees on it. 1 AH is producing corn for self-consumption on the land plot adjoining his house in Patara Poti. The other AHs do not possess any land plots other than affected and do not cultivate crops.

E.5.2.5 - Economy of Affected Housholds

437. Major Economic Activities and Employment Status. Agriculture is not the main sector of economic activities and for the APs. Only 1 AH has agricultural land and is engaged in agricultural production (hazelnuts). 1 AH is producing corn for self-consumption on the land plot adjoining his house in Patara Poti. According to survey results on employment, 9% out of interviewed APs state that they are employed, almost 21% - unemployed, 15% - housewives, 5% student or pupil, 6% - pensioners and 5% - is occupied by other business. Percentage and quantitative distribution of population based on employment status is given in Table 53.

Table 53. Percentage and quantitative distribution of population based on employment status

Occupation	Number	%
Employed in the public service	3	8%
Employed in the private sector	7	18%
Self-employed	0	0%
Farmer	0	0%
Unemployed	7	18%
Student/pupil	5	13%
Pensioner	3	8%

Housewife	8	21%
Other	5	13%
Total	38	100%

438. Annual Income of AHs. Employment in private sector and also in public sector are major contributors to income of the AHs. The survey found that 62.5% of the AHs get income from one single source, 25% from double sources and 12.5% from three sources. Average annual income per household is 5022 GEL.

439. Household Assets and Durables. Possession of durable goods differs from each household depending on the nature of the durable goods. 100% of the households in the project area possess a television and mobile phones, 62.5% have computer, refrigerators, access to gas for cooking. 50% have washing machine. 25% households reported that they have a car.

440. Possession of domestic animals includes large animals in 12.5% households and poultry in 12.5% households (Table 54).

Table 54. Possession of Durable Goods and Domestic Animals

Sl. No.	Item	Households No.	%
1	Mobile phone	8	100
2	Television	8	100
3	L.P.G Connection/ Gas Cylinder	5	62.5
4	Computer	5	62.5
5	Refrigerator	5	62.5
6	Washing Machine	4	50
7	Car	2	25
8	Large Animals (Cows/Bulls/Buffaloes)	1	12.5
9	Poultry	1	12.5
	TOTAL	8	

441. Prevalence of Debt. Debt prevalence is significant among the sample households. 37.5% have reported to have debt and the source is formal bank (Table 55).

Table 55. Indebtedness

Sl. No.	Indebtedness	Number of Households	%
1	Yes	3	37.5
2	No	5	62.5

E.5.2.6 - Water and Sanitation

442. Source of Drinking Water. The major source of drinking water is piped water supply. Out of the 8 surveyed households, it is noted that all 8 households use water from the central water supply system.

443. Sanitation Facilities. 50% of the households possess latrine at their house and 50% reported having flush toilet.

E.5.2.7 - Access to Energy and Civic Facilities

444. Access to Energy for Cooking. Wood is the major source of fuel being used by the households (50%) for cooking and 37.5% use gas and 12.5 electricity. Details are given in Table 56.

Table 56. Type of Fuel Use for Cooking

Sl. No.	Types of Fuel	Number of Households	%
1	Wood	4	50
2	Gas	3	37.5
3	Diesel/ Kerosene		0
4	Electricity	+1	12.5
	Total		100

445. Access to Electricity. 100% of the households are connected with central power supply

E.5.2.8 - Vulnerable Households

446. Poor (receiving government subsidies or pensioners), women headed, and disabled or pensioner households without breadwinner are considered as vulnerable, those that require special assistance for resettlement. There are two vulnerable AHs in the Project area. This includes two women headed AHs (Table 57).

Table 57. Vulnerable Affected Households

AH Category	No. AH
AHs below the poverty line receiving subsidies	0
Lonely pensioner or disabled Aps without breadwinner	1*
Women headed households	2*
Total	2*

*Note: *1AH is represented by two pensioners without breadwinner, and only the female member has some income and thus this 1 AH is attributed to both categories: a) lonely pensioner without breadwinner and b) women headed household*

E.6 - Infrastructure, Utilities, and Services

E.6.1 - General

447. The area of the district is crossed by internationally important roads, including the E-692 and E-70. Other infrastructure includes – railways line, transmission lines, and fiber optic cables.

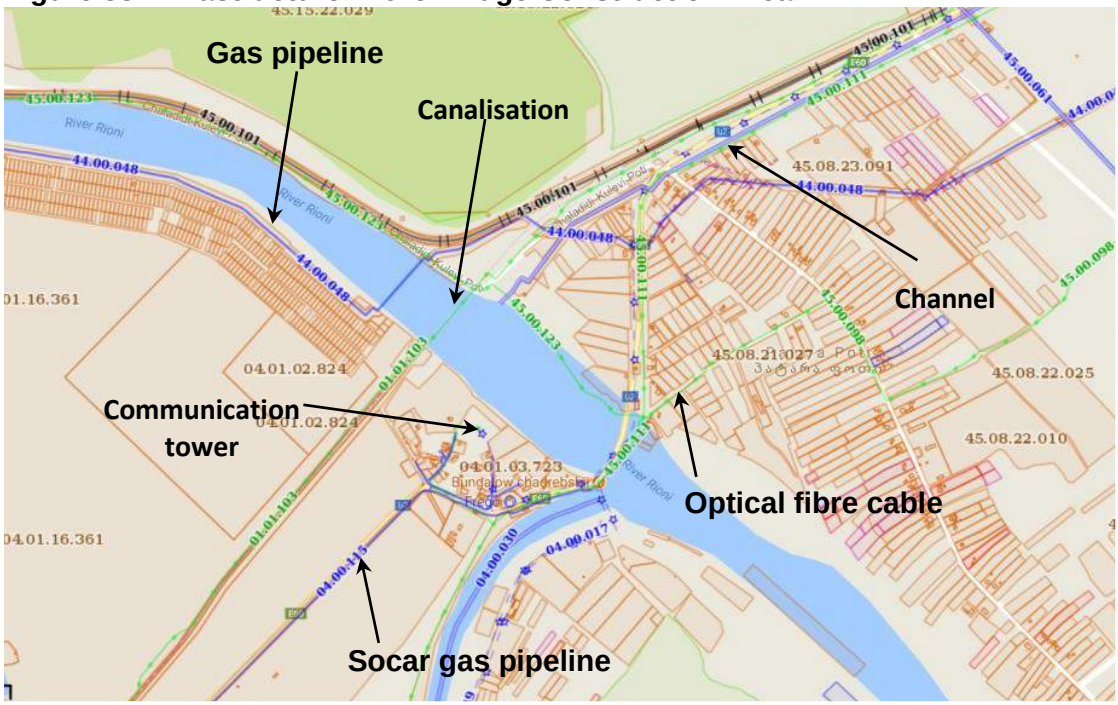
448. Both telephone and mobile telephone communication is freely available. Access to internet via fixed connection in villages is limited.

449. The following service infrastructure will be affected by the project:

- electricity high and medium Network;
- water Network;
- communications Network (fiber optic lines); and

- gas Network (Socar Georgian gas).

Figure 53. Infrastructure in the Bridge Construction Area



Source: National Public Cadaster

E.6.2 - Energy

450. As a part of Georgian Power and Gas Infrastructure Program (PGIP 2010-2012) a 30-km gas pipeline (700mm) from Senaki to Poti has been constructed to provide natural gas to improve energy supply to Poti population, Port of Poti and Poti Free Industrial Zone (FIZ) established on the basis of Port of Poti operations. Under the program replacement of 58 km of 220 kV transmission lines (Senaki I and II) by Georgia State Electro system (GSE); Jvari-Khorga Interconnection Project, which includes: (i) double-circuit 500 kV OHL tied-in to 500 kV OHL Kavkasioni as well as approximately 60 km long double circuit 220 kV OHL from Jvari to Khorga tied-in to 220 kV Khorga and 500 kV Jvari substations; and (ii) Construction of the new 500/220 kV substation in Jvari is being implemented. One of the Project goals is to improve reliability of 220 kV transmission network and diversify power supply sources in the West Georgia.

E.6.3 - Water and Sewage

451. Drinking and industrial water supply of Poti is carried out through the city's central water supply pipeline, the main source of water supply is groundwater. City water distribution network rehabilitation works are in the process of completion, after which the population will have a 24-hour water supply.

452. Wastewater remains a significant problem in the Poti area. At present wastewater infrastructure in Poti is inefficient and inadequate to the needs of the population. Untreated sewage contaminates soil and surface water and endangers human health. The existing sewer network was designed as a separate system and covers the center of Poti. It is orientated towards the location of the existing wastewater treatment plant at the northern edge of Poti. The total length of gravity sewer is 22 km, the total length of pressure pipes is 10 km. The

current condition of the sewer network is not known. The sewer system is submerged most of the time as the pumping stations run only one or two hours per day. The rest of the time the wastewater is stored in the sewer network and closed-circuit television (CCTV)-inspections are not possible. The existing pressure pipes need replacement as they are either out of operation, or damaged or in a bad condition. All existing pressure pipes are in a poor condition, some of them are out of order due to pipe burst and blockages.

453. There are nine existing wastewater pumping stations. Most of these pumping stations are in a very bad condition. The mechanical and electrical equipment has long passed its design life time and also need complete replacement. The pumping stations are over-sized.

454. Besides the old age of most installations and constructions, an important deficiency in Poti is the intermittent operation of the wastewater pumping stations. As the sewer network is submerged during most of the day there is sedimentation of sludge and considerable silting. For an adequate operation of a modern sewer network, the pumping stations need to be operated 24 h/d. The pressure pipes are partly out of order because of pipe breaks and material failure. The present condition of the gravity pipes is not known. The continuous accumulation of wastewater in the sewer pipes makes their inspection impossible.

455. In response to these issues, the ADB has been asked to finance the rehabilitation and extension of the wastewater network and the construction of a wastewater treatment plants for seven secondary towns, including Poti. The wastewater project will include the rehabilitation and extension of the sewer network with gravity sewers and pressure lines, the construction of wastewater pumping stations as well as the construction of a new wastewater treatment plant. As the terrain is flat a number of pumping stations of different size will be constructed, although their locations are unknown at this time. All existing pumping stations will be replaced.

E.6.4 - Waste

456. Landfills exist in every municipality (except for Mestia), however waste collection service is primarily limited in towns. The cleaning and waste management responsibilities within Poti area are assigned to the municipal waste management company. It carries out domestic waste collection/disposal and streets (and parks) cleaning based on existing contracts. The waste collecting containers are installed around the city area, but the segregated waste collection practices are not employed. The industries operating in the city area (including Poti Sea Port Corporation) have contracts with the municipal waste management company for the removal and disposal of domestic wastes. The management of hazardous wastes from the industrial enterprises is subject to the exclusive contracts with the companies licensed to handle and dispose hazardous wastes at specially arranged locations.

457. The Poti municipal landfill, which is closest to the Project site, is located north-east of Nabada Settlement, at the south bank of Rioni River, 600-650 m apart from the closest residential building. The landfill serves Poti and the settlements close to the town. The area of the landfill is 55,185 m^2 and the volume of waste 'accepted' by the landfill on daily bases is about 100 m^3. Solid Waste Management Company of Georgia is responsible for operation of the landfills and waste collection is carried out by municipalities (waste management utilities).

458. Previously, the landfill was not fenced, and waste was not covered with soil, resulting in high environmental contamination risks. In June 2014 the landfill has been transferred to "Solid Waste Management Company of Georgia" (under the Ministry of Regional Development and Infrastructure - MRDI). Landfill rehabilitation was completed in February 2015 and included rehabilitation of internal roadways, storm-water and leachate drainage systems, fencing the entire territory of landfill, covering the disposed waste by isolating layers of soil,

installing guard booths and firefighting stand, lighting, planting trees, etc. The new Landfill Management Plan considers disposal of waste at designated cells with proper compaction and cover with soil, according to management scheme.

459. In 2016, with financial aid from the EBRD, waste management equipment (trucks and waste bins/containers) have been upgraded/renewed.

460. The list of companies in the region authorized for utilization of waste, including hazardous waste, include:

- Ecomedi Ltd (vil.Pirveli Maisi Khobi muncpality,). Activity – insiveration of b, c, and d class medicinal waste and material contaminated with petroleum products (rags, paper, oil filters, etc).
- Sandasuptaveba Ltd (vil.Adlia, Khelvachauri municipality). Activity – incineration of medicinal-biological waste.
- Bilge water Ltd (vil.Chaladidi, Khoi municipality). Activity – utilization of liquid hazardous waste.
- Blacksea 2013 Ltd (vil.Khorga, Khobi municipality). Activity – recovery of waste, incineration, running temporary storage area hazardous waste.
- Zugo Ltd (Makhinjaulri, Batumi) – processing of plastic waste.

461. According to 2017 data, there are two companies engaged in black metal waste and scrap metal processing: individual entrepreneur Nodar Chumbashvili and Tsagura Ltd.

462. There are no hazardous waste landfills located within the municipality. Hazardous waste is to be disposed by a private company for specific types of waste generated by the Project. The list of the companies closest to the Project area which are authorized to manage hazardous waste have been identified above.

E.6.5 - Media

463. Along with the national coverage media, there is the local TV broadcasting company Guria TV, two companies in Poti area (9th channel and cable television), cable TV Madi; one local radio station (Harmony) and a range of newspapers - Guria News, Guria Moambe and Alioni. Guria News and Guria Moambe are weekly editions with regional coverage.

E.6.6 - Non-governmental Organizations

464. There are several NGOs in Guria region mainly involved in human rights protection, information availability, and youth issues. The list includes:

- Union of Young Teachers (Ozurgeti);
- Youth centre Progress (Chokhatauri);
- Mediators association of Guria (Ozurgeti);
- Women for Development (Ozurgeti);
- Consumers Society of Ozurgeti;
- Farmers Union of the Guria Region (Ozurgeti);
- Foundation for Protection of Mothers and Children (Chokhatauri);
- Union of Hunters and Fisherman (Ozurgeti);
- Lanchkhuti Information Centre;
- Georgian Young Lawyers' Association – Ozurgeti branch;
- Youth Resource Centre of Guria; and
- Student-youth consultative Organisation.

F. Anticipated Impacts and Mitigation Measures

F.1 - Impact Assessment Methodology

F.1.1 - Introduction

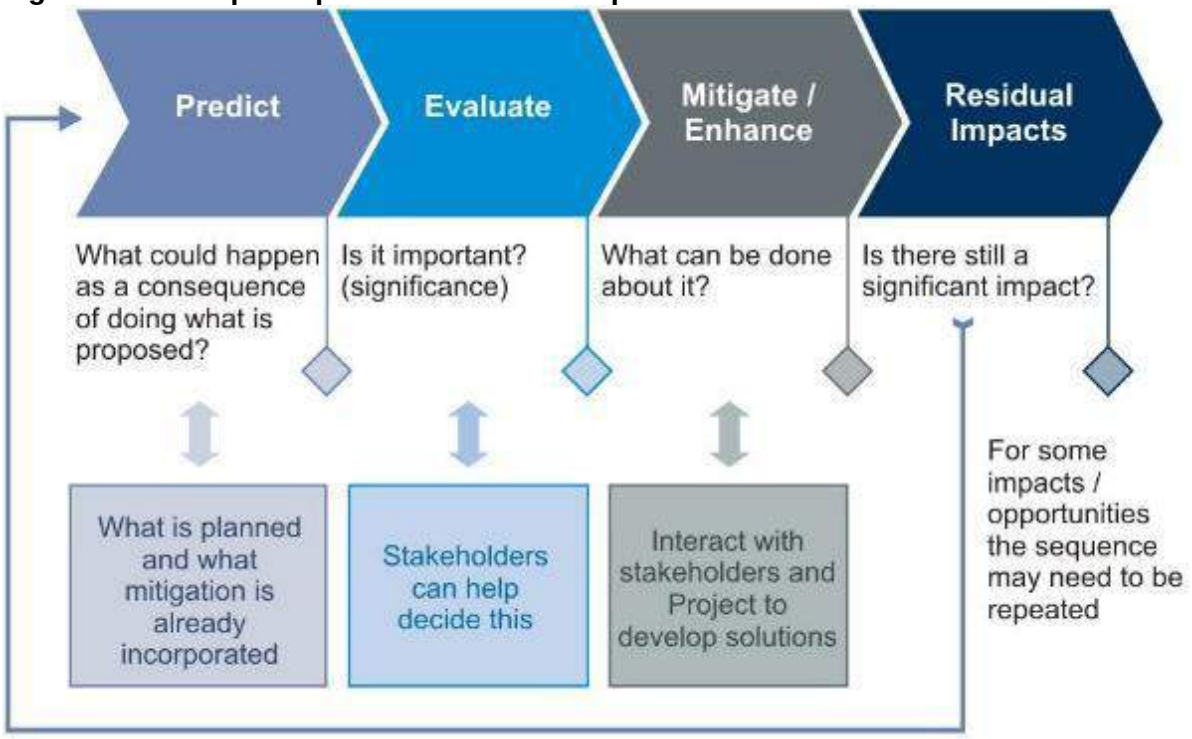
465. The EIA has been undertaken following a systematic process that (i) evaluates the potential impacts the Project could have on aspects of the physical, biological, social/ socio-economic, and cultural environment; (ii) identifies preliminary measures that the Project will take to avoid, minimize/reduce, mitigate, offset or compensate for potential adverse impacts; (iii) identifies measures to enhance potential positive impacts where practicable; and (iv) presents residual impacts. This has been organized as per the various stages of the Project lifecycle to understand the risks and impacts associated with each of these individual stages.

466. There are various techniques to identify and assess interactions of environmental project-factors; however, all environmental impact assessments should describe the action generating the impact, predict the nature and magnitude of environmental effects, interpret the results, and prevent negative effects on the environment. The impact assessment methodology used here provides a basis to characterize the potential impacts of the Project. It is based on models commonly employed in impact assessment and takes into account international best practices.

467. Impact identification and assessment starts with scoping and continues through the remainder of the impact assessment process. The principal impact assessment steps are summarized in Figure 54 and comprise of:

- Impact prediction: to determine what could potentially happen to resources/receptors because of the Project and its associated activities.
- Impact evaluation: to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor.
- Mitigation and enhancement: to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts.
- Residual impact evaluation: to evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures.

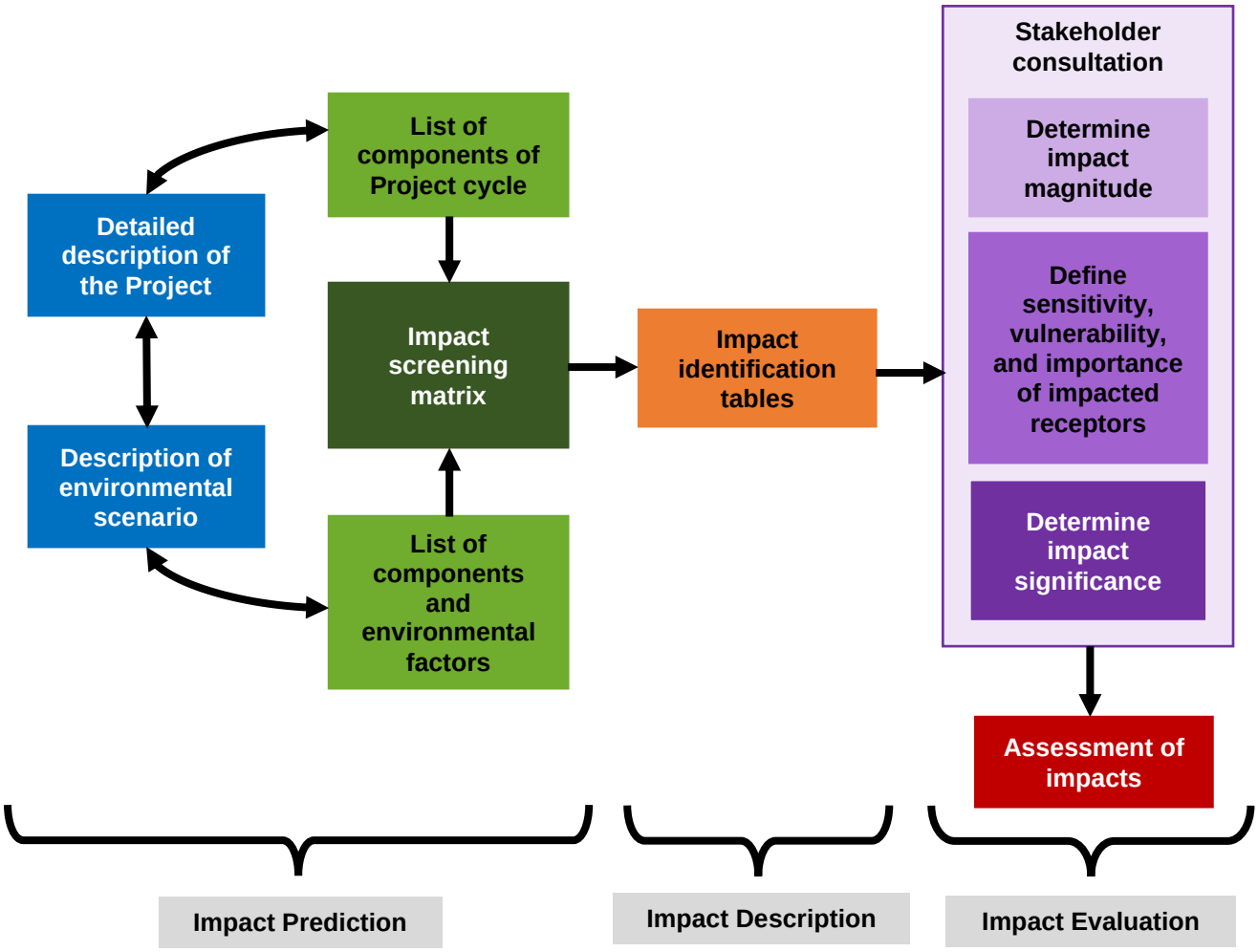
Figure 54. Principal Impact Assessment Steps



Source: Environmental Resources Management

468. The process used to screen, identify, and evaluate potential environmental impacts associated with this Project's activities is described in Figure 55 below.

Figure 55. Environmental Impact Screening, Identification, and Evaluation Process



F.1.2 - Impact Screening and Identification

469. Prediction of impacts was carried out with an objective to determine what is likely to happen to the environment as a consequence of the Project and its associated activities. The framework for the Project has been developed based on:

- detailed review of all the proposed Project activities and civil works;
- detailed review of feasibility study and design reports of the Project;
- experience gained from past similar bridge projects;
- stakeholder and public consultations; and
- collection and analysis of baseline environment information from the Project area.

470. For identification of environmental impacts, a matrix method (a modified Leopold Matrix) was used which is based on identifying and qualifying actions of the Project and comparing them to natural and social environmental conditions. This is done by first adding inputs to a double-entry matrix in columns and rows with information about activities of the Project which may alter the environment and features of the environment susceptible to be altered. The Impact Screening Matrix is provided in **Annex 3. Impact Assessment Results**, Section **3.a - Impact Screening Matrix**.

471. A list of anthropomorphic actions with potential impacts to the environment can be made through cause-effect relationships identified. The Impact Screening Matrix relates through a double-entry case for environmental and socioeconomic components (in the vertical axis) with activities for each phase of the Project (horizontal axis). The matrix identifies where positive and negative relationships exist between expected Project actions and environmental and social components. Impacts are identified on the matrix inputs by component (e.g., "IP 1" stands for Impact #1 during the Site Preparation phase and "IO 7" stands for Impact #7 during the Operation phase). There may be several impacts relating to a single component, for example air quality will be negatively affected by land clearing, mobilization of equipment, and construction activities. A table can then be generated which identifies impacts caused by various Project actions (see **Annex 3. Impact Assessment Results**, Section **3.b - Impact Identification Tables**).

472. For actions to be carried out in the execution of the Project, we consider the following phases:

1) Site Preparation Phase
2) Construction Phase
3) Worksite Closure Phase (i.e., project closure phase)
4) Operation and Maintenance Phase

F.1.3 - Impact Evaluation

473. Once the prediction of potential impacts is complete, each potential impact is described in terms of its various relevant characteristics (e.g., type, timing, scale, duration, frequency, extent). The terminology and designations used to describe impact characteristics are shown in Table 58.

Table 58. Impact Evaluation Terminology and Designations

Characteristic	Definition	Designations
Type	A descriptor indicating the positive, negative, and neutral perceptions of the Project.	• **Positive** or beneficial impact – When impact is considered to represent improvement to baseline condition or introduce a new desirable factor; • **Negative** impact – When impact is considered to represent adverse change from the baseline or introduce a new undesirable factor. • **Neutral** impact – When impact is considered to represent neither beneficial nor adverse changes from the baseline or introduce no desirable/ undesirable factor.
Nature	A descriptor indicating the relationship of the impact to the Project (in terms of cause and effect).	• **Biophysical, social, cultural, health,** or **economic** • **Direct** - Impacts that result from a direct interaction between the Project and a resource/receptor. • **Indirect** - Impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment. • **Induced** - Impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project. • **Cumulative** - Impacts that arise as a result of an impact and effect from the Project interacting with those from another activity to create an additional impact and effect.

		• **Accidental -** impacts that result from accidental (unplanned) events within the project (e.g., fuel spillage during refueling) or in the external environment affecting the project. In these cases, the probability of the event occurring is considered.
Phase of the Project	The phases of the Project life cycle.	• **Site Preparation Phase** • **Construction Phase** • **Worksite Closure Phase (i.e., project closure phase)** • **Operation and Maintenance Phase**
Timeframe	The time period over which a resource / receptor is affected, or frequency of impact when intermittent	• **Short term** - Impacts that are predicted to last only for a limited period (e.g., during construction) but will cease on completion of the activity, or as a result of mitigation/reinstatement measures and natural recovery. • **Long term** - Impacts that will continue over an extended period but cease when the project stops operating. These will include impacts that may be intermittent or repeated rather than continuous if they occur over an extended time period. • **Frequency** - The impacts as one off or varying frequency. • **Temporary** – Impact duration can range from relatively short (less than four years) to long (beyond the life of the Project). • **Permanent** - Impacts that occur during the development of the project and cause a permanent change in the affected receptor or resource that endures substantially beyond the project lifetime • **Immediate effect** - Impact experienced immediately after causative project aspect. • **Delayed effect** - Effect of the impact if delayed for a period following the causative project aspect.
Scale	The “reach” of the impact (e.g., confined to a small area around the Project Footprint, projected for several kilometers, etc.).	• **Local** - When impact due to the proposed Project related activities is restricted within Area of Influence which has been determined as 5 km for social resources and 10 km for environmental and ecological resources. Furthermore, the area of influence is defined with respect to project activities for each component in the impact scale depending upon resource/ receptor and its interaction with the environmental, ecological, and social attributes. • **Regional** - Impacts extend beyond the area of influence to affect regionally important environmental resources or are experienced at a regional scale as determined by administrative Boundaries. • **Transboundary** – Includes impacts that extend or occur across a national boundary. • **Global**
Probability	The likelihood or chance an impact will occur.	• **Definite** - Impact will occur with high likelihood of probability. • **Possible** - Impact may occur but could be influenced by either natural or project related factors. • **Unlikely** - Impact unlikely unless specific natural or Project related circumstances occur.
Reversibility	The performance and degree of reversibility of	• **Reversible** or **Irreversible** - Potential for recovery of the endpoint from a negative impact.

	an impact are factors in its significance.	
Severity	Degree of change to the receptor due to impact, measured qualitatively/quantitatively, and through comparison with relevant thresholds	• **Legal thresholds -** established by law or regulation • **Functional thresholds -** if exceeded, the impacts will disrupt the functioning of an ecosystem sufficiently to destroy resources important to the nation or biosphere irreversibly and/or irretrievably • **Normative thresholds -** established by social norms, usually at the local or regional level and often tied to social or economic concerns • **Preference thresholds -** preferences for individuals, groups or organizations only, as distinct from society at large • **Reputational thresholds -** the level of risk a company is willing to take when approaching or exceeding the above thresholds

F.1.4 - Determining Magnitude of Impact Effect

474. Once impacts were characterized, they were assigned a 'magnitude'. Magnitude essentially describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the impact. Magnitude designations themselves are universally consistent, but the descriptions for these designations vary on a resource/receptor-by-resource/receptor basis.

475. Magnitude is typically a function of some combination (depending on the resource/receptor in question) of the following impact characteristics:

- Extent
- Duration
- Scale
- Frequency

476. Magnitude (from small to large) is a continuum. Evaluation along the continuum requires professional judgement and experience. Each impact on a case-by-case basis and the rationale for each determination is noted.

477. Magnitude designations for negative effects are: **Minor**, **Moderate**, and **Major**.

478. Some impacts will result in changes to the environment that may be immeasurable, undetectable, or within the range of normal natural variation. Such changes are regarded as having no impact and characterized as having a negligible magnitude. In the case of impacts resulting from unplanned events, the same resource/ receptor-specific approach to concluding a magnitude designation is used. The likelihood factor is also considered, together with the other impact characteristics, when assigning a magnitude designation.

479. For this assessment, magnitude has been determined from quantitative or qualitative evaluation of the following criteria:

1) Sensitivity of existing or reasonably foreseeable future receptors
2) Importance value of existing or reasonably foreseeable future receptors, described using the following:

a) inclusion in government policy;
b) level of public concern;
c) number of receptors affected;
d) intrinsic or perceived value placed on the receiving environment by stakeholders; and
e) economic value to stakeholders.

3) Severity or degree of change to the receptor due to impact, measured qualitatively or quantitatively, and through comparison with the following relevant thresholds:

a) legal thresholds – established by law or regulation;
b) functional thresholds – if exceeded, the impacts will disrupt the functioning of an ecosystem sufficiently to destroy resources important to the nation or biosphere irreversibly and/or irretrievably;
c) normative thresholds – established by social norms, usually at the local or regional level and often tied to social or economic concerns;
d) preference thresholds – preferences for individuals, groups, or organizations only, as distinct from society at large; and
e) reputational thresholds – the level of risk a company is willing to take when approaching or exceeding the above thresholds.

F.1.5 - Defining Sensitivity, Vulnerability, and Importance

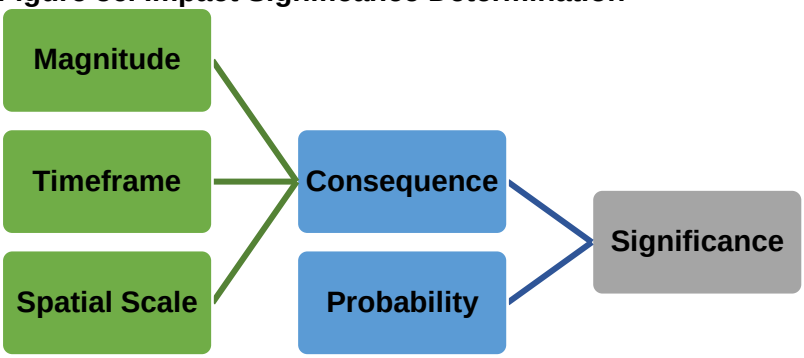
480. In addition to characterizing the magnitude of impact, the other principal impact evaluation step taken was to define the sensitivity/vulnerability/importance of the impacted resource/receptor. There are a range of factors to be taken into account which may be physical, biological, cultural, or human. As in the case of magnitude, the sensitivity/vulnerability and importance designations themselves are universally consistent, but the definitions for these designations vary on a resource/receptor basis.

481. The sensitivity/vulnerability/importance designations used herein for all resources/ receptors are: **Low**, **Medium**, and **High**.

F.1.6 - Impact Significance Rating

482. Once the impact consequence was described on the basis of the above impact characteristics, the probability of impact occurrence was factored in to derive the overall impact significance (see Figure 56). The probability relates to the likelihood of the impact occurring, not the probability that the source of the impact occurs. For example, a continuous Project activity may have an unlikely probability of impact if there are no receptors within the area influenced by that activity.

Figure 56. Impact Significance Determination



483. An impact of **low** significance is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small, and/or the resource/receptor is of low sensitivity/vulnerability/importance. In either case, the magnitude should be well within applicable standards.

484. An impact of **medium** significance has an impact magnitude that is within applicable standards but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly, to design an activity so that its' effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable. This does not necessarily mean that impacts of medium significance have to be reduced to minor, but that medium impacts are being managed effectively and efficiently.

485. An impact of **high** significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of EIA is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted. An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project.

486. The identification of potential positive impacts was also undertaken to assess where the Project is expected to contribute towards the improvement of socio-economic and environmental systems. Where positive benefits are anticipated, a '**+**' sign has been added to the significance rating.

487. The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the approval process (both positive and negative); secondly, it serves to show the primary impact characteristics, as defined above, used to evaluate impact significance.

488. A description of the impact significance rating system methodology and the Impact Significance Matrix developed for this Project are provided in **Annex 3. Impact Assessment Results**, Section **3.c - Impact Significance Matrix**.

F.1.7 - Identification of Mitigation and Enhancement Measures

489. Once the significance of a potential impact was characterized, socially, environmentally, and technically acceptable and cost-effective measures to manage and

mitigate potential impacts were identified and defined. Mitigation measures are developed to avoid, reduce, remedy, or compensate for potential negative impacts, and to enhance potential environmental and social benefits.

490. The approach taken to defining mitigation measures is based on a typical hierarchy of decisions and measures, as described in Table 59.

Table 59. Hierarchy of Decisions and Measures

Avoid at Source, Reduce at Source: avoiding or reducing at source through the design of the Project (e.g., avoiding by siting or re-routing activity away from sensitive areas or reducing by restricting the working area or changing the time of the activity);
Abate on Site: add something to the design to abate the impact (e.g., pollution control equipment, traffic controls, perimeter screening and landscaping);
Abate at Receptor: if an impact cannot be abated on-site then control measures can be implemented off-site (e.g., noise barriers to reduce noise impact at a nearby residence or fencing to prevent animals straying onto the site);
Repair or Remedy: some impacts involve unavoidable damage to a resource (e.g., agricultural land and forestry due to creating access, work camps or materials storage areas) and these impacts can be addressed through repair, restoration, or reinstatement measures; and **Compensate in Kind, Compensate Through Other Means:** where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate (e.g., planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of fisheries access, recreation, and amenity space).

F.1.8 - Residual, Induced, and Cumulative Impact Evaluation

491. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development of a proposed project. Residual impacts also serve as the focus of management and monitoring activities during project implementation to verify that actual impacts are the same as those predicted in the EIA Report.

492. For activities with significant impacts, the EIA process is required to identify suitable and practical mitigation measures that can be implemented. The implementation of the mitigations is ensured through compliance with the Environmental Management Plan (EMP) and the Contractor's Specific Environmental Management Plan (SEMP). After first assigning significance in the absence of mitigation, each impact is re-evaluated assuming the appropriate mitigation measure(s) is/are effectively applied, and this results in a significance rating for the residual impact.

493. Impacts deemed to be "high" or "medium" after the application of the intended mitigation measures would receive ongoing management and monitoring during the various project phases. Additional mitigation measures will be suggested where applicable.

494. The potential significance of residual impacts have been completed for the first day that the road and bridge section come into operation ("day 1") and fifteen years from the first day of operation ("year 15"). The residual impacts are provided for each environmental impact identified at the end of sub-sections within the EIA's Impacts and Mitigation Measures section (see Section **F.2 - Impacts and Mitigation Measures**).

495. In some cases, it may only be possible to reduce the impact to a certain degree such as where an impact could not be completely avoided. All key residual significant impacts are described in this report with commentary on why further mitigation is not feasible.

F.1.9 - Induced and Cumulative Impact Evaluation

496. Cumulative impacts are generally considered as those which are additive or interactive in nature that arise as a result of an impact from the Project interacting with an impact from another activity to create an intensified impact.

497. As identified within Section XVI of the ADB's Environmental Assessment Guidelines (the guideline document has since been updated by the Environmental Safeguards: A Good Practice Sourcebook draft working document), as it applies to assessment of project impacts, they are specifically defined as those impacts which:

i. are caused by the aggregate of past, present, and future actions;
ii. are the total effect, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who has taken the actions;
iii. need to be analyzed in terms of the specific resource, ecosystem, and human community being affected;
iv. cannot be practically analyzed beyond a reasonable boundary; the list of environmental effects must focus on those that are meaningful;
v. rarely correspond to political or administrative boundaries;
vi. may result from the accumulation of similar effects or the synergistic interaction of different effects;
vii. may last for many years beyond the life of the project that caused the effects; and
viii. should be assessed in terms of the capacity of the affected resource, ecosystem, and/or human community to accommodate additional effects.

498. Induced impacts can be defined as adverse and/or beneficial impacts on areas and communities from unintended but predictable developments caused by a project, which may occur later or at a different location.[51]

F.1.10 - Management, Monitoring, and Audit

499. The final stage in the EIA Process is definition of the basic management and monitoring measures that are needed to identify whether: (i) impacts or their associated project components remain in conformance with applicable standards; and (ii) mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent predicted.

500. Commitment is made to regular monitoring and verification of the implementation of the management plans and the undertaking of remedial actions where needed. Monitoring and verification will be reported and made available for inspection upon request. All incidents will be reported and corrective actions will be taken as necessary according to management plan recommendations and RD procedures. This will enable and facilitate a process of continuous improvement. All grievances received will be addressed and investigated.

501. Monitoring during construction and operational phases of the project, through the audit of impact predictions and mitigation measures, will assure:

[51] ADB - Environmental Safeguards: A Good Practice Sourcebook draft working document, December 2012 (Page 4).

- mitigation measures are implemented effectively;
- mitigation measures are appropriate and, if not, that they are amended, or additional measures are designed and implemented;
- compliance with project standards, guidelines, and best practice as applicable;
- assessment of cumulative and residual impacts, so that appropriate measures can be designed if necessary; and
- continuation of the EIA as an iterative process through to the construction and operational environment and social management systems, which will be based on continual improvement.

502. The ADB will review Project performance against the RD's commitments as agreed in the loan agreement. The extent of ADB's monitoring and supervision activities will be commensurate with the risks and impacts of the Project. Monitoring and supervising of environmental safeguards will be integrated into the project performance management system. ADB will monitor the Project on an ongoing basis through the defect liability period and until the project completion report is issued. ADB will carry out the following monitoring actions to supervise Project implementation:

a) conduct periodic site visits for projects with adverse environmental or social impacts;
b) conduct supervision missions with detailed review by ADB's safeguard specialists/officers or consultants for projects with significant adverse social or environmental impacts;
c) review the periodic monitoring reports submitted by the RD to ensure that adverse impacts and risks are mitigated, as planned and as agreed with ADB;
d) work with the RD to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to re-establish compliance as appropriate; and
e) prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

F.2 - Impacts and Mitigation Measures

F.2.1 - General

503. Assessment of impact on the biophysical and socio-economic environment of the Poti-Kobuleti road section (Lot 2, Stage 1) has been prepared for the preferred alignment from the analysis of baseline information, existing grey and published literature, consultations with government and non-government stakeholders within and outside Georgia, and visual reconnaissance data from the field.

504. Focus is given to the potential effects to biodiversity, and sturgeon within the Rioni River in particular, considering the triggering of Critical Habitat designation and the Project's location in the corridor between protected areas (i.e., Kolkheti National Park, Ramsar, and IBAs).

505. Negative and positive environmental impacts have been identified and evaluated for site preparation, construction, worksite closure (i.e., project closure), and operation phases of the Project. The list of key potential impacts by phase of the Project is given in Table 60.

506. The impacts were identified, and the significance ratings were developed according to the methodology described in the previous section. The Project Impact Significance Matrix is provided in **Annex 3. Impact Assessment Results**, Section **3.c.ii - Project Impact Significance Matrix**. In this EIA, the significance of an impact upon the receiving environment has been assessed prior to the implementation of mitigation measures that have been designed into the intended activity during a particular phase of the Project. The level of impacts following the application of mitigation and management measures is then provided for each identified impact. These residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in the EIA.

507. Waste management has been treated as a cross-cutting issue and the analysis of potential impacts and their significance (before and after mitigation) has been incorporated into each section of this chapter. A separate section is also provided on waste management which covers only issues not already integrated into previous analyses. Separate sections providing analysis on potential induced, cumulative, and climate change impacts on the Project are also provided.

508. The analysis has been informed by a Biodiversity Action Plan (BAP) (see **Annex 1. Biodiversity Action Plan (BAP)**) developed in parallel to this EIA which (i) assesses the presence of Critical and Natural Habitat in the Project area; (ii) evaluates potential impacts on priority biodiversity; (iv) outlines Project commitments to mitigation and management measures to achieve at least no net loss for Critical and Natural Habitat; (v) provides an approach that achieves a net gain for priority species; and (vi) summarizes an approach to monitoring and evaluation to give assurance of Project performance.

Table 60. Key Impacts and Significance Ratings Before Mitigation Measures

Environmental / Social Component	**Environmental Factor**	**Project Phase** P-Preparation, C-Construction, WC-Worksite Closure, O-Operation	**Impact**	**Significance** (before mitigation measures)
Atmosphere	Air Quality	P, C, WC, O	Localized emissions of combustion gas and dust resulting from the use of machinery and equipment and circulation of vehicles.	**M**
		P, C, WC, O	Long-term effects of greenhouse gas emissions from the use of machinery and equipment and circulation of vehicles.	**L**
	Noise and Vibration	P, C, WC, O	Noise emissions resulting from the use of machinery and equipment and vehicle circulation.	**M**
Land	Soil Structure	P, C	Land erosion due to loss of vegetation coverage and changes in its structure	**M**
	Soil Quality	P, C, WC	Land pollution due to wrong management of solid waste, as well as possible dripping of hydrocarbons from machinery and equipment, and wrong storage of oil and fuel.	**L**
		O	Pollution due to littering.	**L**
	Relief	P	Modification of geological formations.	**M**
Surface Water	Surface Drainage (runoff patterns)	P	Modification of surface hydrological pattern due to removal of vegetation and construction of provisional works and roads.	**M**
		C	Modification of surface hydrological pattern due to modification of geological formations and construction of elements which may block the original pattern of surface runoff.	**M**
	Water Quality	P, C	Pollution of nearby water bodies due to poor storage and management of waste and construction materials, which may be introduced through runoff or leaching through the soil.	**M**
		WC	Pollution of water bodies nearby due to wrong management and disposal of waste during structure dismantling and demolition	**M**
		O	Surface water contamination from accidentally spilled fuel/oil and road surface runoff.	**H**
Groundwater	Water Quality	O	Groundwater contamination from accidentally spilled fuel/oil and road surface runoff.	**H**
		C	Pollution of groundwater due to poor storage and management of waste and construction materials, and improper vehicle maintenance.	**M**
Flora		P	Loss of vegetation coverage in specific areas of the project.	**L**

	Vegetation Coverage	P	Introduction of invasive alien species.	**H**
		WC	Planting of vegetation on the site after rehabilitating disturbed areas.	**L+**
	Species	P, C	Mortality of individuals.	**L**
Terrestrial Fauna	Habitat	P	Modification and fragmentation of habitat due to loss of vegetation coverage.	**M**
		P	Introduction of invasive alien species.	**H**
		WC	Restoration of land.	**M+**
	Distribution	P, C	Displacement of species due to noise, presence of machinery and equipment and presence of staff.	**L**
		O	Displacement of species due to noise from the presence of normal road traffic and maintenance activities.	**M**
	Species	P	Mortality of terrestrial fauna individuals.	**L**
Aquatic Fauna	Habitat	P	Introduction of invasive alien species	**H**
		C	Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species.	**H**
		O	Degradation of aquatic habitat from accidentally spilled fuel/oil or surface runoff from bridge.	**M**
	Distribution	C	Displacement of species due to noise, presence of machinery, and equipment and of staff.	**M**
	Species	C	Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.	**M**
		O	Mortality of sturgeon from illegal fishing activities using the bridge structures.	**H**
Landscape	Quality	P, C, WC	Modification of original landscape due to loss of vegetation coverage and presence of machinery and equipment.	**M**
		WC	Improvement of landscape quality of the area due to rehabilitation of disturbed areas.	**L+**
		O	Modification of the original landscape from the presence of new infrastructure.	**M**
Socioeconomic (Economic)	Land Use and Livelihoods	P	Land acquisition and livelihood loss to affected persons.	**M**
	Jobs	P, C, WC, O	Creation of direct and indirect jobs because of hiring staff from the region.	**M+**
	Local Development	P	Payment to owners for leasing their premises and compensation for change of land use on their premises.	**L+**
	Local and Regional Development	P, C, WC	Demand of services in neighboring towns (food, accommodation, recreation, vehicles, machinery, and equipment).	**M+**

		C	Road access restrictions to traffic during to construction phase.	**M**
		O	Improved road traffic capacity and connectivity resulting in socioeconomic benefits.	**M+**
Socioeconomic (Services)	Water	P, C, WC	Water demand for construction activities, mainly to avoid spreading dust and particles during drilling, during operation of provisional facilities, during circulation of vehicles on dirt roads, and for general cleaning services.	**L**
	Energy	P, C, WC	Energy demand for provisional facilities, construction/deconstruction activities and lighting.	**L**
		P	The disruption of services, including energy, to surrounding communities due to relocation of utilities.	**M**
	Waste Management and Disposal	P, C, WC	Both the presence of staff at the site and preparation/construction/dismantling tasks will generate waste which need the use of sanitary landfill or municipal dumps duly authorized.	**M**
		O	Services demand for management of waste generated during maintenance activities.	**M**
	Consumables	P, C, WC	Demand of consumables or materials to be used for preparation/construction/worksite closure activities and supplied from local or regional sources (food, fuel, sand, gravel, cement, wood, steel, among others).	**M+**
Socioeconomic (Health and Safety)	Operational Health and Safety	P, C, WC, O	The exposure of workers to various physical hazards that may result to minor, disabling, catastrophic, or fatal injuries.	**M**
	Community Health and Safety	P, C, WC	Risks to community health and safety due to increased traffic; the transport, storage, and use and/or disposal of materials (e.g., fuel and chemicals); and access to structural elements or components of the project by members of the community.	**M**
		O	Road accidents resulting from higher travel speeds and increased traffic.	**M**
Socioeconomic (Cultural)	Cultural Heritage	P, C	Risks to built heritage, objects, and sites that have archaeological, historical, religious, or other cultural value and significance.	**L**

Key: H - High, M - Medium, L - Low
***** *It is unknown whether work camps will be established*
*The '**+**' sign indicates significance of a positive impact*

F.2.2 - Air Quality, Noise, and Vibration

F.2.2.1 - Air Quality

Scope of the Assessment

509. The air quality impact assessment has focused on the following components of the Project:

- Planning, construction, and worksite closure (i.e., project closure) phase activities with potential air quality impact:
    - Fugitive dust emissions from construction of the bridge and approach roads, including excavation and filling, materials handling, vehicle movement on the haul roads, and wind erosion of open stockpile areas or open bare ground
    - Emissions from vehicle movement and non-road machineries
- Operational phase activities with potential air quality impact:
    - Pollutant emissions from vehicle circulation such as CO, VOCs, NO2 and CO2, the GHG which is primarily responsible for global warming
    - Maintenance activities

Identification of Sensitive Receptors

510. The primary human representative air sensitive receptors that will potentially experience air quality impacts from activities during the construction and operation phase of the Project are in Patara Poti village and the Nikora factory due to their relative proximity to the proposed alignment. More broadly, there are sensitive receptors along the transport corridors which will potentially be affected by mobilization of equipment, construction materials/ vehicles, staff, and consumables. Finally, there are the effects on regional or global receptors from GHG emissions contributing to climate change which needs to be considered.

Assessment of Impact: *Site Preparation, Construction, and Worksite/Project Closure Stages*

511. The air quality impacts during construction of the Project have been assessed in a qualitative manner following IFC EHS guidelines and based on the best available information.

512. Potential sources of impacts to air quality include:

- site preparation and levelling;
- excavation of soil to create building and equipment foundations;
- pile driving for the equipment foundation;
- exhaust emission from movement of heavy equipment by barge, heavy loaders, and trucks;
- loading and unloading of materials;
- concreting works, including operation of concrete batching plant, which will be located away from sensitive receptors;
- operation of diesel generators and other diesel-based construction machineries; and
- dust generated from stockpiles of materials, waste, loose earth, handling and moving excavated material, and transporting wastes on vehicles.

513. Dust. Dust is the major air quality problem from construction sites and caused primarily by excavation, loading, transportation, and unloading works. Dust is a problem for a variety of reasons, including:

a) Health and safety problems. Dust may irritate eyes and cause worsening effects on asthmatics. Dust can reduce visibility for drivers on road and be blown long distances by the wind.
b) Impact on ecology. Dust blowing onto watercourses may damage ecology by increasing sedimentation, reducing sunlight, and suffocating fish. It may also affect plant growth and change the species of plants growing in an area.
c) Crop damage. Dust can affect plant and fruit growth, especially to dusts that are highly alkaline, for example limestone and cement dust. Dust deposited during light rainfall can cause the soil surface to form a crust increasing runoff.
d) Inconvenience to local people. Dust can coat outdoor laundry, homes, and vehicles.
e) Damage to equipment. Dust can increase abrasion of moving parts in equipment and clogging of air filters within the construction site.

514. Emissions. Vehicles and equipment exhaust emissions can lead to increases in levels of nitrogen oxides (NOx), sulfur dioxide (SO2), particulate matter (PM10 and PM2.5), volatile petroleum hydrocarbon constituents, and carbon monoxide (CO), which are key pollutants of concern with respect to human health. It is difficult to accurately quantify or predict dust or exhaust emissions arising from construction activities. However, emissions from vehicles and building machinery will depend on the status of its technical maintenance, quality of fuel, and speed. Fuel use efficiency in old cars is generally low and exhaust emissions are higher.

515. Impacts from vehicle emissions decrease rapidly with increasing distance from the source and are not likely to be significant at distances of more than 200 m from the source. Impacts are usually minor at a distance of more than 50 m with limited number of vehicles using access roads. Since the Project construction phase duration is anticipated to be two years, consisting of different construction activities, air quality impacts generated from these activities will not be static.

516. In addition to these mobile source emissions, there is also the potential for stationary emissions from the activities if a camp site is established by the Contractor, as well as the concrete and asphalt plants. Emissions from camps will be mostly due to heating and power generations in diesel generators, resulting in SO2, PM, NOx, VOC, and CO emissions. At the asphalt plants and concrete sites, there will be VOC, SO2, and PM emissions. The locations of construction facilities, the concrete and asphalt plants, and crushing units have yet to be determined at this time.

517. The locations of machinery stationing and material storage are also unknown and will be identified by the Contractor, but they are likely to be established close to the design interchanges on both sides of the Rioni where access to the existing road and the construction site is provided. There is the potential of impacts to sensitive receptors in Patara Poti where residences and businesses are near the proposed interchange.

Assessment of Impact: *Operation Stage*

518. Emissions. Impact during operation will be related to dust and exhaust emissions from vehicles using the highway. The quantity of pollutant emissions by vehicles depends on a variety of factors, such as type and composition of fuel, efficiency of combustion (e.g., age, wear), presence of emission control equipment (i.e., catalyzer), composition of vehicle types (e.g., abundance of trucks, average age and actual performance of engine types), traffic flow characteristics on a specific road section (i.e., average speed, free flow, or congested traffic), and road characteristics (i.e., incline). Increasing speed of the vehicle demands higher fuel supply and therefore results in larger amounts of emitted pollutants. That being said, increased transport efficiency along the new road where a constant speed can be maintained, and traffic

is reduced will result in less emissions for vehicles than the existing road where the flow, speed, and traffic levels are variable.

519. Modelling of air emissions at two air sensitive receptors (points provided in Figure 57) was completed by the Consortium as part of the Project design. Results predict traffic flows for 2020 (when the project was originally planned for completion) to be 6,042 vehicles per day, including 4,965 light and 1,076 heavy good vehicles. Hourly flows recalculated using a transition coefficient 6.13% was used, totaling 304 light and 66 heavy good vehicles respectively. A 20-minute traffic flow rate was then input into modeling software and qualitative and quantitative characteristics of emissions were calculated.[52] Results of from the analysis are provided in Table 61 below.

520. Projecting air quality further into the future was considered unnecessary since construction of the new bridge and approach roads as designed in the preferred alignment will in effect be replacing the existing bridge over the Rioni River instead of connecting the area to new traffic sources. Moreover, the preferred alignment for the Project will divert the vast majority of traffic currently using the E-60 (with the exception of local traffic who will be permitted to use the existing bridge) further away from sensitive human receptors. Finally, as shown in Section **C.12.2 – Traffic Projections** above, traffic projections are expected to decline from 2024 to 2025 as a result of the E-70 highway coming into operation which provides additional options to drivers in the region. This temporary decline will further reduce the air pollutant concentrations from vehicle circulation.

Figure 57. Location of the Points P1 and P2

Location of measuring points: P1 - 37T 734627E; 4674986N; P2 - 37T 722891E; 4674033N

521. Calculation and graphical analysis indicate that maximum concentration of substances for which national air quality standards exist are below allowable limits (see **B.3.1 - Air Quality**

[52] Assessment of impact on air quality during operation of the highway was carried out using software 'Magistral-gorod' (Магистраль-город), version 3.0, Copyright ©1997-2013 Firm «Integral». Traffic data provided by design team were used as a basis for calculation. Dispersion of emitted substances was calculated using software 'Ecolog-3'.

Standards). As indicated in section **E.2.1 - Air Quality**, air quality of the area is generally good, and the baseline analysis showed that air quality levels were below national standards (and not expected to be above IFC standards). Since it is anticipated that traffic volumes would fall 65% in 2025 compared to 2020 due to the opening of highway E-70, the air quality is not expected to exceed IFC standards.

Table 61. Values in Control Points as Share of Maximum Permissible Concentration (MPC)

Parameter	Values as share of MPC	
	Point 1	Point 2
Nitrogen dioxide (NO2)	0.3	0.5
Nirtogen oxide (NO)	0.02	0.04
Soot	0,01	0,01
Sulphyr dioxide (SO2)	0	0
Carbon monoxide (CO)	0.01	0.02
Benzo(a)pyrene	0	0
Formaldehyde	0	0
Hydrocarbons, fuel fraction	0	0
Hydrocarbons, kerosene fraction	0.01	0.02
Summary impact group (NO2+SO2)	0.19	0.31

522. An atmospheric dispersion model was also used to predict pollutant concentrations at three points where human receptors in relative proximity to where the proposed road section will be built. Dispersion was calculated using software 'Ecolog-3'. Modeling results are provided in **Annex 4. Air Modelling Results – Graphical Representation (operation stage)**. It should be noted that the modeling was completed with an interchange that was originally planned for as part of the Project but that is now outside the scope of Lot 2, Stage 1.

Assessment of Impact: *Climate Change*

523. Potential Climate Change Impacts ***Caused*** by the Project. The concentration of GHG in the atmosphere beyond the level of naturally occurring concentrations could result in more heat being held within the atmosphere.

524. Transport is considered as the major GHG emitter in Georgia and the increase of emissions from the sector is determined by the following factors:

- Annual growth of the car fleet
- Large share of older vehicles in the fleet
- High traffic of transit vehicles, in particular heavy good vehicles (HGVs)
- Fuel quality

525. Traffic accounts for over 60 percent of CO2 emissions in Georgia. Passenger transport contributes to 60.8 percent of total energy consumption in road transport, while trucks contribute to 26.5 percent, the rest belongs to other types of road transport (agriculture machines, firefighting trucks, etc.). Among the transport related greenhouse emissions, carbon dioxide (CO2) dominates with 99.3 percent.

526. The design speed of the Project road is 100 km/h. Increased speed along the route would result in larger amounts of emitted CO2 gases, but would also help to avoid emissions due to vehicles travelling at very low speed or being stuck in traffic. One of the measures for CO2 emissions reduction is proper management of vehicle speed.

527. Other factors influencing CO2 emissions are hard to foresee. For example, it is possible that in the near future the consumption of low-carbon fuel (such as biofuel and synthetic fuel) will considerably increase resulting in lower emissions than predicted. From a longer-term perspective, as Georgia progresses in the implementation of recommendations for EU approximation, regulations of the age and technical condition of vehicles will stiffen and control over the quality of fuel will enhance, leading to the decrease of impact from the movement of vehicles.

Management and Mitigation Measures

Site Preparation, Construction, and Worksite/Project Closure Stages

- Construction Dust
  - Dust generating areas will be controlled by water spraying, particularly under dry weather conditions.
  - Stockpiles will be planned and sited to minimize the potential for dust generation by taking into account prevailing wind directions and the locations of sensitive receptors.
  - The drop height of potentially dust generating materials will be kept as low as possible.
  - Where practicable, stockpiles will be located away from sensitive receptors.
  - If crushing of construction materials is required, crushers will be located away from sensitive receptors. Keeping at least 300 m distance from residences windward to concrete production plants shall be ensured.
  - Obtaining an environmental impact permit for an asphalt plant (if planned to run own facility).
  - On-site speed limits will be applied and enforced for trucks travelling on unpaved surfaces (20 km/h).
  - Trucks transporting spoil or other dusty materials off-site will be covered before leaving the sites.
  - Wheel washing facilities will be available and used so that trucks leaving the site do not spread dust onto neighboring roads.
  - Public roads used by site traffic will be swept regularly to prevent accumulation of dirt.
- Emission and Ambient Air Qulity
  - Construction machines will not be left running in periods between work or will be throttled down to a minimum.
  - The burning of waste or vegetation on site will be prohibited.
  - Special attention will be given in storage and handling of petrochemicals in order to avoid environmental hazards and risks.
  - Maintenance procedures will be implemented in order to keep equipment in good working condition to minimize exhaust emissions caused by poor performance.
  - Training will be provided for the operators of equipment and truck drivers regarding the air pollution potential of their activities.

Operation Stage

528. The primary measures for reduction of emissions related nuisance during operation is arrangement and maintenance of vegetation barriers along the road (particularly in the sensitive areas such as settlements). To reduce CO2 emissions from the transportation sector, attention should be given to more efficient vehicles and alternative fuels.

529. Mitigation measures suggested for construction stage should also apply to road maintenance works (the measures should be relevant to the type of activity and the scale of impact).

Conclusions

530. The assessments indicate that the air quality associated with the construction phase can be largely controlled and that no significant adverse air quality impacts are anticipated provided that all recommended air mitigation measures are implemented.

531. The potential air quality impacts arising from the Project during the operational phase have been predicted to be minimal, relative to the relevant World Health Organization (WHO) Ambient Air Quality Guidelines as recommended in the IFC EHA Guidelines. Therefore, no adverse air quality impacts during operational phase of the Project are anticipated at the air sensitive receptors in the vicinity of the Project site.

Residual Impacts

Table 62. Residual Impacts – Air Quality

Impact	Significance before Mitigation	Residual Impact After Implementation of Mitigation Measures			Key Residual Impacts
		Preparation Construction Worksite Closure Phase	Operation Phase		
			Day 1	Year 15	
(i) Localized emissions of combustion gas and dust resulting from the use of machinery and equipment and circulation of vehicles.	**Medium**	**Low**	**NEGL**	**NEGL**	It is considered unlikely that exhaust or dust emissions associated with the construction of the proposed project would be capable of having a significant effect on nearby sensitive receptors. Residual impact significance is Low during preparation, construction, and worksite closure phases and Negligible during the operation phase provided all recommended air mitigation measures are implemented.
(ii) Long-term effects of greenhouse gas emissions from the use of machinery and equipment and circulation of vehicles.	**Low**	**Low**	**Low**	**Low**	Residual impacts from the generation of GHGs will remain throughout the lifecycle of the Project. This is an unavoidable consequence of vehicles powered by fossil fuels, but as noted, more fuel-efficient cars may in the future lead to a decrease in the emissions generated on the Project road.

Note: NEGL means Negligible

F.2.2.2 - Noise and Vibration

Scope of the Assessment

532. Scoping of potential noise impacts has been undertaken in two stages:

- First, potential interactions between Project activities and sensitive receptors have been identified; and
- Second, taking into consideration the information gathered on the extent and nature of Project activities, and the existing conditions / sensitivities of the baseline, these potential interactions have been prioritized in terms of their potential to cause significant impacts.

533. A noise modelling study was undertaken by an international noise and vibration engineer[53] and a Georgian consulting firm[54] in 2019 which has informed the identification of potential impacts related to noise on sensitive receptors and the necessary mitigation measures. The scope of the analysis covered:

a) conducting background noise measurements;
b) predicting construction noise and vibration levels for different constructions phases;
c) traffic noise modeling for one year, 10 years, and 15 years after the project completion using information included in the Project traffic study developed during feasibility stage (see **C.12 - Traffic Studies**);
d) identification of possible noise impacts at sensitive noise receptors based on modeling; and
e) identifying feasible and reasonable construction mitigation measures and traffic noise mitigation options if there would be impacts after project completion.

Identification of Sensitive Receptors

534. The nearest representative noise and vibration sensitive receptors that may potentially experience impacts from the work sites of the Project during construction and operational phases include both humans and fauna. Human receptors are primarily located in Patara Poti village and the Nikora factory, while fauna receptors are primarily located east of the Rioni River and north of the proposed highway (i.e., Kolkheti National Park and IBAs).

Assessment of Impact: *Site Preparation, Construction, and Worksite/Project Closure Stages*

506. Noise and vibration impacts may occur during various construction phases. Noise and vibration limits outlined in Section **B.3.4 - Noise Standards** will be followed for this Project.

507. The simplest definition of noise is 'unwanted sound' which can be produced by many sources such as construction equipment; operating machine tools; as well as friction between road surfaces/tires and engines of vehicles traveling on the road.

508. Vibration is a mechanical phenomenon whereby oscillations occur about an equilibrium point. Noticeable vibration is usually an undesirable situation. For example, the

[53] Mr. Areg Gharabegian, PE
[54] DG Consulting Ltd

vibrational motions created by impact pile driving, trucks, construction equipment, and tools in an operation are typically unwanted.

509. Noise from construction activity. Each construction phase has its unique noise characteristics due to use of different equipment items. The potential sources of noise and vibration during the preparation, construction, and worksite closure phases of the Project include equipment, machinery, and transportation used for the construction activities. The heavy equipment used for construction will be the major sources of noise and vibration. This will include impact and sheet piling as well as preparing concrete foundations for bridge piers, retaining walls, and structures. There is expected to be an increase in traffic and thereby in traffic noise impacts to receptors near the existing access road from the transportation of equipment, construction materials, and workers. Impact pile driving creates the highest noise levels by far from any other construction activities. Besides the high noise levels, if impact pilling is done in the water it can also have adverse effects on fish. The relative isolation of most of the Project site would reduce noise-related disturbance to humans or fauna.

510. Construction equipment noise. Construction noise levels at receptors would fluctuate depending on the type and number of equipment, their duration of use, and the distance from receptor. Roadway construction activities for the purpose of this analysis have been divided into the following three phases:

1) Demolition and removal of the existing roadway asphalt surface.
2) Preparing and compacting the base for the new roadway.
3) Laying down asphalt on the new roadway.

511. Bridge construction has been divided to the following phases:

- Installing plates for coffer dam and dewatering.
- Impact pilling for bridge columns.
- Preparing wood forming and pouring concrete.

512. The main sources of noise and vibration during construction of the project include:

- construction machinery;
- haulage and general vehicle movements;
- concrete mixing and aggregate production systems; and
- impact pilling.

513. The criteria for determining significance is the IFC's EHS Guidelines for noise, which require that the sound levels in residential areas (and other sensitive receptors, such as schools and hospitals) not exceed 55 dBA (A-weighted decibels are abbreviated) during the day and 45 dBA during the night. During construction period, it is possible that these standards will be exceeded for short duration during the day.

514. Table 63 represents typical noise levels from various construction equipment items. It should be noted that the values indicated in the table may differ depending on the brand and age of machinery provided/used by construction company.

Table 63. Construction equipment noise emission levels

Equipment	Typical noise level (dBA) approximately 15 m from source
Clamshell	93
Crane	85
Drilling Machines	85
Ditcher/Trencher	80
Scrapers	85
Angle dozers	85
Front loaders	80
Concrete mixer truck	80
Shovel loaders	85
Excavators	83
Bulldozers	85
Roller	78
Grader	83
Paver	80
Dump/flatbed Truck	80
Tractor	84
Concrete pump	81
Backhoe	77
Compactor	78
Impact pilling	100

515. The noise impact assessment completed by the Consortium was performed by identifying sensitive receptors (settlements, dwellings) within minimum distances from alignment boundaries. Calculations have been updated but they need to be finalized by the contractor when the construction work schedule details and equipment types are determined.

516. The calculation used to determine average construction noise exposure for each piece of equipment is based on the following equation from US Federal Highway Administration Construction Noise Handbook:

$$L_{eq} = L_{max} + 10 \log(UF) – 20 \log(D/15)$$

Where:

a) L_{eq} is the 10 minute average noise level in A-weighted decibels, dBA,

b) L_{max} is the maximum noise level at 15 meters in A-weighted decibels, dBA,

c) UF is the Usage Factor or the ratio of time equipment is in operation each hour,

d) D is the distance (in meters) from the geometric center of construction activity.

517. Table 64 presents results of the calculated noise levels for different construction activities at 5, 15, and 50 m from the construction activities. It is assumed that the location of the acoustic center for all equipment is assumed at the center of construction activity for each phase. Results indicate that during Phases 1 and 2, the predicted noise levels would exceed 90 dBA, which is daytime noise limit for the construction. Project drawings indicate that there will be no noise sensitive receptors at 5 meters from the construction activities; therefore, no

impacts are anticipated. However, during certain activities, the construction noise would be noticeably higher than the background and it may annoy some nearby residences. No nighttime construction activities are planned; therefore, there would be no nighttime impacts.

518. Predicted construction noise levels would exceed 90 dBA limit at 5 m and up to 15 m during Phases 4 and 5, respectively. Again, in accordance to the project drawings, there will be no noise sensitive reporters within these impact distances. However, noise levels from the impact pile driving by its nature is high and annoying.

Table 64. Construction Noise Levels for Different Phases

No. of Items	Equipment Type	Maximum Equipment Noise Levels at 15 Meters dBA	Hourly Equivalent Noise Levels			Hourly Equipment Usage Percentage	Percent time at full power	Effective Equipment Usage Factor Percentage
			At 5 Meters, dBA[1]	At 15 Meters, dBA[1]	At 50 Meters, dBA[1]			
Roadway construction work								
Phase 1:	**Demolition and removal of the existing roadway asphalt surface**							
1	Excavator	83	88	79	68	60%	60%	36%
3	Dump Truck	80	78	68	57	15%	40%	6%
1	Backhoe	77	81	71	61	50%	50%	25%
1	Bulldozer	85	86	76	66	25%	50%	13%
1	Trencher	80	81	71	61	25%	50%	13%
1	Back up Alarms	85	85	75	65	10%	100%	10%
		Combined L_{eq}	**93**	**83**	**72**			
Phase 2:	**Preparing and compacting the base for the new roadway**							
1	Excavator	83	84	74	64	25%	50%	13%
2	Dump Truck	80	76	66	56	10%	40%	4%
1	Compactor	78	79	69	59	25%	50%	13%
1	Roller	78	80	70	59	30%	50%	15%
1	Grader	83	85	75	65	35%	50%	18%
1	Back up Alarms	85	88	78	68	20%	100%	20%
		Combined L_{eq}	**92**	**82**	**71**			
Phase 3:	**Laying down asphalt on the new roadway**							
1	Roller	78	82	72	61	40%	60%	24%
4	Dump Truck	75	71	61	51	10%	40%	4%
1	Front loader	80	81	71	61	25%	50%	13%
1	Backhoe	73	72	62	51	15%	50%	8%
1	Back up Alarms	85	87	77	66	15%	100%	15%
		Combined L_{eq}	**89**	**79**	**69**			
Bridge construction work								
Phase 4:	**Installing plates for coffer dam and dewatering**							
1	Sheet piling	85	88	78	68	35%	60%	21%
1	Dewatering pump	81	81	71	61	10%	100%	10%
1	Crane	85	87	77	67	35%	50%	18%
3	Flatbed truck	80	74	64	54	5%	50%	3%
		Combined L_{eq}	**91**	**82**	**71**			
Phase 5:	**Impact pilling for bridge columns**							
1	Impact pilling	100	101	91	81	25%	50%	13%
1	Crane	85	86	76	66	25%	50%	13%
2	Flatbed truck	80	74	64	54	5%	50%	3%
		Combined L_{eq}	**101**	**91**	**81**			
Phase 6:	**Preparing wood forming and pouring concrete**							
2	Small tools/ wood cutting	75	77	67	57	25%	70%	18%
4	Concrete mixer truck	80	77	67	57	10%	50%	5%
2	Concrete pump	81	81	71	61	20%	50%	10%
1	Back up Alarms	85	80	70	59	3%	100%	3%
		Combined L_{eq}	**88**	**78**	**68**			

Note: Calculated construction noise levels use the following three assumptions:
(1) all equipment operation based on operation data from other projects (2) all equipment effective usage factor percentages are also based on operation data from other projects; and (3) the location of the acoustic center for all equipment is assumed at the center of construction activity for each phase.

519. Vibration. Impact pilling, sheet pilling, and dirt compacting using vibratory roller as well as wheel compactors would generate the highest vibration levels. Measurements vibration levels from numerous impact pilling has indicated that impact pilling would not cause any structural damage, even cosmetic at distance beyond 50 m from the pilling location. As there are no structures within 50 m of impact pilling, no impact is anticipated. However, vibration from the impact pilling can annoy some people at distance up to 100 m. Therefore, vibration levels are expected to be felt only locally near construction sites and should not have any negative impacts on residents. Prior to construction, the status of the nearest buildings will be checked to avoid unjustified complains from the community regarding damages caused by construction related vibration.

520. Based on measured vibration levels from sheet pilling, it is safe to assume that there would be no impacts to any structures beyond 35 m. As sheet pilling will be done in the river, no impact is anticipated from the sheet pilling at the nearby structures. Activities related to the compacting of dirt for the new roadway would be another source of high vibration level. No structural damages are anticipated beyond 30 m from dirt compacting. If there are structures with such distance, then level of the force for the wheel compactor or vibratory roller must be reduce to avoid any possible impacts. Residences of the two first row houses located on the south side of the highway may be annoyed from the vibration for the short periods of time when dirt compacting activities are in front of their houses.

521. Section **F.2.5 - Ecology and Biodiversity** covers in detail the potential noise impacts on aquatic fauna resulting from pile driving as well associated mitigation measures.

Assessment of Impact: *Operation Phase*

522. Traffic noise and vibration studies have being conducted for the Project to determine compliance with the operational limits and recommend mitigation measures as needed. Main components for conducting a traffic noise study are roadway alignment, location and elevation of receptors, traffic volumes as well as distribution of the volume between different vehicle types and traffic speed. Using this information, future traffic noise levels can be predicted using a computer model.

523. A computer noise model was developed using SoundPLAN to predict traffic noise levels for one year, 10 years, and 15 years after Project completion (2022, 2031, and 2036) and analyze possible noise impacts as well as mitigation measures. SoundPLAN is a three-dimensional noise modeling program that utilizes ray-tracing techniques to predict noise levels. SoundPLAN not only considers sound propagation over distance from multiple sources, but also considers shielding from intervening structures and barriers, reflections off of buildings and walls, atmospheric absorption of sound, as well as ground effects on the sound propagation between sources and receivers. The three-dimensional model was developed using aerial photographs, CAD files, and future development plans.

524. Table 65 provides traffic volume distribution by daytime and nighttime as well as by vehicle type. It has been assumed that this distribution will be same for all the future years.

Table 65. Day and Night Traffic Distribution

	Type of vehicle(veh/d)		Total
	Heavy	Light	
24 hour ADT	1,125	5,143	6,268
Day	844	3,857	4,701
Night	281	1,286	1,567

Source: Construction and Operation ff Poti-Grigoleti-Kobuleti Bypass. Section of International E-70 Senaki-Poti (Detour) - Sarpi (Border of Turkish Republic) Road, Poti-Grigoleti section (stage 1) – bridge over Rioni River and access roads, Activity 2 (Detailed Design), Environmental and Social Impact Assessment (ESIA) Report.

525. Using the information provided in Table 65 and forecasted traffic for the future years, the traffic distribution has been calculated for three different years, which are then used for predicting traffic noise impacts. Table 66 represent detailed information about traffic volumes and distribution. It is assumed that the traffic speed for all the vehicles types will be 90 km/h. It is assumed that the daytime and nighttime peak hour traffic volumes would be 10% of the total daytime and nighttime volumes.

Table 66. Traffic data for noise modelling

Year		Heavy	Light	Total	Peak hour	
					Heavy	Light
Existing	ADT	1,125	5,143	6,268	--	--
		18%	82%	--	--	--
	Day	844	3,857	4,701	84	386
		18%	82%	75%	10%	10%
	Night	281	1,286	1,567	28	129
		18%	82%	25%	10%	10%
2022	ADT	1207	5535	**6,742**	--	--
		18%	82%		--	--
	Day	905	4151	5057	91	415
		18%	82%	75%	10%	10%
	Night	302	1384	1686	30	138
		18%	82%	25%	10%	10%
2031	ADT	1195	1676	**2,871**	--	--
		42%	58%		--	--
	Day	896	1257	2153	90	126
		42%	58%	75%	10%	10%
	Night	299	419	718	30	42
		42%	58%	25%	10%	10%
2036	ADT	1294	1665	**2,959**	--	--
		44%	56%		--	--
	Day	971	1249	2219	97	125
		44%	56%	75%	10%	10%
	Night	324	416	740	32	42
		44%	56%	25%	10%	10%

526. Five noise sensitive receptors were identified for degerming the traffic noise impacts. Figure 58 shows locations of these receptors and Table 66 presents predicted hourly daytime and nighttime peak noise levels at these five receptor locations. In addition, noise contours were developed for these two peak hours for years 2022, 2031, and 2036 plus day-night average noise levels. These contour maps are included in **Annex 5. Noise Contour Maps**. Predicted noise levels at each receptor and contours are representing noise levels at 1.5 meters above the ground.

Figure 58. Location of Noise Sensitve receptors

Table 67. Hourely peak L_{eq} for daytime and nighttime

Receptors	Existing peak hour Leq, dBA		2022 peak hour Leq, dBA		2031 peak hour Leq, dBA		2036 peak hour Leq, dBA	
	Day	Night	Day	Night	Day	Night	Day	Night
R1	61.3	55.4	61.6	55.7	60.7	54.9	61.0	55.1
R2	57.1	51.2	57.4	51.5	56.6	50.8	56.9	51.1
R3	64.4	58.6	64.8	58.9	63.7	57.9	64.0	58.2
R4	60.6	54.8	61.0	55.1	60.2	54.4	60.5	54.6
R5	57.0	51.2	57.3	51.5	56.5	50.6	56.8	50.9

527. Based on the noise analysis results, predicted equivalent peak hour noise levels from operation of the Project would exceed the nominated limits. However, peak hourly average noise levels increase would be no more than 0.4 dB which is by order of magnitude below the allowable noise increase of 3 dB specified by IFC.

528. The highest measured peak hourly average daytime noise level at Receptor R3 was 61.9 dBA (see Figure 43) which is lower than the modeled value of 64.4 dBA. The 2.5 dB difference can be attributed to two factors, use of higher traffic volumes during peak hour and higher daytime traffic volumes in general for the existing case. As project traffic report does not provide volumes for year 2018, volumes for year 2020 were used for the modeling of the existing case. Most probably traffic volumes for 2020 are slightly higher than 2018 volumes. Furthermore, it was assumed that 10% of daytime traffic would be occurring during the peak hour. Again, project report does not indicate what percentage of the traffic would occur during the peak hour; therefore, 10% was used to be at the conservative side to predict the highest

possible noise levels. As 10% value is used throughout the study, it can be assumed that predicted daytime peak hour noise levels for all three future years are possibly 2 to 2.5 dB higher than what actual levels would be.

529. The highest measured peak hourly average nighttime noise level at Receptor R3 was 60.0 dBA which is higher than the modeled value of 58.6 dBA. A 1.4 dB difference is typically considered an acceptable difference between measured and modeled noise levels.

530. Measured and modeled peak hour daytime and nighttime noise levels are higher than IFC limits for the hourly average daytime and nighttime noise levels. Even if a lower volume were used for the peak hour and predicted peak hour noise levels became lower by 2.5 dB, they would still be over IFC limits. However, in any case noise increases would be less than 3 dB allowable limit. Therefore, no noise mitigation measures such as noise barriers are needed. Furthermore, staring year 2025, traffic volumes would be reduced by almost 70% due to the opening of the east-west highway E-70, where it would result in traffic noise level below the existing noise levels. In another word, there would be positive impacts.

531. Vibration from the vehicular traffic is negligible from well-maintained highways. If there are expansion joints or potholes on the highway, then there may be some vibration when heavy trucks are passing over them. However, even in these cases, vibration levels are hardly noticeable beyond the shoulder of the roadway. No vibration impacts are anticipated from the operation of the proposed highway at the nearby sensitive receptors.

Management and Mitigation Measures

Site Preparation, Construction, and Worksite/Project Closure Stages

- Restrict construction hours to between 07:00 to 20:00 hours within 500 m of the houses and other noise sensitive receptors.
- Set optimum travel speed during offsite travel.
- Install temporary noise barriers made of plywood or acoustical blankets around noisy operation where necessary to comply with project noise limits.
- Train staff in construction best practice.
- Regular maintenance of equipment such as lubricating moving parts, tightening loose parts, and replacing worn out components.
- Use newer equipment with improved noise muffling and ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators intact and operational. Newer equipment will generally be quieter in operation than older equipment. All construction equipment should be inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (e.g., mufflers and shrouding, etc.).
- Shut down or throttle down between work periods for machines and construction plant items (e.g., trucks) that may be in intermittent use.
- Reduce the number of equipment operating simultaneously as far as practicable.
- Orientate equipment known to emit noise strongly in one direction so that the noise is directed away from receptors as far as practicable.
- Locate noisy plants as far away from receptors as practicable.
- Avoid transportation of materials on- and off-site through existing community areas during nighttime hours.
- Use material stockpiles and other structures, where practicable, to screen noise sensitive receptors from on-site construction activities.
- Record and respond to complaints according to the established grievance redress mechanism.

- Keep nearby residences informed in advance about noisy activities during various construction phases.
- Perform independent periodic noise and vibration monitoring to demonstrate compliance with Project noise and vibration limits.
- When there is a possibility of human annoyance from construction activities, conduct such activity only during weekday daytime hours when the ambient background noise and vibration is higher and many residents are away from their homes at work.

Operation Stage

535. Noise barriers. Traffic noise prediction results indicate that the future noise levels after the completion of the project would be higher by less than 0.5 dB from the existing noise levels which is not noticeable. Therefore, no noise mitigations such as noise barriers are needed. Furthermore, staring year 2025, traffic volumes would be reduced by 70% due to the opening of highway E-70, where it would result in traffic noise level below the existing noise levels.

Conclusions

536. A certain level of noise and vibration is an inevitable side effect of construction activities and will vary depending on the construction activity and schedule. Some nearby residences may be annoyed during impact pilling activities. No vibration impacts are anticipated at the nearby receptors.

537. With the exception of freshwater critical habitat (i.e., the Rioni River), the majority of construction will take place at considerable distance from habituated areas and sensitive habitat and will therefore have limited impact on sensitive receptors.

538. Using dewatered coffer dams would minimize impact pilling effect on the fish species of Rioni River, but under water noise monitoring will be conducted to assure safety of fish species. This is discussed more fully in Section **F.2.5 - Ecology and Biodiversity** below.

539. Increased HGV movement along the route during construction will not be significant compared to the existing traffic flows, and settlement patterns along the road section imply that few human receptors will be exposed to elevated noise.

540. There would be no operational traffic noise impact as the future noise levels would at most increase less than 0.5 dB, which are below the IFC's specified allowable 3 dB increase of the existing noise levels. After year 2025, traffic noise levels would be below existing traffic noise levels since traffic volumes are expected to drop due to the opening of the east-west highway E-70.

Residual Impacts

Table 68. Residual Impacts – Noise and Vibration

Impact	Significance before Mitigation	Residual Impact After Implementation of Mitigation Measures			Key Residual Impacts
		Preparation Construction Worksite Closure Phase	Operation Phase		
			Day 1	Year 15	

(i) Noise and vibration emissions resulting from the use of machinery and equipment and vehicle circulation.	**Medium**	**Low**	**Low**	**Low**	Implementation of the recommended mitigation and management measures would help to reduce noise levels at many locations. However, at some receptors noise levels may rise above Project noise limits during certain construction phases of the Project, especially during impact pilling. Noise and vibration monitoring of these sites will be required to determine possible impact in these areas. If limits are exceeded, the RD will consult with the affected owners to determine the feasible and reasonable mitigation measures. Results of traffic noise analysis indicate that there would be no operational noise impact as the future noise levels would increase less than 0.5 dB which bellow the IFC specified 3 dB allowable increase. After year 2025, traffic noise levels would be below existing traffic noise levels.

F.2.3 - Soil and Relief

Scope of the Assessment

541. This section explains the potential impacts on soil, geology, and relief conditions from the proposed Project.

542. Note that some of the conditions and effects described, particularly with regard to contamination and hydrogeology, may interact with other parameters such as ecology and surface water. Such interactions are described where appropriate.

Identification of Sensitive Receptors

543. Potential impacts within the Project sites, as well as adjacent receptors, have been considered.

Assessment of Impact: *Site Preparation, Construction, and Worksite/Project Closure Stages*

544. Key potential impacts on soils, geology, and relief arise from the following activities:

- soil disturbing activities and excavation associated with construction leading to loss of soil structure, quantity, and quality;
- accidental events (spills, uncontrolled releases) associated with the storage, handling, and disposal of hazardous materials, including fuels;
- storage and disposal of non-hazardous waste; and
- inappropriate management of borrow pits.

545. Soil works, including vegetation clearance, grading, and levelling, compaction, backfilling, and construction of various structures must be carried out at the site, access roads, and on the banks of the Rioni River. Changes to soil structure may be caused by mechanical disturbance from these activities. Exposure of soil to rain and wind may in turn cause erosion and loss of top soil. The design considers selection of a reasonable embankment height, establishment of temporary berms, slope drains, temporary pipes, contour ditches, ditch checks, diversions, and sediment traps.

546. Geological impacts. Geological conditions are relatively uniform in the Project area and a not a criterion affecting the locations of the proposed actions. There are some areas where provisional works will be installed, and the topography is slightly irregular. Therefore, it will be necessary to make some cuts and leveling. During these activities geological formations are modified due mainly to earth moving and readjustment. However, it is estimated that much of the material removed will be used for filling and leveling, seeking to recover to the extent possible the original topographic conditions.

547. The material for levelling will be a combination of excavated soil on site, as well as additional soil brought in from another location to be identified by the Contractor. The excavated materials suitable for backfilling will be temporarily stockpiled onsite. This phase of the Project is generally the most intensive in terms of potential for topsoil loss. Poor topsoil management can lead to a loss of topsoil through either the air (as dust) or as sediment entrained within surface water flows. Soil erosion can also result from poor management of stockpiled soils, excavated areas, and general construction areas.

548. Additionally, soil will be compacted at the site and access roads, the lay down areas, and the construction camp (if established) to ensure soil stability. Movement of heavy vehicles in the construction area will also result in soil compaction and damage to the soil structure. This compaction of the soil may potentially result in changed hydrological characteristics, such as reduced permeability and water infiltration to the soil, which could create additional surface runoff (and increase the flow velocity of this runoff), as well as reducing infiltration into the subsurface.

549. If compaction and erosion are not managed, associated potential impacts could include excessive sedimentation of local waterways, loss of topsoil and reduction in soil fertility, and detrimental changes to site hydrology. As a result of excavation and construction of the roadway embankment, the water regime (mainly towards waterlogging) of the soil on the sections adjacent to the Rioni River and the canal in near Patara Poti may change. However, soil compaction erosion due to construction activities will only be in the vicinity of the Project site, which is limited. Loss of topsoil, if not controlled, can result in a waste of valuable topsoil resource which can be used in rehabilitation activities and or/agriculture.

550. Sourcing of construction materials (e.g., sand, gravel). Impacts to geological resources such as gravel and other quarried materials will occur due to extraction for use in the road construction. Embankments and other requirements for fill may necessitate the use of borrow pits. Unless properly controlled, borrow pits cause drainage and visual problems and present

a potential for increased vector activity (e.g., mosquitoes or water contamination). Decisions made in the site preparation stage will determine whether the bid and contractual conditions control or fail to control borrow pit development and restoration.

551. A typical source of aggregate in the region is from the banks and within the rivers that flow from Georgia's interior to the Black Sea coast. This includes abstraction sites within Rioni River, Natane River, Khobi River, Khobistskali Tekhuri River, Supsa River, Abasha River, and Enguri River, to name a few. The potential impacts of sourcing of construction materials from within or on the banks of the Rioni River could have on sturgeon are highly significant and must be avoided as further covered in Section **F.2.5 - Ecology and Biodiversity**.

552. Soil contamination. Contamination of soil in the construction phase may result from the inappropriate transfer, storage, and disposal of petroleum products, lubricants, chemicals, hazardous materials, liquids, and solid waste. These impacts are particularly associated with construction camps and staging areas where the majority of potentially contaminating chemicals are stored, and during refueling of equipment.

553. It is noted that soil and groundwater contamination due to improper construction waste storage and disposal would be the result of contaminated surface water runoff being discharged from waste storage and disposal areas. The production and discharge of this contaminated surface water is assessed within Section **F.2.4 - Surface and Groundwater**. It is considered that this impact has therefore already been covered and will not be re-assessed within the context of impacts to soil. This is also the case with the impacts due to improper discharge of waste water and runoff, which if directed to either a surface water, groundwater, or soil receptors would all be subject to similar impacts and thus mitigation, management, and monitoring measures.

Assessment of Impact: *Operation Phase*

554. Emissions and dust. Impacts on soil from operation of the road will primarily result from the following:

- Emissions of solid particles
- Emissions of liquid matters
- Road maintenance operations

555. The highest degree of contamination does not necessarily have to occur in direct vicinity of the road (except, of course, the closest – marginal part), but lies somewhat further out. This depends on the method of dispersion of pollutants and given local conditions.

556. Solid particles are emitted from the highway as fine dust and widely spread by wind. Distinction is made between large and tiny dust particles. Large particle dust is usually sedimented on green leaves near the road, while finer dust is dispersed by wind to more distant areas as dust suspension or aerosol. Sedimentation of dust on plants reduces the penetration of light and intensity of photosynthesis. Additionally, the dust sediment on the back side of leaves precludes normal transpiration causing physiological disorders. This results in reduced growth of the plant.

557. Soil contamination from liquids dripping out of vehicle engines (e.g., fuel, motor oils, oil from gear-box and brakes, windshield washing liquids, and anti-freezing products) regularly contribute to the total pollution loading from roads and vehicles. Some of the stated liquids contain heavy metals including lead, cadmium, copper, nickel, vanadium, and molybdenum. The quantity of these substances depends primarily on the traffic intensity (i.e., number of

moving vehicles). It is difficult to predict the range and quantity of pollutants released accurately due the wide range of materials that can be released, and the unpredictable nature of the occurrence of leaks and accidents. Additional dust related impacts and mitigation measures are covered in Section **F.2.2.1 - Air Quality**.

558. Road maintenance impacts. Maintenance operations include the clearance of snow or ice in winter and the control of weeds and vegetation on the roadside. At less frequent intervals it also includes the cleaning of drainage systems, resurfacing of roads and refurbishment of street furniture. The use of herbicides and pesticides on roads for weed control could potentially pose impacts as well but is not expected to be significant issue.

559. Ice breaking salt/material may lead to increase of sodium and chlorine ions in surface runoff and respectively the soil. The salt components make their way into environment through the runoff (rain, melting snow, and ice), as well as through splash and spray by vehicles and/or by wind causing impact on environment. Chloride ions are completely soluble and very mobile, toxic to aquatic life, and has the potential to negatively impact vegetation and wildlife. There is no natural process by which chlorides are broken down, metabolized, taken up, or removed from the environment. The transport of sodium in environment is less prominent due to ion exchange. With consideration of the climate, excessive use of salt and sand during winter months in the project area is not required and significant impact is unlikely.

560. Impact on soil may also result from the poor design or blockage of the road drainage system which may cause flooding, waterlogging and/or erosion of soil. Finally, litter from users of the road will generally result in elevated levels of solids which may or may not break down in the environment.

Management and Mitigation Measures

Site Preparation, Construction, and Worksite/Project Closure Stages

- Soil Management
  - To avoid loss of the productive soil layer, all suitable topsoil and other material shall be saved and stockpiled separately for the future recultivation of the area.
  - Stockpiles of removed topsoil must be properly designed/shaped and managed.[55]
  - Temporary detention ponds or containment to control silt runoff will be provided.
  - Intercepting ditches and drains will be created to prevent runoff entering construction sites.
  - Soil compaction may be reduced by strictly keeping to temporary road boundaries.
  - Slopes of embankment will be protected from erosion by vegetation and slope drainage.
  - Disturbed vegetation must be replanted immediately after the construction/disturbance stops.

[55] Topsoil management must comply with requirements set in the Government regulations (N424, dated 31 December 2013) on topsoil removal, storage, use and recultivation. Good management practice experience must be also taken into account. Subsoil pile must have a natural angle of slope of up to 40° depending on texture and moisture content but, if stable stockpiles are to be formed, slope angles will normally need to be smaller. For stockpiles that are to be grass seeded and maintained, a maximum side slope of 1 in 2 (25°) is appropriate. If the soil is to be stockpiled for more than six months, the surface of the stockpiles should be seeded with a grass/clover mix to minimise soil erosion and to help reduce infestation by nuisance weeds that might spread seed onto adjacent land. Sites of temporary storage of excess material will be agreed with the local municipalities.

  - Appropriately set up temporary construction camps (if determined needed) and storage areas to minimize the land area required and impact on soil erosion.
- Soil Contamination
  - Use of offsite fueling and maintenance facilities will be encouraged. However, if planned to have onsite – storage and handling of fuels, oils, and other hydrocarbons will be a controlled process, involving measures to prevent soil and water contamination. Designs will include storage on sealed surfaces and within secondary containment and refueling of all plant, vehicles and machinery will not be allowed within 50 m of any watercourse, drain or channel leading to a water course.
  - Onsite repairs /maintenance/fueling activities shall be limited. Priority shall be given to offsite commercial facilities. If impossible, a designated area and/or secondary containment for the on-site repair or maintenance activities must be provided.
  - Secondary containment devices (drop cloths, drain pans) shall be used to catch leaks or spills while removing or changing fluids from vehicles or equipment. Drip pans or absorbent materials shall be provided. On small spills, absorbent materials shall be used.
  - On-site vehicles and equipment shall be inspected regularly for leaks and all leaks shall be immediately repaired. Incoming vehicles and equipment shall be checked for leaks. Leaking vehicles/equipment shall not be allowed on-site.
  - Wastewater Management Plan and proper sewage collection and disposal system will be available to prevent pollution of watercourses (if discharge in surface water is planned).
  - Water will not be drained to the area where crops may be/are cultivated.
  - No fly tipping policy shall be followed.
  - Waste collection area must be sited so as to avoid draining by runoff directly to a water body.
  - Materials to be disposed of will be assessed and where required tested to confirm its chemical characteristics so that it can be categorized as inert, non-hazardous, or hazardous waste as appropriate.
  - Adequate training on environmental protection and safety shall be provided to the staff.
- Quarries
  - The Contractor will carry out operation of quarries and borrow pits, as well as extraction of gravel from river terraces (if utilized), in strict accordance with the conditions of a license issued by the Ministry of Economic Development (MoED) and cleared by the MoEPA; and
  - The Contractor will be responsible to develop, agree and strictly adhere to Aggregate and Borrow Pits Management Plan.
  - Borrowing from the Rioni River will be prohibited.
  - Sourcing of construction materials (e.g., sand, gravel) will avoid use of any licensed or unlicensed sites in the Rioni River or on its banks.

Operation Stage

- Limit dispersion of fine dust and aerosol to the narrowest area possible through protective revegetation activities on both sides of the road.
- Awareness raising and education of community on waste management (no illegal dumping or littering).
- Periodic inspections will be done to detect signs of slope instability and ensure revegetation where necessary.

- Regular maintenance and cleanup of the drainage system to prevent impact on soil erosion or flooding.

Conclusions

561. In terms of soil structure and quality, geological features and relief, there will be inevitable impacts where the alignment is planned. The extent of soil systems that will be lost or damaged within the footprint of the Project is small however when considered on a regional scale. Provided the recommended soil mitigation measures and restoration and re-planting programs are implemented, overall impacts to soil structure, quality, and ecological suitability will be minimal.

562. Proper maintenance during the operation phase will include soil inspection to detect signs of slope instability and direct revegetation actions where necessary. Drainage systems will be regularly monitored.

Residual Impacts

Table 69. Residual Impacts – Soil and Relief

Impact	Significance before Mitigation	Residual Impact After Implementation of Mitigation Measures			Key Residual Impacts
		Preparation Construction Worksite Closure Stages	Operation Phase		
			Day 1	Year 15	
(i) Land erosion due to loss of vegetation coverage and changes in its structure.	**Medium**	**Low**	**NEGL**	**NEGL**	The clearing of land surfaces will modify the land structure due to the removal of vegetation coverage and of surface layers of the land. This removal may expose the land to erosive processes due to wind and rain, however the residual impact after mitigation measures is expected to be Low.
(ii) Land pollution due to wrong management of solid waste, as well as possible dripping of hydrocarbons from machinery and equipment, and wrong storage of oil and fuel.	**Low**	**Low**	**NEGL / Low**	**NEGL**	During the construction phase, a range of waste materials will be generated due to the daily activities of the construction workforce (e.g., generation of food waste) as well as a range of general construction waste such as concrete, steel pipes, plastic pipes, steel plates, structural steel, and wooden crates during the civil works phase of construction. While most of these are likely to be nonhazardous, some of these may be hazardous

					include used paint, engine oils, hydraulic fluids, spent solvents, spent batteries etc. Implementation of proper mitigation measures including Waste Management Plan (both non-hazardous and hazardous) will minimize the impacts. With implementation of the mitigation measures, the residual impact is expected to be Low.
(iii) Pollution due to littering.	**Low**	**N/A (Operation Phase Impact)**	**Low**	**Low**	Littering may harm animals, humans, and spread chemicals in the environment. Litter in the environment can also affect recreational values in an area.
(iv) Modification of geological formations.	**Medium**	**Low**	**NEGL**	**NEGL**	The area where the road and bridge are to be located are generally flat; however, there are some areas where provisional works will be installed, and the relief is slightly irregular; therefore, it will be necessary to make some cuts and leveling. During these activities geological formations are modified due mainly to earth moving and readjustment. However, it is estimated that most material removed will be used for filling and leveling.

Note: NEGL means Negligible

F.2.4 - Surface and Groundwater

Scope of the Assessment

563. The surface water and groundwater impact assessment has focused on the following components of the Project:

- potential impacts on the hydrology or quality of the water environment from physical intervention and intentional and accidental discharges to water during construction; and
- potential impacts on the water environment during operation of the project including at the bridge and along the roadway.

564. Note that as previously mentioned, some of the conditions and effects described, particularly with regard to contamination and hydrogeology, may interact with other parameters such as ecology and soil.

Identification of Sensitive Receptors

565. Surface water receptors along the Project alignment include rivers and water courses. All of these receptors are vulnerable to physical disturbance, for example from construction of the road and any river crossings; introduction of pollutants, including sediment, to rivers that will affect their water quality, which in turn will affect their ecology and economic importance; or contamination of runoff that may eventually reach drinking water supplies.

566. In the Project area, the Rioni River is identified as the most prominent potential receiving body. Contamination of the Rioni River has implications for human health, fauna, and flora. In addition, groundwater contamination and use could impact the availability for groundwater for users in surrounding communities.

Assessment of Impact: *Site Preparation, Construction, and Worksite/Project Closure Stages*

567. During the construction and operation phases, different activities have the potential to generate wastewater, accidental spills, sedimentation, and increased water consumption, which could lead to impacts on the hydrology and quality of surrounding freshwater bodies.

568. Impacts on the water environment during preparation works and works during construction of the road and bridge may be generated from the following sources:

- accidental leakages of fuel/oil/ lubricants from cars and machinery (including emergency situations);
- pollution caused by improper management of construction materials and waste;
- increase of turbidity caused by earthworks and construction activities near and/or in the riverbed;
- discharge of sewage effluent or other untreated wastewater; and
- contamination of groundwaters by infiltrated contaminated surface water
- littering.

569. Road and bridge construction, as well as relocation of utility infrastructure, will disturb surface soils and could affect surface water in the Project area through increased sedimentation of rivers, such as cutting and filling operations, excavation of pipeline trenches, bridge constructions across the Rioni and embankment works. Many of these potential impacts interrelate with other parameters, including soil and air quality that have been covered already.

570. Groundwater. The scale of impact on groundwater will depend on the 'depth' of water horizon. The risk of impact on shallow aquifers which are more vulnerable may exist. The impact probability in the bridge construction areas, where extensive excavation compared to that during the road construction works is needed, is higher.

571. In-river construction. Construction of the bridge foundation has the potential to disturb the river sediment and further increase suspended solid concentration in the river water body. During construction of the bridge piers, sheet piles will be used to avoid operation in water. Use of machinery in the riverbed is not planned. Contractors will be requested to pump slurry to shore and properly dispose cutting materials. This will reduce the disturbance of sediments and the residual impact on water quality. The impacts to the riverbed are expected to be minimal considering the intermittent short-lived period of disturbance. Works on river banks and within watercourses will be strictly controlled – particularly in terms of the time in which

construction will be permitted in the river; vehicles and personnel entering such watercourses and damaging banks and river beds; as well as introducing pollutants into them. Where possible temporary bridges should be put in place and work should be undertaken from the bank rather than in the watercourse itself.

572. Water contamination. Surface water contamination may occur during the construction phase due to accidental leaks or spills of chemicals or hazardous materials such as oils, lubricants, or fuel from heavy equipment; improper chemical/fuel storage; inappropriate disposal of domestic wastewater; washdown water from construction equipment; and from waste materials if not stored and disposed of properly. These issues have been covered fully in Section **F.2.3 - Soil and Relief**.

573. During construction, runoff water will be managed through arrangement of settling ponds. Water collected in the pond can be used for dust suppression (assuming it is not contaminated) or other use as technical water. Part of water will evaporate, and accumulated sediments can be removed/disposed of safely. Settling ponds may be constructed directly on compacted earth or with a high-density geotextile sheet covering the ground and ridges.

574. A settling basin is required for management of waste water from concrete production/batching on site. The decision on the need for a concrete batching plant on the Project site rests with Contractor identified through tendering.

Assessment of Impact: *Operation Phase*

575. Major possible impacts on water during operation of the road will be:

- sedimentation and pollution of waters with heavy metals and petroleum hydrocarbons caused by road surface runoff and accidental spills;
- pollution from generic waste (i.e., littering, illegal dumping);
- cross contamination of groundwater in case of surface water pollution;
- increase of groundwater level caused by the load of the road structure; and
- pollution during maintenance works (e.g., application of salt and sand).

576. Surface and groundwater pollution. Pollution of surface and groundwater from operation of the highway may occur from regular operational and maintenance as well as from traffic accidents involving cargo vehicles transporting hazardous substances.

577. Concentrations of pollutants in runoff varies, but studies done by the US Federal Highway Administration can provide illustrative estimates. Table 70 shows the relationship between traffic flows and concentrations of pollutants in the runoff.

Table 70. Concentration of Pollutants in Highway Runoff

Pollutant	Mean concentration (mg/l) for highways with	
	<30,000 vehicles/day	>30,000 vehicles/day
Total suspended solids	41	142
Volatile suspended solids	12	39
Total organic carbon	8	25
Chemical oxygen demand	49	114
Nitrite and nitrate	0.46	0.76
Total Kjeldal nitrogen	0.87	1.83
Phosphate phosphorus	0.16	0.4
Copper	0.022	0.054
Lead	0.08	0.4
Zinc	0.08	0.329

Source: Driscoll, E., Shelley, P., and Strecker, E. Pollutant Loadings and Impacts from Highway Stormwater Runoff, Volume I. Washington, D.C.: Federal Highway Administration, 1990

578. To protect water quality from contaminated roadway surface runoff and in the event hazardous substances are accidently spilled, protection measures have been integrated into the design as described in Section **C.5.3 - Bridge Runoff and Spill Containment Chamber**. Runoff waters and roadway spills will be collected, diverted, and retained in two chambers, one on each side of the bridge. The RD will conclude a long-term contract with a Road Maintenance Contractor to maintain the road and bridge section in the operation stage. The RD will ensure that this additional responsibility is included in the SOW, in addition to being financed and monitored accordingly.[56]

579. The risk of accidents will be brought to the possible minimum by application of road safety measures and implementation of the RD's Road Safety Action Plan 2016-2021, which was developed with technical support provided by the WB, will enhance safety of operation of the newly reconstructed highways.

580. Maintenance impacts. Pollution from road maintenance works is possible in case of failure to adhere to good practice. The potential impacts from road treatments and vegetation control along the road have already been covered in the Section **F.2.3 - Soil and Relief**.

581. Runoff. Concentration of contaminants in the runoff cannot be reduced at the source since it largely depends on the status of technical maintenance of cars, traffic speed, quality of petrol, etc. Impact caused by the runoff on surface water can be managed to some degree by vegetation along the highway, availability of infiltration trenches, and general roadway maintenance and clean-up activities. The baseline quality of water, size, and characteristics of receiving stream, potential for dilution, and ability of self-cleaning are the critical factors in determining the magnitude of highway runoff on surface water.

Management and Mitigation Measures

Site Preparation, Construction, and Worksite/Project Closure Stages

- Discharges and Sediments
    - Discharge of any untreated water into the surface water body will be strictly prohibited.
    - Discharge of cement contaminated water will be prohibited as cement pollution results in high alkalinity and raises the pH, which can be toxic to aquatic life.
    - To prevent runoff contamination, paving should be performed only in dry weather.
    - In disturbed soil areas, compacted straw (straw bales), silt fence, fibber rolls, gravel bags, or other approved sediment control must be ensured. At a minimum, all bare soil (whether it's an abutment slope or a stockpile) must be protected before it rains.
    - Regularly, and particularly following rainstorms, inspect and maintain drainage systems and erosion control and silt removal facilities to ensure proper and efficient operation at all times.
    - Vegetation must be preserved where feasible, in particular in the areas near the river bank to avoid erosion/sedimentation. Revegetate areas promptly, where practicable and appropriate.

[56] Levan Kupatashvili, Roads Department, pers. comm. 2018

  - The construction camp (if needed), permanent or temporary, will not be located within 500 meters of any river, or irrigation channel.
  - Wastewater Management Plan and proper sewage collection and disposal system will be available to prevent pollution of watercourses (if discharge in surface water is planned).
  - Provide coffer dams, silt fences, sediment barriers or other devices to prevent migration of silt during construction within the river.
  - Perform dewatering and cleaning of cofferdams to prevent siltation by pumping from cofferdams to a settling basin or a containment unit.
  - Where applicable (i.e., to irrigation canal in Patara Poti), the Project will, as much as possible, control the effluent and runoff discharged to the irrigation channel to below the "Severe" restriction on use according to the FAO Guidelines for Interpretations of Water Quality for Irrigation.[57]
- Waste Management
  - Materials and waste must be stockpiled so as to avoid erosion and washing off into the river. Drainage trenches must be established to divert surface runoff from the site.
  - Implement proper storage of the construction materials and wastes to minimize the potential damage or contamination of the materials.
  - Implement construction materials inventory management system to minimize over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period.
  - Segregate hazardous and non-hazardous waste and provide appropriate containers for the type of waste type.
  - Store waste systematically to allow inspection between containers to monitor leaks or spills.
  - Dispose of waste by licensed contractors.
  - Storm water drainage and wastewater will be treated in accordance to the applicable World Bank/IFC guidelines.
- Hazardous Substances
  - Use of offsite fueling and maintenance facilities will be encouraged. Should any temporary fuel tank be available, it must be located at least 50 m away from any watercourse, drain, or channel leading to a water course. The tank must be placed in covered areas with berms or dikes installed to intercept spills, if any. Any spill should be immediately localized and cleaned up with absorbent materials. The bund will be able to accommodate 110% of the volume of the tank.
  - Onsite repairs /maintenance and fueling activities should be limited.
  - Onsite vehicles and equipment shall be inspected regularly for leaks and all leaks shall be immediately repaired. Leaking vehicles/equipment shall not be allowed on-site.
  - Secondary containment devices (drop cloths, drain pans) shall be used to catch leaks or spills while removing or changing oils from vehicles or equipment. For small spills, absorbent materials must be used.
  - Tire washing unit, if any, must be equipped with drainage settling facilities. The washout pit must be cleaned immediately upon 75 percent filling.
  - No washing of vehicles etc. in the river will be allowed.
  - Usage of off-site vehicle wash racks or commercial washing facilities is preferable. If on-site cleaning is required, bermed wash areas for cleaning activities must be established.

[57] FAO, 1985. Water Quality for Agriculture. Food and Agriculture Organization, Rome, Italy. http://www.fao.org/docrep/003/T0234E/T0234E01.htm

- The Contractor will be responsible for developing a Spill Management Plan and an Emergency Response Plan.
- Contractor will implement a training program to familiarize staff with emergency procedures and practices related to contamination events.
- Operating personnel will be trained to visually inspect discharged water quality for oil and grease traces (that will be visible on the surface) periodically and take appropriate corrective actions.

Operation Stage

- Perform maintenance paving of the road sections and bridge decks only in dry weather to prevent runoff contamination.
- Use staging techniques to reduce the spread of paving materials during the repair of potholes and worn pavement. These can include covering storm drain inlets and manholes during paving operations, using erosion and sediment controls to decrease runoff from repair sites, and using drip pans, absorbent materials, and other pollution prevention materials to limit leaks of paving materials and fluids from paving machines.
- Comply with relevant mitigation measures defined for water protection during construction.
- Clean-up of the roadside strips through regular maintenance.

Conclusions

582. The activities posing the highest risk to deterioration in the surface water environment would be the temporary works associated with bridge construction and release of contaminants, sediment loading, and other runoff into watercourses. The Project will be implemented in accordance with all relevant legislation for the protection of surface and resources.

583. Prior to the start of civil works, site workers will be trained about mitigations and procedures. As part of this, training will be given about all potential contaminants, spillage, or leakage of any polluting material such as fuel, oil etc. and impacts of these, as well as contingency and clean-up procedures.

584. Extra attention will be needed during the operational phase for ongoing and long-term mitigation measures. All required controls will require to be done regularly, including maintenance of the spillage and runoff containment system.

585. Overall the impacts to surface and groundwater resources is expected to be Low, taking the recommended mitigation measures into account.

Residual Impacts

Table 71. Residual Impacts – Surface and Groundwater

Impact	Significance before Mitigation	Residual Impact After Implementation of Mitigation Measures			Key Residual Impacts
		Preparation Construction Worksite Closure Stages	Operation Phase		
			Day 1	Year 15	

(i) Modification of surface hydrological pattern due to removal of vegetation and construction of provisional works and roads.	**Medium**	**Low**	**Low**	**NEGL**	Revegetation of disturbed areas from site clearing at the Project footprint is expected to address any disturbance to hydrologic systems within the succession time frame of native plant species.
(ii) Modification of surface hydrological pattern due to modification of geological formations and construction of elements which may block the original pattern of surface runoff.	**Medium**	**Low**	**NEGL**	**NEGL**	Potential impacts to surface hydrological patterns is expected to be short-term and localized in nature and can be controlled with the implementation of good construction practices and adequate water drainage systems on-site.
(iii) Pollution of nearby water bodies due to poor storage and management of waste and construction materials, which may be introduced through runoff or leaching through the soil.	**Medium**	**Low**	**Low**	**NEGL**	Impacts to surface water quality are expected to be short-term and localized in nature and can be controlled and minimized with the implementation of good construction practices and adequate wastewater treatment systems on-site.
(iv) Pollution of water bodies nearby due to wrong management and disposal of waste during structure dismantling and demolition.	**Medium**	**Low**	**Low**	**NEGL**	
(v) Surface water contamination from accidentally spilled fuel/oil or surface runoff.	**High**	**N/A (Operation Phase Impact)**	**NEGL / Low**	**NEGL / Low**	It is noted that the Project requires containment tanks for bridge runoff and to manage spills from accidents on the bridge during the operation phase. As long as measures are taken to sustainably manage the systems over the long-term, pollution from the bridge will be prevented from entering surface water courses and the residual impacts will be Negligible.

					Since interceptor tanks for the road drainage network in general are not planned, residual impacts will occur during the operational phase as polluted road water runoff drains into surface water courses. The residual impact is expected to be **Low**.
(vi) Groundwater contamination from accidentally spilled fuel/oil and road surface runoff.	**High**	**N/A (Operation Phase Impact)**	**Low**	**Low**	Since interceptor tanks for the road drainage network in general are not planned, residual impacts will occur during the operational phase as polluted road water runoff drains into the soil and surface water courses. The residual impact is expected to be **Low**.
(vii) Pollution of groundwater due to poor storage and management of waste and construction materials, and improper vehicle maintenance.	**Medium**	**Low**	**NEGL**	**NEGL**	**N/A**

Note: NEGL means Negligible

F.2.5 - Ecology and Biodiversity

Scope of the Assessment

586. This chapter provides an assessment of the potential effects on sensitive ecological and biodiversity receptors from the Project. It identifies and assesses the potential construction and operational impacts of the development and formulates an appropriate mitigation strategy. The scope of this assessment is to:

- examine and analyze baseline data with regard to the proposed development;
- identify the significance of any potential direct/indirect impact on the ecology and biodiversity of the proposed development site and its immediate environs; and
- identify appropriate and effective means of mitigating the potential adverse impacts arising from the construction and operation of the road and associated infrastructure.

587. Impacts have been evaluated and assessed through using information derived from desk-based studies and from site specific field surveys. Baseline ecological information is provided in Section **E.3 - Ecological Resources** of this EIA.

Identification of Sensitive Receptors

588. A full Critical Habitat Assessment (see BAP, **Annex 1. Biodiversity Action Plan (BAP)**) identified the Project area to be likely Tier 1 Critical Habitat for one globally Critically Endangered water plant, and likely or actual Tier 2 Critical Habitat for three freshwater fishes, one bird, one additional plant, two protected areas, and one internationally-recognized area (Table 72). Some uncertainty remains in the conclusions of this assessment, given extremely limited recent information on a number of species in the Project area. Nonetheless, this uncertainty does not change the overall conclusions of the assessment. Although in some cases conclusions could be refined by further studies, on a precautionary basis the features listed in Table 72 should all be considered priority biodiversity for the Project to avoid, mitigate and – if necessary – offset impacts upon. More extensive details of why each feature meets Critical Habitat criteria are given in the BAP (**Annex 1. Biodiversity Action Plan (BAP)**).

Table 72. Summary of Critical Habitat-qualifying biodiversity in the Project area

Biodiversity type	**Biodiversity**	**Critical Habitat Tier qualified**	**Critical Habitat criterion qualified**						**Justification**
			1	**2**	**3**	**4**	**5**	**6**	
Freshwater fish	Stellate Sturgeon *Acipenser stellatus*	2	X		X				Regularly supports at least one individual of this globally Critically Endangered migratory species, quite possibly more than 1% of its global population.
Freshwater fish	Russian ("Colchic") Sturgeon *Acipenser gueldenstaedtii*	2	X		X				Regularly supports at least one individual of this globally Critically Endangered migratory species, quite possibly more than 1% of its global population.
Freshwater fish	Grusinian Scraper (*Capoeta ekmekciae*)	2		X					Very likely supports more than 1% of the population of this restricted-range species.
Freshwater fish	Beluga Sturgeon *Huso huso*	2?	X						Quite possibly regularly supports at least one individual of this globally Critically Endangered species.
Bird	White-headed Duck *Oxyura leucocephala*	2	X						Nationally important concentrations of a species listed nationally as Endangered: 10s of individuals winter in the Kolkheti wetlands.
Plant	*Hibiscus ponticus*	2?		X					Quite possibly supports more than 1% of the population of this restricted-range species.
Plant	Colchis Water-Chestnut *Trapa colchica*	1?, 2	X	X					Quite possibly supports more than 10% of the population of this globally Critically Endangered restricted-range species.
Protected area	Kolkheti National Park	n/a						X	Internationally and nationally recognized IUCN Category II protected area of high

	and Ramsar Site								biodiversity value, due to be proposed as an Emerald Site and World Heritage Site.
Internationally recognized area	Kolkheti Important Bird Area	n/a						X	Area of high biodiversity value, internationally recognized as an Important Bird Area and Key Biodiversity Area.

589. There is a very slim possibility that Atlantic (European) Sturgeon (*Acipenser sturio*) and/or Ship (Fringebarbel) Sturgeon (*Acipenser nudiventris*) also still regularly occur in the Rioni River. If that were the case, they would also qualify the Project area as Critical Habitat (See BAP, Section **3.2 - Priority biodiversity**). The historic decline of sturgeon in the Rioni has been dramatic (Guchmanidze 2009). Both Atlantic and Ship Sturgeon were still thought to regularly spawn in low numbers in the Rioni just ten years ago, and other species have declined dramatically – for example, Beluga may be on the verge of no longer spawning in the Rioni (if, indeed, it still does), yet just ten years ago it was estimated that 35-44 individuals spawned in the river each year (BAP)

590. ***Assessment of Impact*: *Site Preparation Stage***

591. Habitats. The construction activities will result in the loss of approximately 5.25 hectares of habitat within the infrastructure footprint. Site clearance activities entail the excavation and removal of natural and modified vegetation, including up-rooting of shrubs and cutting of trees, to accommodate for the associated working areas. This 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. 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.

592. A botanical survey implemented by the Consortium at feasibility stage did not reveal any protected tree species in the area under the direct impact zone of the Project. The Project is situated in a landscape of varying land use and land cover, comprising a matrix of natural and modified habitat and the loss will be limited to that necessary for construction. The affected vegetation is mostly secondary, represented by alder trees and bushes. The site clearance will result in the following tree cuttings:

Left Bank of the Rioni River	Right Bank of the Rioni River
35 units - Alder 34 units – conifers (Cyprus, Pine) 32 units - Willow Shrubs from 0.1ha area	50 unit - Alder 35 units – conifers (Cyprus, Pine) Shrubs from 0.6 ha – Greenbrier, Honeysuckle, Blackberry, Amorpha, and invasive species - Canadian goldenrod.

593. Invasive alien species. Site clearance/preparation and movement of equipment results in the removal of top soil which can negatively influence several soil functions which are relevant in nature and environmental protection (e.g., carbon storage, and a decrease in biological activity). The spread of invasive alien species (IAS) is also facilitated by disturbances such as site clearance through increased movement of people, vehicles,

machinery, vegetation, and soil. Invasive flora species can rapidly germinate in disturbed areas whereby affecting the ability of native vegetation communities to re-establish. Alien animals also have the potential to be introduced or increased in abundance. These animals may adversely impact native fauna because of increased competition for resources, predation, or habitat degradation. Invasive species have the capacity to exacerbate their role in ecosystem degradation through combination threats by habitat change, climate change over-exploitation of ecosystem resources, and pollution, which further enhances their threat to biodiversity.

594. The Global Invasive Species Database has records for 86 terrestrial or freshwater IAS in Georgia, of which 59 are plants (of which some represent water-edge or semi-aquatic species) (see BAP, Section **4.1.1 - Habitats**). There is a particular risk for invasive plants, of which seeds or fragments of plant material can easily adhere to transported items. Introduction of invasive plants would primarily represent a habitat-level impact. Risks from IAS vary, according to the individual species and the conditions for their establishment at a particular site. Overall, however, IAS present a very high risk to biodiversity globally. On a precautionary basis, the potential impact of introduction of invasive alien species is thus considered of High significance.

595. Species disturbance and mortality. Fauna mortality can occur during vegetation clearing activities in the event individuals are struck by vehicles and machinery. Animals that are unable to disperse during clearing activities are vulnerable to being injured or destroyed through interaction with machinery or falling debris. It is likely that most individuals will disperse from clearing locations into adjacent habitats, however some less mobile species may experience a localized reduction in abundance during this period, such as amphibians, reptiles, and small mammals.

596. In-river construction may possibly also cause direct mortality through accidental collision or crushing of individual fish by machinery or equipment, or by poaching of fish by construction workers. Propeller-driven boats pose a particular mortality threat to sturgeon.[58] Direct mortality impacts would be short-term and localized and, depending again on the season, could have a high, medium or low consequence. As such, the use of propeller-driven boats will be minimized during construction. The most likely method of moving equipment and materials during in-river construction will be use of pontoons.[59]

Assessment of Impact: *Preparation, Construction, and Worksite Closure Stages*

597. Habitat. A range of Project activities have the potential to lead to indirect dust and runoff impacts to native flora, fauna, and habitat during site preparation and construction. During construction, land preparation has the potential to generate dust which may settle on vegetation adjacent to the construction area. The construction activities will be temporary and short lived, and dust generation is likely to be localized to active work areas. Rainfall will generally remove dust from foliage.

598. Land preparation will also create exposed bare earth areas that are vulnerable to erosion (wind and/or runoff) until infrastructure construction or replanting is completed to stabilize the surface. Erosive processes transport and deposit sediment to downstream habitats (both aquatic and terrestrial). The indirect impact has the potential to degrade downstream habitat areas or change habitat characteristics, and as such influencing suitability

[58] Goldfarb, B. (2016) The Hudson's Bridge To Death. *Waterkeeper* 12. Available at: https://waterkeeper.org/magazine/summer-2016/the-hudsons-bridge-to-death.

[59] Levan Kupatashvili, Roads Department, pers. comm. 2018

for native flora and fauna communities. Issues and mitigation measures connected with erosion have been previously covered in Section **F.2.3 - Soil and Relief**.

599. Edge effects from degraded habitat are an indirect impact of land clearing. 'New' habitat edges will be created where infrastructure is located in natural habitat areas, not previously disturbed. In general, the habitats that may be impacted are common and widespread and construction is not likely to impact the viability/function of adjacent habitats. Moreover, the existence of the railway line, which the new Road will run parallel to for much of the section, has already significantly altered habitat characteristics. Finally, the bridge design leaves approximately 140 m of open space along the riversides between the abutments and the waters for fauna to use once the road comes into operation. This ensures a level of access for terrestrial animals remains intact.

600. Disturbance and mortality of species. Accidental release or spill from the storage and handling of hazardous materials can be toxic to flora and fauna locally and downstream if substances are released into the aquatic environment. Irresponsible dumping of waste 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. Potential related impacts are covered in Sections **F.2.3 - Soil and Relief** and **F.2.4 - Surface and Groundwater**.

601. Disturbances and displacement of resident fauna due to noise, light, and/or vibration as a result of construction activities (excavation, clearing, spoil disposal, potential work camp, plant and vehicle movement, and pile driving) will occur. These impacts have the potential to influence fauna breeding, roosting, or foraging behavior of native fauna. The consequences of these influences are dependent on the extent of disturbance and the characteristics of the receptor.

602. In the case of Kolketi National Park, where large numbers of migratory soaring birds – particularly birds of prey are found, the project footprint is approximately 150 m away at all times separated from the Project by an existing railway track and right of way, and a high voltage powerline. Direct impacts on the park are thus unlikely. Indirect impacts of noise were identified as a concern by the park authorities,[60] but only limited noise impacts are likely to reach the park and are unlikely to reach sensitive receptors such as wintering waterbirds, which occur further away in the park (see BAP, Section **4.2.1 - Habitats**).[61]

603. Potential noise and vibration impacts on aquatic fauna from pile driving. Sound generated by percussive pile driving has the potential to affect fish in several ways. The range of effects potentially includes alteration of behavior to physical injury or mortality, depending on the intensity and characteristics of the sound, the distance and location of the fish in the water column relative to the sound source, the size and mass of the fish, and the fish's anatomical characteristics.

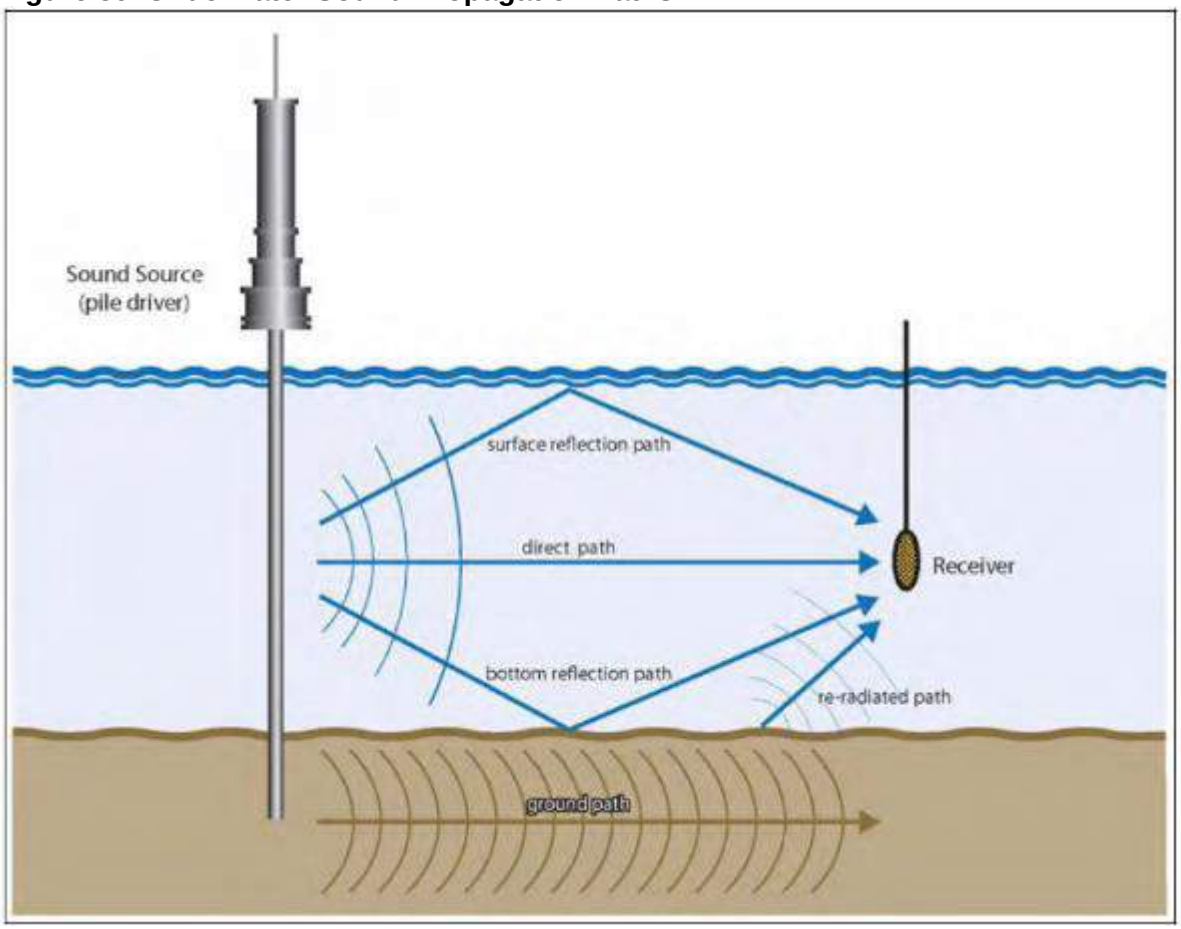
604. Noise levels from pile driving are expressed in (i) peak sound pressure level (peak), which is maximum pressure level generated by a single strike; (ii) accumulated sound exposure level (SEL), which is a sum of cumulative squared over the time of entire single pile driving event; and (iii) root mean square level (RMS), which is the square root of the mean square of the single pile driving event. Units of the sound levels are expressed in decibels (dB) over a range of frequencies which the level is measured (1 µP a2 /Hz).

[60] Vladimir Khurtsilava, Kolkheti National Park, pers. comm. 2018
[61] Gela Ingorokva, Kolkheti National Park, pers. comm. 2018

605. Piles are usually driven into the substrata using one of two types of hammers – impact hammers and vibratory hammers. Impact hammers consist of a heavy weight that is repeatedly dropped onto the top of the pile, driving it into the substrata. Vibratory hammers utilize a combination of a stationary, heavy weight and vibration, in the plane perpendicular to the long axis of the pile, to force the pile into the substrate. The type of hammer used depends on a variety of factors, including pile material and substrate type. While impact hammers are able to drive piles into most substrates including hardpan, vibratory hammers are limited to softer, unconsolidated substrates (e.g., sand, mud, gravel).

602. Sound generated by impact pile driving is impulsive in nature. Impulsive sounds have a short duration and consist of a broad range of frequencies. Figure 59 present a schematic of how the sound waves propagate in the water.

Figure 59. Underwater Sound Propagation Paths



603. Underwater sound pressures from pile driving will depend primarily on the size and type of the pile or hammer, and whether technologies or processes are used which reduce the sound pressure effects (e.g. sheet piles and coffer dams, bubble curtains).

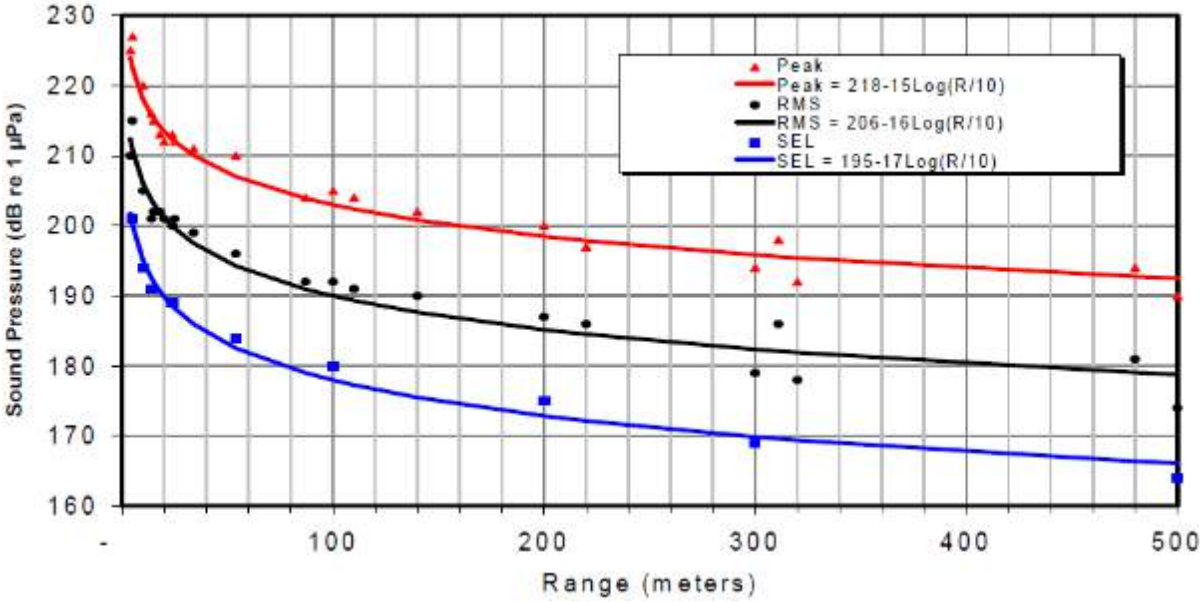
604. Vibratory drivers vibrate sheet metals into the sediment to build coffer dams. Coffer dams are temporary structures used to isolate an area generally submerged underwater from the water column. Coffer dams are dewatered to isolate the piling from the water, which attenuates sound by providing an air space between the exposed pile and the water column. Coffer dams that have been dewatered down to the mud line are the best isolation that can be provided. However, the sound is not eliminated because some of the energy is transmitted

through the ground as it is shown in Figure 59. As outlined in Section **C.5.2 - Abutments and Piers**, the piles for this Project will be driven in five dewatered coffer dams.

605. Typically, vibratory installation of sheet metals that are used to build a coffer dam in a river results in sound pressure levels that are not measurable above the background sound created by the current. Although impacts on fishes or other aquatic organisms have not been observed in association with vibratory hammers, this debate is ongoing. This may be due to the slower rise time and the fact that the energy produced is spread out over the time it takes to drive the pile. As such, vibratory driving of piles is considered less harmful to fish.[62]

606. Figure 60 illustrates sound pressure levels at the distance from a typical impact pilling in open water. It also shows the measured sound levels that were conducted during construction of the Benicia-Martinez Bridge in California, USA. Results of different studies have shown that sound levels dropped off at a faster rate in shallow water. Data from Benicia-Martinez Bridge is used for this evaluation but, pre-construction, the contractor will be required to calculate exact noise levels from impact pilling and measure noise levels outside the coffer dams in accordance with international interim good practice guidelines (California Department of Transportation (Caltrans) "Technical Guidance for Assessment and Mitigation of Hydroacoustic Effects of Pile Driving on Fish" can be found at; http://www.dot.ca.gov/hq/env/bio/fisheries_bioacoustics.htm). Such modelling is anticipated to incur a minor additional cost for the contractor. In the unlikely event that planned pile-driving appears likely to exceed established thresholds, alternative pile-driving methods or appropriate mitigation measures will be selected.

Figure 60. Sound Pressure Levels at Different Distances from Impact Pilling



Source: California Department of Transportation, Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish, November 2015

607. Results of testing at Benicia-Martinez Bridge in California with a coffer dam from which water was removed showed a reduction in peak sound pressure levels of 25 dB at 54 meters (California Department of Transportation, Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish, November 2015, page I-192). Base on

[62] Halvorsen, M.B., Casper, B.M., Matthews, F., Carlson, T.J. & Popper, A.N. (2012) Effects of exposure to pile-driving sounds on the lake sturgeon, Nile tilapia and hogchoker. Proceedings of the Royal Society B 279: 4705-4714.

values presented in Figure 60, if it is assumed that the sound pressure level at 5 m from the impact pile will be 222 dB_{PEAK}, and if dewatered coffer dams provides a reduction of 25 dB, then sound pressure level just outside of the coffer dams would be less than 206 dB_{PEAK},, which is the threshold to avoid injury to fish. It is assumed that distance from the closest pile to the wall of the coffer dam would be approximately 5 meters.

608. Using data from Figure 60, it can be determined that $SEL_{CCUMULATED}$ would be approximately 195 dB at 5 m from the impact pile. Again, if the coffer dam with no water provides 25 dB reduction, then the $SEL_{CCUMULATED}$ just outside the coffer dam wall would be 170 dB, which is less than the recommended threshold of 189 dB.

609. Although sturgeon suffer lower mortality from noise impacts than some other fish owing to their open (physostomous) swim bladders, pile-driving has been demonstrated to result in injuries in sturgeon such as hematomas on the swim bladder, kidney, and intestine. Haematomas on sturgeon gonads can be caused even at relatively low noise levels and could potentially impact reproductive capacity.[63]

610. Increased turbidity of surface water due to construction activities in the Rioni River and on its riverbanks. Works in on near the Rioni River will inevitably result in temporary increase of water turbidity potentially impacting aquatic fauna. The scale of impact will depend of the level of observance and implementation of water impact related mitigation measures and schedule of works. Works will be temporary and short-lived, therefore impact on water environment and water biodiversity will be minimal.

611. Displacement of species due to construction of bridge piers in the river. Complete blockage of the stream is not planned at any point during construction of the Project. However, there is the potential that too large a proportion of the river may be blocked by cofferdams at any one time if construction of the bridge piers is not staged appropriately. Sheet piling coffer dams for all three piers will span approximately 100 m of the river (two of c. 25 m width and one of c. 50 m width[64]) – a relatively small proportion if split into two periods, but of concern if constructed simultaneously.[65] Therefore, the central bridge pier and adjoining two piers will be constructed at two different times.

612. Potential impact from sand and gravel abstraction within the Rioni River. While no sand or gravel quarry sites have been licensed within the protected area, the sourcing of construction materials such as sand or gravel from elsewhere in the Rioni River would still result in more significant negative impacts on sturgeon than any direct impacts of the Project itself. Given this, construction Contractors will be prohibited from sourcing any materials from any sites in the Rioni River or on its banks. This includes licensed and unlicensed sites, including at least (but not only) licensed sites 1002940, 1003925, 1003956, 1004022 and 1004267: the operation of these sites has potential for significant adverse impacts on sturgeon (see BAP, Section **4.1 - Impacts on freshwater Critical Habitat**). This mitigation measure is not anticipated to cause any significant additional cost or time delay for the Project, since many alternative sand/gravel quarry sites exist nearby. Data from the Ministry of Economy[66] suggest that 96 quarry sites exist within 40 km of the Project, of which only five appear to be in the Rioni River or on its banks (see BAP, Section **5.1.1 - Sourcing of construction materials**

[63] Halvorsen, M.B., Casper, B.M., Matthews, F., Carlson, T.J. & Popper, A.N. (2012) Effects of exposure to pile-driving sounds on the lake sturgeon, Nile tilapia and hogchoker. Proceedings of the Royal Society B 279: 4705-4714.
[64] Levan Kupatashvili, Roads Department, pers. comm. 2018
[65] Radu Suciu, pers. comm. 2019
[66] Mako Zavrashvili, National Agency of Mines, *in litt.* 2018

(e.g., sand, gravel) will avoid use of any licensed or unlicensed sites in the Rioni River or on its *banks.*).

613. Poaching. Construction staff involved on-site, such as workers and site managers, can engage in poaching and illegal exploitation of wildlife. Sturgeon in the Rioni River have been severely impacted in part by historical overfishing, ongoing poaching, and bycatch. Therefore, the potential impacts to sturgeon from poaching during construction are significant. Enforcement action by the Contractor must prevent the targeting of species of conservation importance including those currently under legal protection from hunting and exploitation, include sturgeon species within the Rioni River.

Assessment of Impact: *Operation Phase*

614. Main impacts on fauna during operation in general may include:

- fauna mortality cause by road traffic;
- higher levels of disturbance and stress to fauna, including that related to noise;
- barrier effect (reduced connectivity);
- modification of light conditions;
- indirect impact from dust, particles (abrasion from tires and brake linings); oil, fuel (e.g., in case of traffic accidents), including chronic contamination due to bioaccumulation;
- possible pollution of water with runoff – impact on aquatic life; and
- impact of 'additional' obstacles for fish migration in the section from the railway bridge till existing Rioni dam-bridge.

615. Damage to and disturbance of flora and fauna species. As mentioned above, immediate impact related to the road operation is noise from heavy traffic. The birds and other wildlife that communicate by auditory signals may be particularly confused near roads.

616. No direct impact on flora is expected during operation of the bridge and the design section of the road. Indirect impacts to flora near the road may result from dust and exhaust emissions from traffic and pollution with contaminated runoff from the road. Pollutants washed off from the road can impair growth of vegetation and affect soil organisms. The EIA includes analysis on these impacts in Sections **F.2.3 - Soil and Relief** and **F.2.4 - Surface and Groundwater**.

617. Emissions. Pollutants, such as heavy metals, carbon dioxide, and carbon monoxide, emitted by vehicles, may all have serious cumulative effects. Combustion of petrol containing tetraethyl lead, and wear of tires containing lead oxide, result in lead contamination of roadsides. Many studies documented increasing levels of lead in plants with proximity to roads, and with increases in traffic volume. Related impacts and mitigation measures are covered in Sections **F.2.2.1 - Air Quality**, **F.2.3 - Soil and Relief**, and **F.2.4 - Surface and Groundwater**.

618. Aquatic habitat. Regarding aquatic habitat, the actual area in the river to be lost from bridge piers will be minimal compared to the wider aquatic habitat available in the Rioni River. While habitat loss will cause local impacts to aquatic flora and fauna, as rivers are dynamic systems, it is expected that the Rioni River will recover following construction. Furthermore, the bridge piers may also provide an additional small habitat resource as they get colonized by marine invertebrates and other species.

619. Poaching. From discussions with staff from the Kolkheti National Park, it has been reported that structures in the Rioni River have been used in the past to string fishing gear for

the purpose of catching sturgeon.[67] This could foreseeably be the case once the bridge proposed for this Project is constructed also. Therefore, there are potential impacts to protected species which need to be mitigated during the operation stage. The Roads Department understands this risk and proposes installation of Closed-Circuit Television (CCTV) cameras on both sides of the bridge to detect illegal fishing activities that are using the bridge.[68] CCTV cameras should be maintained through operation and a live feed should be provided to the relevant authorities and key stakeholders. Installed cameras should be suitably sited and protected to minimize impacts from weather and vandalism. They should also be easy to remotely monitor (i.e., internet-enabled) or facilitate regular downloading of footage, to enable at least weekly monitoring of footage during the spawning season. Simple signs will also be installed on both sides of the bridge to warn people against illegal fishing.

620. Pollution. Impact of roadside litter should also be mentioned. Poorly managed waste may attract and entrap small animals, while cigarette butts and filters are often mistaken for food by fish and birds.

No Net Loss / Net Gain Approach

621. The ADB SPS requires 'measures to avoid, minimize, or mitigate potentially adverse impacts and risks'. Nonetheless, some residual impacts cannot be fully mitigated, and – on a precautionary basis – it is recognized that this Project may have significant, though Low-level, residual impacts on Stellate, Russian and Beluga Sturgeon (see BAP, Section **5.3 – No Net Loss / Net Gain Approach**). In such cases, ADB requires 'compensatory measures, such as biodiversity offsets, to achieve no net loss or a net gain of the affected biodiversity'. These compensatory measures should ensure that, overall, the high biodiversity value of the Critical Habitat is maintained, along with populations of Endangered and Critically Endangered species.

622. Two main approaches are assessed as potentially suitable compensation measures for this Project's residual impacts on sturgeon species: (i) support to a high standard mixed-method monitoring system; and (ii) support to a cumulative impacts working group to improve hydropower management upstream and reduce sand/gravel quarrying in the Rioni River. In both cases, funding would need to be allocated to non-governmental or research institution partners to implement these approaches. Refer to Section **5.3 – No Net Loss / Net Gain Approach** in the BAP (**Annex 1. Biodiversity Action Plan (BAP)**) for further analysis on this recommended no net loss / net gain approach.

Management and Mitigation Measures

Site Preparation, Construction, and Worksite/Project Closure Stages

- Impacts to Vegetation Coverage
    - Delimitation of areas to be cleared before the beginning of the construction activities in order to limit as much as possible the surface of vegetation to be cleared.
    - Fencing critical root zone of the trees at the boundary with the project area or on the way.
    - To achieve no net loss of natural habitat, the Contractor shall conduct a pre-construction site survey to identify the extent of modified and natural habitat so that natural habitat can be rehabilitated as well as compensated for through replanting where it will be permanently lost.

[67] Gocha Kurdgelia and Konstantin Topuria, Mayor and First Deputy Mayor of Poti, pers. comm. 2018
[68] Gia Sopadze, Roads Department, pers. comm. 2018

- The Contractor shall identify through a site survey if any Georgian Red-listed tree species are located within five meters of the site boundary. This survey will form part of the Contractor's Clearance, Revegetation, and Restoration Management Plan. In case walkover surveys during pre-construction reveal any protected plant species in the area, the latter will be removed from the environment [and translocated] in accordance with sub-paragraph (v), Article 24, first paragraph of the law of Georgia on 'Red List and Red Book'.
- Recultivation of disturbed sites after completion of works.
- Use of temporary or existing roads for delivery of construction materials.
- Retaining a strip of riparian habitat along the edge of the river to reduce impact on species (retain connectivity and possibility for free movement along the river edge).
- Training of the staff in environmental and safety issues, including protection of vegetation outside the boundaries of the project corridor.
- The Contractor shall be responsible for replanting of any trees cut in these areas on a 1:3 basis using species native to the area.

- Impacts to Habitat
  - Implementation of air, water, soil impact mitigation measures (described in sections above).
  - Waste management – regular clean-up of the areas, management of waste according to the type and category.
  - Refueling of all plant, vehicles and machinery will not be allowed within 50 m of any watercourse, drain or channel leading to a water course.
  - Sourcing of construction materials (e.g., sand, gravel) will avoid use of any licensed or unlicensed sites in the Rioni River or on its banks.
  - Care will be taken to avoid introduction of new invasive species to, and spread of existing invasive species within, the Project area through: washing of vehicles, equipment and supplies before entry to the Project area; monitoring for invasive species; and control/eradication of invasive species where found.
  - Construction materials and chemicals will be appropriately secured during flood season to avoid accidental release to the natural environment.
  - Dropping structures into rivers/streams will be avoided [construction will instead take place from the river bank or pontoons].
  - Discharge of sediment-laden construction water (e.g., from areas containing dredged soil) directly into surface watercourses will be forbidden.
- Impacts to Species
  - Sturgeon abundance surveys annually, from before the preparation phase until the end of the defect liability period.
  - Relocation of any specimens found during the surveys will be provided with the help of biodiversity experts to ensure proper handling. This is especially important for species of conservation importance (e.g., Colchis Water-Chestnut (Trapa colchica) and Spring snowflake (Leucojum vernum)). The practice will provide the best possible chance of survival for wildlife. A plan and schedule must be developed by the Contractor prior to implementation of this task.
  - Commitment will be made to raise awareness of values of natural habitat areas and poaching animals will be strictly prohibited to apply for all Contractor staff.
  - Fishing and using of illegal fishing gear anywhere along the river will be prohibited.
  - The Contractor will model planned pile-driving and assess alignment with international interim good practice guidelines before starting to pile.
  - Implement a build-up of activity which slowly increases construction activities within the Rioni River to allow aquatic fauna to exhibit avoidance responses.
  - Ensure compliance with construction specifications which envisage the arrangement of cofferdams to protect water quality during construction and

minimize the impacts to aquatic fauna during pile driving in the Rioni River. Noise from pile-driving will be kept below current international interim good practice guidelines.
    - In the unlikely event that planned pile-driving appears likely to exceed Project thresholds, alternative pile-driving methods or mitigation shall be selected. Such methods may include using vibratory pile driving or reducing hammer force of the impact pile.
    - Before starting any in the water construction activities conduct underwater noise measurements using hydrophones to establish in the water background noise levels. Then conduct regular noise measurements during pilling activities to determine compliance with the Project in the water SEL and Peak noise limits.
    - Sturgeon are not present in the Rioni River in significant numbers throughout the year (see BAP, Section **4.1.2 - Species**) so, depending on the season, such impacts could have a high, medium, or low consequence. In order to further reduce the risk of impacts to sturgeon from pile driving activities, all in-river will be avoided during March-September, inclusive, to avoid disturbance to sturgeon during their overall spawning season. Where feasible, in-river activities will also be avoided in October and November. This avoids the period when sturgeon fish migration is believed to occur (March-August).
    - Boundaries of ROW and operation area will be strictly kept to - to avoid impact on the adjacent vegetation; Strict keeping to traffic routes during the construction will be ensured to avoid impact on vegetation.
- Impacts to Distribution
    - Vehicles and machinery will be maintained in accordance with industry standard to minimize unnecessary noise generation.
    - All in-river activities will be avoided during March-September inclusive, to avoid disturbance to sturgeon during their overall spawning season. Where possible, in-river activities will also be avoided in October and November.
    - The central bridge pier and adjoining two piers will be constructed at two different times.
    - Use of propeller-driven boats will be minimized during construction.
    - If lights are installed on the road or bridge in the future, ensure that lower wattage lamps are used in street-lights which direct light downwards to reduce glare.
    - Movement of machines inside rivers, streams, or on their banks will be prevented except when it is unavoidable due to the construction of a structure.

Operation Stage

- Fauna Mortality
    - Sturgeon abundance surveys annually, from before the preparation phase until the end of the defect liability period
    - Warning signs and CCTV cameras will be installed on both sides of the bridge to deter and detect illegal fishing activities.
    - Monitoring of the bridge piers using the installed CCTV throughout the operation period to prevent poaching of sturgeon by using fishing gear from bridge structures
    - To understand the potential for longer-term impacts, it would be necessary for sturgeon abundance monitoring to continue into the operational phase of the project, annually until the third year of operation after defect liability and then twice more at five-yearly intervals. It is recommended that the RD identify parties best placed to undertake such surveys and to report to ADB and other relevant stakeholders on the findings.
- Degradation of Habitat Conditions

- Monitoring of the presence of invasive species
- Roadside waste collection and regular clean up (sweeping) of the road
- Preservation of roadside vegetation

Conclusions

623. The Project is situated in a landscape of varying land use and land cover, comprising a matrix of natural and modified habitat. Construction and operation of the proposed alignment for the Project will follow or run close to existing infrastructure and habitat loss will be limited to that necessary for construction. The affected vegetation is mostly secondary, represented by alder trees and bushes. Nevertheless, for ADB, compensation planting will be required to meet requirements set out in SPS (2009) regarding the loss of natural habitat and that projects should cause 'no net loss' to biodiversity. Plant maintenance as part of such programs will be carried out for at least two years in the plantation areas. The Contractor will be responsible for the maintenance of these areas during their contract period and then the RD afterwards.

624. It is unlikely that construction of the new road section will exert any significant additional impact on the existing flora and fauna in the project area over and above the current situation due to the relatively small footprint of the Project and presence of largely modified habitat. Short-term disturbances to fauna and fragmentation of habitat in the ROW of the project are unavoidable. A strip of riparian habitat along the edge of the river will be retained to reduce impact on species (ensuring connectivity and possibility for free movement along the river edge).

625. The Project's location near the Kolkheti National Park, Ramsar Site and IBA, and unavoidable disturbance and habitat loss due to construction, have the potential to impact fauna beyond the immediate Project site. Significant direct impacts are, however, unlikely since the most important parts of these sites, and concentrations of migratory and wintering birds, are not found near the Project footprint.

626. In only a few cases are impacts on priority biodiversity expected to remain greater than negligible by the Project operations phase, for plants and sturgeon (Stellate, Russian and Beluga Sturgeon). In neither case are such impacts anywhere near the level that could impair the ability of the nearby Critical Habitat to function. These impacts are not predicted likely to impact on these species' ability to persist (See BAP, Section **5.2 - Residual impacts**).

627. Provided that all general and specific mitigation and compensatory measures are implemented, the Project is predicted to reach no net loss or net gain for all Critical Habitat-qualifying biodiversity (see BAP, Section **5.3 – No Net Loss / Net Gain Approach**). Only a few impacts on priority biodiversity are expected to remain measurable by the Project operations phase, for plants and sturgeon. In neither case are such impacts anywhere near the level that could impair the ability of the Critical Habitat to function (See BAP, Section **5.2 - Residual impacts**) and the implementation of the BAP will ensure that the project achieves a net gain for these priority species.

Residual Impacts

628. Residual impact analysis specifically for Critical Habitat-qualifying ("priority") biodiversity after the application of Project mitigation is provided in Section **5.2 - Residual impacts** of the BOP (**Annex 1. Biodiversity Action Plan (BAP)**).

Table 73. Residual Impacts – Ecology and Biodiversity

Impact	Significance before Mitigation	Residual Impact After Implementation of Mitigation Measures			Key Residual Impacts
		Preparation Construction Worksite Closure Stages	Operation Phase		
			Day 1	Year 15	
(i) Loss of vegetation coverage in specific areas of the project (Flora).	**Low**	**Low**	**Low**	**NEGL**	Revegetation of disturbed soils will seek to improve the physical stability of surface materials against erosion process, achieve the desired aesthetic conditions of the project site at closure, and restore habitat. Many uncertainties are associated with revegetation including slow rates or unsuccessful revegetation at the project area.
(ii) Introduction of invasive alien species (Flora).	**High**	**NEGL**	**NEGL**	**NEGL**	Overall, IAS present a very high risk to biodiversity globally. With the implementation of appropriate mitigation measures and monitoring, the risks associated with IAS on the Project can be managed appropriately. As such, the residual impact is considered Negligible. Monitoring for invasive species into the operations phase will be required.
(iii) Planting of vegetation on the site after rehabilitating disturbed areas (Flora).	**Low +**	**Low +**	**Low +**	**Medium +**	*See Impact (i)*
(iv) Mortality of individuals (Flora).	**Low**	**Low**	**Low**	**NEGL**	Individual protected and priority plants will be relocated before construction impacts, though translocations of plants are rarely fully successful. The actual area in the river to be lost from bridge piers or retaining walls and the areas impacted by

					construction will be minimal compared to the habitat available in the vicinity of the Project. It is expected that the plants will recover in the vicinity of the Project following construction.
(v) Modification and fragmentation of habitat due to loss of vegetation coverage (Terrestrial Fauna).	**Medium**	**Low**	**Low**	**NEGL**	The clearing of natural habitat will have impacts to biodiversity in the area. The restoration and re-planting programs should go a long way to mitigating these impacts, but in some locations, such as river banks, residual impacts will remain. In addition, short term fragmentation of habitat maybe caused by access roads and other temporary construction facilities.
(vi) Introduction of invasive alien species (Terrestrial Fauna).	**High**	**NEGL**	**NEGL**	**NEGL**	*See Impact (ii)*
(vii) Restoration of land (Terrestrial Fauna).	**Medium +**	**Low +**	**Low +**	**Medium +**	The restoration and re-planting programs will take time to reverse the impacts from clearing of vegetation and natural habitat in the area.
(viii) Displacement of species due to noise, presence of machinery and equipment and presence of staff (Terrestrial Fauna).	**Low**	**Low**	**NEGL**	**NEGL**	N/A
(ix) Displacement of species due to noise from the presence of normal road traffic and maintenance activities (Terrestrial Fauna).	**Medium**	**N/A (Operation Phase Impact)**	**Low**	**Low**	Impacts cause by the generation of traffic noise in the operation phase is unavoidable. Considering the state of existing natural and modified habitat, the significance of impacts is expected to remain Low.
(x) Mortality of terrestrial fauna individuals.	**Low**	**Low**	**NEGL**	**NEGL**	Accidents involving wildlife are likely to be minor given the fact that around the road habitat has few species present and restoration of riparian habitat will

					ensure a wildlife corridor is still present for species to move along the edge of the Rioni.
(xi) Introduction of invasive alien species (Aquatic Fauna).	**High**	**NEGL**	**NEGL**	**NEGL**	*See Impact (ii)*
(xii) Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species (Aquatic Fauna).	**High**	**Low**	**NEGL**	**NEGL**	While habitat modification will cause local impacts to aquatic flora /fauna, rivers are dynamic systems and it is expected that the river will recover following construction. This will take some time to get back to natural conditions however.
(xiii) Degradation of aquatic habitat from accidentally spilled fuel/oil or surface runoff from bridge (Aquatic Fauna).	**Medium**	**NA (Operation Phase Impact)**	**NEGL**	**NEGL**	It is noted that the Project requires containment tanks for bridge runoff and to manage spills from accidents on the bridge during the operation phase. As long as measures are taken to sustainably manage the systems over the long-term, pollution from the bridge will be prevented from entering surface water courses and the residual impacts will be Negligible.
(xiv) Displacement of species due to noise, presence of machinery, and equipment and of staff (Aquatic Fauna).	**Medium**	**Low**	**Low**	**NEGL**	Disturbance during construction has the potential to disrupt spawning or juvenile dispersal, which would have impacts lasting into the operational phase.
(xv) Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers (Aquatic Fauna).	**Medium**	**Low**	**Low**	**NEGL**	Mortality or injury of fish during construction has the potential to affect spawning, which would have impacts lasting into the operational phase. The Project is proposing to build coffer dams at the bridge bents and conduct impact pilling after dewatering the coffer dam. This approach would reduce impacts from pilling. However, underwater noise monitoring is

					required using hydrophones to issuer that no harm is done to different fish species.
(xvi) Mortality of sturgeon from illegal fishing activities using the bridge structures (Aquatic Fauna).	**High**	**N/A (Operation Phase Impact)**	**Low**	**Low**	Risks to sturgeon from fishing practices that utilize the bridge structure will continue through the operation phase, however sustained surveillance and monitoring efforts will ensure residual impacts remain Low.

Note: NEGL means Negligible and the '+' sign indicates significance of a positive impact.

F.2.6 - Landscape

Scope of the Assessment

629. The development of the Project will be introducing a number of new elements into the existing landscape and visual environments. This analysis considers how the Project, as described in Chapter **C. Description of the Project** may have an impact on the landscape (essentially as an impact on an environmental resource with its own defined intrinsic value) and visual amenity (defined as one of the interrelated effects on population and how various groups experience and perceive changes in the values attributed to the landscape).

630. The analysis presents a purely qualitative assessment of the impacts and no quantitative modelling, viewshed analysis, or photomontage development has been undertaken. It is based purely on information readily available as secondary sources (primarily online mapping databases) and information gathered during site visits for the purposes of gaining quantitative environmental data (e.g., water quality, soil quality, air quality baseline). Additionally, no stakeholder engagement was undertaken to determine the various values that particular visual sensitive receptors place on various elements of the landscape.

Identification of Receptors

631. Receptors include residential properties, workplaces, road users, pedestrians and other outdoor sites used by the public which would be likely to experience a change in existing views as a result of the construction and operation of the Project.

Assessment of Impact: *Preparation, Construction, and Worksite Closure Stages*

632. The starting point of the preferred alternative connects with the E-60 highway in Patara Poti. The Alignment then crosses the Rioni River parallel to the railway bridge and runs through non-agricultural land up to the end of alignment where it reconnects with the E-60. As the road is a linear structure, construction works will vary in intensity along the alignment. The Project Area largely consists of flat natural and modified terrain where an existing railway line (with bridge) establishes a prominent visual impact on the landscape.

633. During the construction and operation phases there will be a range of activities which have the potential to change the existing landscape character and how various people will

perceive the landscape. Visual impact during construction will be related to machinery and people operating on the ground, onsite and offsite traffic, as well as the temporary facilities (e.g., car stationing, material and waste storage areas, and camp (if established)) and built sections of the road and bridge. The most 'static' source of visual disturbance will be related to construction of the bridge.

634. The activities during construction that will affect the aesthetics of the area include:

- removal of existing areas of soft landscape;
- construction movement including cranes;
- increased volume of HGV delivering supplies including concrete and road construction material;
- temporary construction facilities;
- the introduction of new built structures into the landscape, including interchanges, road carriageway, and bridge;
- topsoil/material storage areas;
- alteration of topography and landform;
- introduction of increased traffic levels to the study area; and
- movement of construction material on existing road network.

635. Most of the activities will be implemented away from the residential areas except for roadwork near Patara Poti village (refer to Point 1 in Figure 57 in Section **F.2.2.1 - Air Quality**). In that area landscape changes from construction of the new road and interchange, as well as the realignment of the secondary road leading to the oil terminal, will be particularly noticeable. Changes to the landscape during preparation and construction stages will also be especially visible to those working in the Nikora factory and from the residences northeast of the factory (refer to Point 2 in Figure 57 in Section **F.2.2.1 - Air Quality**) due to their proximity to the alignment.

636. Rehabilitation of disturbed areas and revegetation activities including replanting of native tree species on a 1:3 basis during the worksite closure stage will be undertaken by the Contractor. This has the potential to reduce visual impacts, or perhaps even improve, the landscape and visual environment.

637. The impact during site preparation and construction will be unavoidable, though short term (restricted to duration of construction of approximately 24 months), local, and reversible.

Assessment of Impact: *Operation Stage*

638. When in place, the new alignment will change the landscape substantially as a completely new structure on the relatively flat landscape. The main recipients of impact will be local residents, Nikora staff, travelers, and those using the road/railway. Impact on the last two categories will be short-term and limited to the travel time only. For travelers passing through, the landscape will not be not familiar and changes will not be noticeable.

639. Revegetation will go a long way to restore and potentially improve the aesthetic views of the area. In addition to mitigating the impression of the landscape disturbance, vegetation planted along the road will act as a windbreak, noise barrier, and reduce impact to wildlife habitat.

640. With time, the community and Nikora staff will get accustomed to the new infrastructure, and any visual discomfort related to the change will diminish. While perceptions of visual change are subjective, the impacts should be considered negligible over time.

Management and Mitigation Measures

Preparation, Construction, and Worksite Closure Stages

- Visual impact of construction works will be mitigated by keeping to the boundaries of the worksites and traffic routes; preservation of vegetation; cleanup and good management of construction sites and camps; timely removal of waste from the area; material stock control (to avoid accumulation of surplus material on the site).
- Implementation of mitigation measures defined for soil, vegetation, and waste management.
- Develop and have approved a comprehensive Clearance, Revegetation, and Restoration Management Plan.
- After completion of works, ensure that the worksite is cleaned up; surplus materials, temporary structures, and machinery have been removed; and recultivated in compliance with the plan mentioned above has been implemented.
- Carefully position site compounds within the landform.
- Retention and protection of existing woodland and landscape features and other key elements within the proposed development corridor.
- Borrow areas for materials, other than dredged sand fill, shall not be located in productive land, forested areas and near water courses such as rivers, streams, etc.
- Commitment to high quality design, materials, and specification for the road and Rioni crossing.

Operation Stage

- Regular cleanup of the road and adjacent areas.
- Preservation/maintenance of roadside vegetation to shield the visual change in the landscape related to the new infrastructure.
- Implementation of mitigation measures set for pre-construction and construction stages of the project during the road maintenance works as appropriate.

Conclusion

641. During the construction period, some receptor groups may experience adverse visual impacts as a result of the loss of visual amenity and the visually intrusive activity associated with construction of the bridge, road carriageway, road junctions, and associated infrastructure.

642. There will also be unavoidable effects on the visual amenity afforded from many locations from within the immediate area following the development road and bridge. However, it is considered that the landscape and visual resource of the wider area will not deteriorate to a significant degree and the overall impact upon landscape and visual amenity in general is Low.

643. The proposed mitigation measures will reduce the landscape and visual impacts of the proposed route to the extent possible with planting of native trees and shrubs so that in time some of the newly introduced elements will be screened from view and assimilated into the landscape setting, thereby reducing the long-term disruption of the overall landscape and visual character of the area. Recultivation and landscaping at the interchanges within areas of residential settlement could, over time, contribute to the visual amenity and provide visual screening and filtered views of the proposed development.

Residual Impacts

Table 74. Residual Impacts – Landscape

Impact	Significance before Mitigation	Residual Impact After Implementation of Mitigation Measures			Key Residual Impacts
		Preparation Construction Worksite Closure Stages	Operation Phase		
			Day 1	Year 15	
(i) Modification of original landscape due to loss of vegetation coverage and presence of machinery and equipment.	**Medium**	**Medium**	**Low**	**NEGL**	The landscape will be disturbed during the site preparation and construction stages, mainly due to clearing, presence of machinery and equipment, and construction activities. However, it is estimated that loss of vegetation and presence machinery and equipment will not be visible for most of Project construction due to its remote setting.
(ii) Improvement of landscape quality of the area due to rehabilitation of disturbed areas.	**Low +**	**Low +**	**Low +**	**Medium +**	The restoration and replanting programs will take time to reverse the impacts from clearing of vegetation and natural habitat in the area. Successful revegetation has the potential to reduce visual impacts, or perhaps even improve, the landscape and visual environment.
(iii) Modification of the original landscape from the presence of new infrastructure.	**Medium**	**N/A (Operation Phase Impact)**	**Low**	**NEGL**	Cut slopes, embankments, and the bridge will have an impact on the landscape within the area throughout the Project lifecycle. The mitigation measures outlined in the EIA may go some way to enhancing the aesthetic value of the Project especially as vegetation grows back around construction zones, and in all likelihood any negative opinion of the new road in terms of visual impact will decrease over time as people get used to the altered landscape.

Note: NEGL means Negligible and the '+' sign indicates significance of a positive impact.

F.2.7 - Socio-Economic

Scope of the Assessment

644. This assessment describes the potential socio-economic impacts associated with the construction and operation of the Project. The key objectives include the following:

- Identify and assess potential project-related socio-economic impacts across the project cycle.
- Determine whether the proposed project has positive or adverse effects on individuals, households, and institutions.
- Describe, where appropriate, the general mitigation measures that will be incorporated into the Project.

645. A LARP has been developed for the Project in line with national legislation and fitting the requirements of the ADB resettlement policy. The LARP entailed consultations with the stakeholders, especially the APs and their community. Consultations were conducted to understand the extent of impact and validate the severity and compensation measures. As part of the LARP, a detailed assessment of loss of land, structures, and other assets under the Project was undertaken. Analysis on land acquisition and resettlement from the Project LARP has informed this section.

Identification of Receptors

646. Potentially impacted receptors are primarily local businesses and workforce, regional and national workforce, and the regional and national government of Georgia.

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647. Employment and economy. The Project will generate a range of skilled and unskilled employment opportunities. Based on similar projects, there is the potential that 70 percent of direct employment opportunities will be available to the regional workforce during construction. The extent to which the regional or local population will benefit from employment opportunities created by the Project will depend partially on the skill-level of the positions to be filled. The number of people employed by the Project will decrease dramatically at the end of the construction phase.

648. The construction of the Project will result in temporary economic impacts from procurement of goods and services by the Project in construction and related industries (construction vehicles and machinery, construction materials, etc.) and goods and other services such as transport, catering, laundry, food supply, security services, etc. Procurement of goods and services for the project is expected to contribute to the economy to the extent that these outputs are purchased locally, regionally, or nationally. Considering that the construction industry is a relatively important sector in the region, this seems possible. Given the limited number of existing businesses in the immediate area around the Project however, it is anticipated that regional businesses will likely be the primary beneficiaries.

649. Temporary economic impacts will also stem from induced economic effects of spending on goods and services by construction workers who will have increased disposable income and the ability to spend more money in the local economy. The magnitude of worker

spending will depend on the percentage of local or regional (resident) vs. national vs. foreign workers and the duration of their contracts.

650. The payment of leases for land by the Contractor to be used for the Project could potentially provide beneficial impacts to landowners in the Project area. In addition to this, the rehabilitation of roads within the entire area of the project will give owners better and easier access to their land, enabling them to better develop their activities.

651. The Project will likely result in some long-term capacity enhancement for the local workforce during the construction period. Specifically, this includes long-term benefits from on-the-job and formal training opportunities for individual workers, and the possibility for capacity enhancements for local and national companies who would have won tenders for work on components of the Project. Civil works contracts will include provisions to encourage employment of women.

652. Therefore, it is considered that the impacts related to employment opportunities during the construction phase will be largely positive.

653. Community infrastructure and services. An increase in population in the local area (due to employment opportunities and immigration) is likely to place additional pressure on existing infrastructure and services (e.g., healthcare, roads). The result is often a short-term reduction in capacity of existing infrastructure and services to meet the needs of the local villagers (as well as the additional population added by the Project). For example, the use of the existing road infrastructure may lead to short-term deterioration of the road and or reduced access to agricultural fields, residences, and business. This is most relevant in Patara Poti, however the impact is expected to be low considering the limited number of receptors and the setting of the Project site and that key access along the E-60 will be allowed throughout the construction period.

654. As described in Section **E.6 - Infrastructure, Utilities, and Services**, the following service infrastructure will be affected by the project:

- Electricity high and medium Network
- Water Network
- Communications Network (Optic fiber lines - Deltacom Ltd)
- Oil Network (Baku-Supsa oil pipeline) existent and projected gas pipeline.
- Gas Network (Socar Georgian gas)

655. Existence of the gas pipeline and/or transmission lines is associated with certain land use restrictions within the protection zones established for these infrastructures. The 8m width zone along the pipeline (4m each side from the centreline) is restricted for planting trees and the 50m zone (25m from each side) is restricted for constructing houses. For 220kv transmission lines the restriction zone is 62m width and within this zone it is prohibited to construct buildings and plant tall growing trees.

656. Relocation of the transmission lines planned under this project does not affect land plots owned or used by affected households (AHs). Relocation of the gas pipeline imposes restrictions on part of two land plots (No 14 and 29) and reduces the area under restrictions for a third plot (No 26).[69] These factors have been taken into account during the analysis of viability of the residual land plots and impact assessment within the Project LARP.

[69] Lot 2 – Stage 1: Poti-Grigoleti Land Acquisition and Resettlement Plan, 2019

657. All of the service operators have supplied drawings and information on the location of the utilities to the RD. This information will be provided to the Contractor for coordination with relevant utility operators.

658. Land Acquisition and resettlement.[70] In all land impacts amount to some 33,647 sq.m of land from 30 plots (see Project LARP for details). Out of this, 16 plots are owned by state or by state-owned companies - Georgian Railways and Georgian Oil and Gas Corporation (GOGC). 14 land plots are owned by 12 AHs and 1 company. In terms of tenure the affected land plots are distributed in accordance with the following legal categories:

- **Category 1.** Titled private agricultural land plots with valid registration. 12 of the affected land plots (with aggregated area of 14,781 sq.m.) have valid registration.
- **Category 2.** 2 land plots of 886 sq.m non-titled, but legalizable according to current legislation through 1 stage registration in NAPR. Related right establishing documents are available in Archives. All of these mentioned 2 categories of land plots owned by 12 AHs and 1 company are subject for compensation.
- **Category 3.** State Owned land plots illegally occupied by private users (squatters). In this sub-section of the road we do not have plots illegitimately occupied by squatters.
- **Category 4.** 16 State owned land plots of 18,226 sqm not used by private users. Most of State land plots are registered as land under the MoESD. Some of these state land plots belong to the existing railway infrastructure and some plots are owned and managed by GOGC.

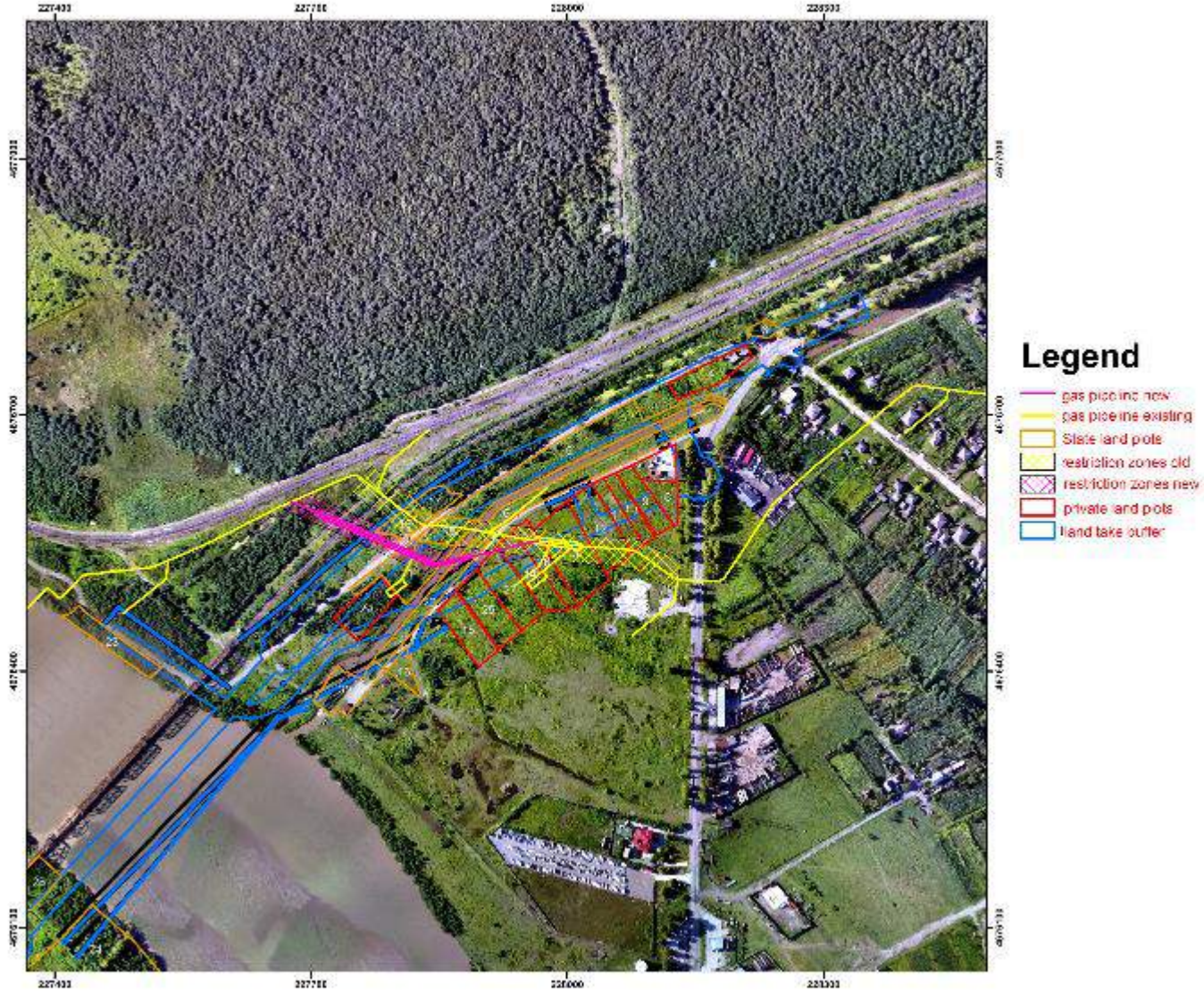
659. Category 3 and 4 land parcels are not subject for compensation. There are no public land plots in the affected area used by leaseholders.

660. The land costs and compensation categories within the project area are fully determined by the land use status, as the location and physical and productivity characteristics of the affected plots are very similar. Figures on Land impacts are provided in accordance to the land classification and legal categories that are relevant to determine compensation rates and amounts due to their use modalities. Additional information on land costs and compensation categories is provided within the Project LARP.

661. The main Project road crosses only two private land plots (No 4 and No 29). The main resettlement impacts are related to the new alignment of the secondary road leading from Patara Poti to the oil terminal which affects a total 12 private land plots.

[70] Ibid.

Figure 61. Land Impacts Map



662. Specific impacts from the Project include the following:

- **Impact on Crops** - No annual crops are cultivated on the affected plots. Accordingly, there are no crop losses resulting from the project activities.
- **Impact on Trees** - No trees are planted on the affected plots. Accordingly, there are no fruit tree or other perennial losses related to the project activities.
- **Impact on Buildings/Structures** - The Project will affect only two private buildings located on one plot and belonging to one AH and 285.6 sqm of fences (iron mesh on wooden poles). Both buildings are abandoned and not finished. One is residential type 2-storey building constructed by concrete and the other is ancillary building (bricks and wood). No business structures or public buildings or community structures will be affected. In Table 75 detailed data on these impacts are presented. The area of the buildings is the sum of each floor.
- **Business Impacts** – The Project will not affect businesses although one business will lose 4% of its land. This loss will not affect the buildings, business operations, income or the jobs of employees.
- **APs and Communities** - In overall the Project affects 1 company and 12 AHs (59 AP). Of these, the company and 11 AH will lose registered agricultural land and two AHs will lose legalizable plots (1 AH loses 1 legalizable and 1 registered plot). One AH loses two buildings – 1 abandoned 2-storey residential house and 1 storey ancillary building. Four AHs are losing fences. No AHs are physically relocated and losing their shelter. No AHs are losing crops, trees, businesses or incomes. The affected one company loses only a small patch of land and business operations are not affected.
- **Impact on Employment and Agricultural Tenants** - Road construction will not affect any employees or agricultural tenants.
- **Impact on Common Property Resources** - Road construction will not affect any community or public property.
- **Severely Affected and Vulnerable Households** - A total of 11 AHs are deemed to be severely affected due to loss of more than 10% of their productive land. 1 more AH loses 19% of his land at the project site, but in addition to that, as the head of AH has reported during the interview with the Social Safeguards (Resettlement) Specialist, the AH possesses one more agricultural land plot of 1500 sqm in other place and thus the total loss of agricultural land is less than 10%.
- **Gender and Resettlement Impacts** - The Project impact extends to 59 APs comprising 28 (47%) male and 32 (53%) females. Further, 2 of the 12 AHs are headed by women. Special attention will be given to the impact of resettlement on women and other vulnerable groups during monitoring and evaluation of the LARP. The project will have a positive impact on gender, and civil works contracts will include provisions to encourage employment of women during implementation. Additionally, women headed households have been considered as vulnerable and special assistance was provided in the LARP entitlements.

Table 75. Impacts on Buildings

No	Item	Construction type	No. Storey	No. Structure	Unit	Quantity	No of AHs
1	Residential abandoned, not finished	Concrete/hollow blocks	2	1	Sqm	130	1*
2	Ancillary building	Bricks, wood	1	1	Sqm	125	1*
3	Fences,	iron mesh on wooden polls		4	Sqm	285.6	4
	TOTAL			6			5*

*Note: * 1 AH loses 2 buildings situated on his land plot*

663. A summary of the major impacts is included in the summay table below.

Table 76. Summary of Socio-Economic Impacts (from Project LARP)

No.	Impacts	Unit	
Land Tenure Patterns			
1	Total Land parcels affected	No.	30
2	Total land Area to be acquired	Sqm	33,647
3	Category 1. Category 1. Titled private agricultural land plots with valid registration	No.	12
		sq.m	14,781
4	Category 2 . Private Legalizable	No.	2
		sq.m	886
5	Category 3. State Owned Used by Private Users (Squatters)	No.	0
		Sqm	0
6	Category 4. State Owned Not Used by Private Users	No.	16
		Sqm	18,226
Land Use and Compensation Categories			
7	**Type 1. Agricultural (arable) land**. **(29.70 GEL/sqm)** The land plots of official agricultural/arable status according to NAPR registration	No.	7
		sq.m	5,082
8	**Type 2. Agricultural (residential) land (38.25 GEL/sqm)** The land plots of official agricultural/residential status according to NAPR registration (in rural areas most of residential land plots have official status of agricultural/residential)	No.	4
		sq.m	7,097
9	**Type 3. Nonagricultural land (38.25 GEL/sqm)**)	No.	3
		sq.m	3,488
10	**Type 4.** State Owned Used by Private Users (Squatters)	No.	0
		sq.m	0
11	**Type 5** State Owned Not Used by Private Users	No.	16
		sq.m	18,226
Agricultural Patterns			
12	Area under annual crops	sq.m	0
13	Affected Trees	No	0
Affected Structures		No	
14	2-storey residential abandoned house, not finished block/brick, 130sqm	No	1
15	1-storey ancillary building, brick, and wood; 125 sqms	No	1
16	Fences, iron mesh on wooden pols (total area 285.6 sqm)	No	4
Affected Businesses and Employees		No	
17	Businesses	No	0
18	Employees	No	0
Affected Households			
19	Severely affected Households	No.	11
20	Vulnerable Households	No	2
21	Resettled households	No.	0
	AHs losing owned or used land		12 AHs* and 1 company

No.	Impacts	Unit	
22	AH losing registered plots	No.	11 AHs* and 1 company
23	AH losing legalizable plots (rightful owners, 1 stage registration through NAPR)	No.	2 AH*s
24	AHs losing non-legalizable land plots (squatters)	No	0
25	AH losing agricultural land plots	No	7** AHs
26	AH losing agricultural / residential plots		4 **AHs
27	AH losing non-agricultural (commercial) land plots	No.	2 AHs and 1 company
28	**AHs losing businesses**	No	0
29	**AH losing Jobs**	**No**	0
30	**AHs losing outdoors trading incomes**		0
31	AH losing crops		0
32	AH losing trees		0
33	**Total AH**		12 Aha and 1 company
34	Total Affected Persons	No	59

664. The RD is the Executing Agency and has the lead responsibility for road construction, as well as the implementation of the LARP. A time bound implementation schedule of the LARP will be prepared in consultation with the RD. All activities related to the LARP have been planned to ensure that compensation is paid prior to displacement and commencement of civil works construction.

665. Community health and safety. There are a number of potential health and safety related impacts which may result from construction activity on the Project, including:

- *Traffic accidents*. An increase in traffic can lead to an increase in congestion, leading to frustration on the part of local villagers. The key issue however is the potential for an increase in accidents or incidents, which can lead to injuries and/ or fatalities.
- *Presence of new infrastructure*. There can be safety issues with the establishment of new infrastructure – e.g., community members falling in unsecured trenches or interacting with unsecured equipment. This can lead to onsite accidents and injuries.
- *Management of hazardous materials and waste onsite*. It is particularly important that these materials are managed appropriately so as not to contaminate the surrounding water sources. There are a number of activities that will generate hazardous waste (e.g. chemical cleaning of equipment during the pre-commissioning process).

666. The Project will employ a range of people during construction and operation. There is potential for the workforce to introduce and/ or increase the rate of spread of communicable diseases in the Project area. This includes the introduction of a new disease and/ or a more virulent strain of an existing disease. An increase in the transmission of communicable diseases may occur as the result of the introduction of workers into the area, creation of vector habitat, and/ or the presence of commercial sex workers.

667. Social cohesion. Although employment opportunities bring positive economic benefits, they also can result in social issues. These are largely associated with the following:

- An increase in disposable income within the local villages. Although this can have positive benefits such as improvement education, it may also result in negative impacts, such as an increase in the use of drugs and alcohol and an increase in the price of commodities and food; and
- The introduction of new people in an area. This can lead to conflict within local communities. This stems from a variety of issues including differences in ethnicity and/ or religious values as well as jealousy that 'outsiders' have successfully secured positions within the Project.

668. Occupation health and safety (OHS). Project workers will be exposed to different hazards during construction including noise and vibration, dust, handling heavy materials and equipment, falling objects, work on slippery surfaces, fire hazards, and chemical hazards such as toxic fumes and vapors etc.

669. Workers' rights and OHS need to be considered to avoid accidents and injuries/deaths, loss of man-hours, labor abuses and to ensure fair treatment, fair remuneration, and working and living conditions. Core Labour Standards outlined in the International Labour Organization (ILO) Declaration on Fundamental Principles and Rights at Work, and the relevant national labor laws will be followed. Equal remuneration and other relevant clauses for female workers will also be included. Employment of child laborers is prohibited and a clause to this effect will be included in contract agreements.

670. The Contractor shall provide workers with an effective grievance mechanism. This mechanism should involve an appropriate level of management and address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned, without any retribution.

671. Environmental emissions. The construction and operation of the Project will generate noise, vibration, and dust, which have been covered extensively in Section **F.2.2 - Air Quality, Noise, and Vibration**.

672. Cultural Heritage. There are no known ancient above ground resources in the Project area and there is no indication that an archaeological site may exist there. Nonetheless, a chance find procedure has been developed and is provided in **Annex 6. Chance Find Procedure**. In the event of unanticipated discoveries of cultural or historic artefacts (movable or immovable) in the course of the work, the Contractor shall take all necessary measures to protect the findings.

Assessment of Impact: *Operation Stage*

673. Impacts on community health and safety. According to statistics, the key health risks in relation to roads and traffic are accidents, noise, and air quality changes. Along with the exposure to emissions from the traffic, health risk is also related to potential contamination of crops that might be cultivated adjacent to the road. Health risks associated with noise, and air quality during the operation stage are covered in Section **F.2.2 - Air Quality, Noise, and Vibration**.

674. Due to the anticipated higher average vehicle speed on the new road (as compared to existing road), there is a potential that there may be more frequent high-speed accidents and correspondingly more severe injury implications. On the other hand, the geometry of the new

road, improved drainage, and two-lanes will provide safer driving conditions for road users. The impacts on traffic safety will likely be positive for the overall scope of the new road section.

675. Connectivity and accessibility. The operational stage of the Project is expected to improve connectivity for the transport of goods, services, and people leading to a better economic growth potential of the region. This would include better accessibility for businesses in the region to expand their geographical markets and resources to other areas and countries.

676. Access to areas being utilized by farmers and their livestock along the Rioni River will be retained as the bridge design allows for crossing underneath the structure on both sides. This is particularly relevant to farmers near the Nikora factory which are now passing under the railway bridge and rely on access for their animals.

677. Employment opportunities. Under Project operation, employment for the operation and maintenance activities of the road and bridge will be required, resulting in long-term employment opportunities for the local, regional, and national workforce. However, employment opportunities will be limited.

Management and Mitigation Measures

Preparation, Construction, Worksite Closure Stages, and Operation Stages

- Impacts on Employment and Economy.
  - Establish a local recruitment and Employment and Procurement Procedure. Development of the plan should involve consultation with relevant stakeholders, including government authorities and local villagers.
  - Review opportunities to establish a skills training program with an aim of training interested local villagers to contribute to the Project.
  - Inform local villagers of job opportunities in a timely manner.
  - Inform local businesses of contracting opportunities in a timely manner.
- Impacts on Community Infrastructure and Services
  - Provide signs advising road users that construction is in progress, specifically at the points where the new road connects with the E-60.
  - Employ flag persons to control traffic when construction equipment is entering or leaving the work area.
  - Post traffic advisory signs (to minimize traffic build-up) in coordination with local Authorities.
  - Prompt restoration of accidentally damaged private property and/or infrastructure.
  - Define and observe schedules for different types of construction traffic trips (e.g., transport of pre-cast sections, haulage of spoils, delivery of construction materials, etc.)
  - Keep the community informed about the schedule of works which could cause temporary restriction of services and the potential duration of the 'impact' in advance
- Land Acquisition, Resettlement
  - The key mitigation for land use is implementation of the LARP
  - Written agreements with local landowners for temporary use of the property will be required and sites must be restored to level acceptable to the owner within a predetermined time period
- Noise, Vibration and Dust – Refer to mitigation measures provided in respective Sections of **F.2.2 - Air Quality, Noise, and Vibration**.
- Impacts on Social Cohesion

  - Locate construction camps (if established) away from communities in order to avoid social conflict in competition for resources and basic amenities such as water supply.
  - Give qualified local residents priority in hiring of construction workers.
  - Encouraging employment of women.
  - Maximize goods and services sourced from local commercial enterprises.
- Occupational and Public Health and Safety
  - Conduct orientation for construction workers regarding health and safety measures, emergency response in case of accidents, fire, etc., and prevention of HIV/AIDS and other related diseases.
  - Workers at the bridge site shall be provided with life vests/buoyancy devices at all times.
  - Stable footpaths/access with sturdy guardrails to the bridge work sites shall be provided.
  - Before construction, the Contractor will be required to prepare a Waterway Safety Plan for submission and approval by the agencies in charge.
  - The Contractor will develop and implement Traffic Management and Waste Management plans.
  - Ensure the grievance mechanism is functional and understood by the community.
  - Implementation of Stakeholder Engagement Plan.
  - Provide first aid facilities that are readily accessible by workers.
  - Provide fire-fighting equipment at the work areas, as appropriate, and at construction camps where fire hazards and risks are present.
  - Provide adequate sanitation facilities for all workers at the workers'/construction camps.
  - Ensure that all wastewater emanating from the project site are treated consistent with national regulations.
  - Ensure proper collection and disposal of solid wastes consistent with local regulations.
  - Provide personnel with appropriate safety equipment such as safety boots, helmets, gloves, protective clothes, breathing mask, goggles, ear protection, etc. and ensure that these are properly worn as required.
  - Ensure reversing signals are installed on all construction vehicles.
  - Implement fall prevention and protection measures whenever a worker is exposed to the hazard of falling more than two meters, falling into operating machinery or through an opening in a work surface.
  - Implement precautions to ensure that objects (e.g., equipment, tool, debris, pre-cast sections, etc.) do not fall onto or hit people, vehicle, and properties in adjoining areas.
  - Barriers should be installed to keep pedestrians away from hazardous areas such as constructions sites and excavation sites.
  - Signage should be installed at the periphery of the construction site to warn and direct traffic and pedestrians.
  - Provide security personnel in hazardous areas to restrict public access.
  - Strictly impose speed limits on construction vehicles along residential areas and where other sensitive receptors such as schools, hospitals, and other populated areas are located.
  - Educate drivers on safe driving practices to minimize accidents and to prevent spill of hazardous substances and other construction materials during transport.
  - Provisions will be incorporated into all sub-contracts to ensure the compliance with the SEMP at all tiers of the sub-contracting.
- Cultural Heritage

- Implementation of chance finds procedures to appropriately manage unanticipated discoveries of cultural or historic artefacts (movable or immovable) in the course of the work

Operation Stage

678. Measures to reduce/mitigate impact on socio-economic environment during operation of the road include:

- Ensuring road safety measures described in Section **C.11 - Road Safety** are integrated into the final design.
- Control if noise, emissions, and vibration where appropriate and as described in Section **F.2.2 - Air Quality, Noise, and Vibration**.
- Ensure continued financing for repair and maintenance activities.
- Maintain access for farmers to pass beneath the new bridge.

Conclusion

679. The socio-economic impact assessment identified a large number and wide range of positive and negative impacts that are likely to occur during construction and operation of the Project. Significance of these impacts before and after management is summarized in the table below.

Residual Impacts

Table 77. Residual Impacts – Socio-Economic

Impact	Significance before Mitigation	Residual Impact After Implementation of Mitigation Measures			Key Residual Impacts
		Preparation Construction Worksite Closure Stages	Operation Phase		
			Day 1	Year 15	
(i) Land acquisition and livelihood loss to affected persons.	**Medium**	**Low**	**NEGL**	**NEGL**	No significant residual impacts are anticipated if the LARP is implemented correctly. However, there will still be disruption to the local community during the LARP implementation process. A GRM has been prepared to manage complaints received during this process.
(ii) Creation of direct and indirect jobs because of hiring staff from the region.	**Medium +**	**Medium +**	**Low +**	**NEGL**	After the Project construction phase, many local workers may be without employment. However, the Project will have provided them, in many instances, with additional skills and experience to work on

					similar projects in other locations.
(iii) Payment to owners for leasing their premises and compensation for change of land use on their premises.	**Low +**	**Low +**	**NEGL**	**NEGL**	N/A
(iv) Demand of services in neighboring towns (food, accommodation, recreation, vehicles, machinery, and equipment).	**Medium +**	**Medium +**	**NEGL**	**NEGL**	N/A
(v) Road access restrictions to traffic during to construction phase.	**Medium**	**Low**	**NEGL**	**NEGL**	N/A
(vi) Improved road traffic capacity and connectivity resulting in socioeconomic benefits.	**Medium +**	**N/A (Operation Phase Impact)**	**Medium +**	**Medium +**	The Project is an important part of the larger Poti-Grigoleti-Kobuleti Bypass project which is envisaged to bolster the economic growth of Georgia with its neighboring countries. It is expected that the new bridge and road section will play a positive role in enhancing economic growth locally and regionally.
(vii) Water demand for construction activities, mainly to avoid spreading dust and particles during drilling, during operation of provisional facilities, during circulation of vehicles on dirt roads, and for general cleaning services.	**Low**	**Low**	**NEGL**	**NEGL**	N/A
(viii) Energy demand for provisional	**Low**	**Low**	**NEGL**	**NEGL**	N/A

facilities, construction/deconstruction activities and lighting.					
(ix) The disruption of services, including energy, to surrounding communities due to relocation of utilities.	**Medium**	**Low**	**NEGL**	**NEGL**	N/A
(x) Both the presence of staff at the site and preparation/construction/dismantling tasks will generate waste which need the use of sanitary landfill or municipal dumps duly authorized.	**Medium**	**Medium**	**NEGL**	**NEGL**	N/A
(xi) Services demand for management of waste generated during maintenance activities.	**Medium**	**N/A (Operation Phase Impact)**	**Low**	**Low**	The Project will provide opportunities for local businesses in the neighborhoods surrounding the Project.
(xii) Demand of consumables or materials to be used for preparation/construction/worksite closure activities and supplied from local or regional sources (food, fuel, sand, gravel, cement, wood, steel, among others).	**Medium +**	**Medium +**	**NEGL**	**NEGL**	N/A
(xiii) The exposure of workers to various physical hazards that may result to minor, disabling, catastrophic, or fatal injuries.	**Medium**	**Low**	**Low**	**Low**	Due to the nature of construction activities under the Project, occupational health and safety can reduce but not eliminate exposure to workers from various physical hazards. Therefore, the residual exposure that remains after all efforts to mitigate risk have been made is assessed as Low.

					The Potential operational health and safety and environmental risks will continue into the operation phase as a result of maintenance of the structures over the long-term.
(xiv) Risks to community health and safety due to increased traffic; the transport, storage, and use and/or disposal of materials (e.g., fuel and chemicals); and access to structural elements or components of the project by members of the community.	**Medium**	**Low**	**NEGL**	**NEGL**	Considering the relatively isolated Project site and assuming the mitigation measures are implemented and monitored over time, the residual impact is assessed as Low during the Site Preparation, Construction, and Worksite/Project Closure Stages. Ongoing monitoring should occur to track implementation and evaluate the management measures.
(xv) Road accidents resulting from higher travel speeds and increased traffic.	**Medium**	**N/A (Operation Phase Impact)**	**Low**	**Low**	Project impact on traffic safety will be both positive and negative through the operation stage. The community health and safety impacts, as those associated with changes in environmental conditions, increased prevalence of diseases, and heavy traffic movement are assessed as Low.
(xvi) Risks to built heritage, objects, and sites that have archaeological, historical, religious, or other cultural value and significance.	**Low**	**NEGL**	**NEGL**	**NEGL**	N/A

Note: NEGL means Negligible and the '+' sign indicates significance of a positive impact.

F.2.8 - Waste Management

Scope of the Assessment

680. Waste and waste management is a cross-cutting issue and has been covered in each impact analysis section within the EIA. This section will therefore focus on providing only relevant new information.

681. It should also be noted, that in the time of the preparation of this EIA report, information on many of the specifics regarding waste management were not available (e.g., areas allocated for temporary storage of hazardous waste; whether camps will be established, and whether quarries will be opened). These potential impacts and the mitigation measures to prevent, reduce, or control adverse environmental effects will be provided in the Contractor's SEMP.

Identification of Receptors

682. The resources (physical, biological, human, or cultural environment) and receptors that may be impacted in relation to waste generation and management include the following:

Resources	Receptors
• Physical environment including land, air quality and water resources (addressed elsewhere). • Biological environment, primarily being the terrestrial environment • Human environment including subsistence resources, community health, welfare, amenity and safety, employment and incomes, business and economic activity, existing government services, land use and traffic	• Construction workers • Full time and temporary workers during operation • Contractors and visitors to the site • Residents within the area of influence • Adjoining industrial facilities • Workers in or near waste disposal locations • Residents near waste disposal locations • Government bodies/businesses providing waste management services

Assessment of Impact: *Preparation, Construction, and Worksite Closure Stages*

683. The following construction waste will be generated during the construction and operation of the road:

- Inert materials like padding soil, sand and gravel mix, concrete, which will be processed and used as a construction material in backfilling, shaping, and landscaping operations.
- Potentially harmful and hazardous substances such as construction camp waste (if camps are developed), crushed stone from crushing, empty containers used to store fuel, lubricants and chemicals, ferrous scrap, electrode stubs –these wastes have to be properly disposed of as per national regulations.
- Timber waste from tree felling and other organic substances from site clearing – these should be stockpiled at designated areas outside construction sites and removed during the period of felling and grubbing. A possible solution is to sell these materials as fire wood to local residents (subject to national legislation).

684. It will be necessary for the Contractor to classify waste streams (hazardous, non-hazardous, or a waste that requires a full assessment to determine classification – so-called 'mirror entry' waste) and manage them according to international best practice and Georgian law.

685. Solid non-hazardous and inert waste will be removed to the Poti municipal waste dump, which is located north-east of Nabada Settlement at the south bank of Rioni River. Solid Waste

Management Company of Georgia is responsible for operation of landfills and waste collection is carried out by municipalities (waste management utilities). The Contractor will be required to conclude an agreement with the Poti municipality for waste collection.[71]

686. Inadequate management of hazardous waste generated during construction may cause soil, ground, and surface water pollution as described in the sections above. Therefore, hazardous wastes will be handed over to licensed companies authorized for utilization of this types of the waste. For a list of private companies in the region authorized for waste management refer to Section **E.6.4 - Waste**.

687. The contractor will need to develop a Waste Management Plan, Wastewater Management plan, and Spoil Disposal Plan for review and approval by the RD before construction begins. Guidance and direction on what needs to be covered within this management plans is provided in **Annex 7. Thematic Management Plans**.

Assessment of Impact: *Operation Stage*

688. The RD will conclude a long-term contract with a Road Maintenance Contractor to maintain the road and bridge section in the operation stage. An important mitigation measure to prevent the potential impacts to aquatic biodiversity and habitat from roadway runoff accidental spills (however unlikely) is the management of the bridge storm water and spill containment chambers at both ends of the bridge (described in detail in Section **C.5.3 - Bridge Runoff and Spill Containment Chamber**). The RD will ensure that this additional responsibility is included in the service company's SOW, in addition to being financed and monitored accordingly.[72]

F.2.9 - Induced and Cumulative Impacts

Scope of the Assessment

689. In most instances, past and present developments will have been captured in the baseline for the Project (for example, through noise measurements, traffic counts) and the normal practice of 'adding' impacts from the Project to the baseline will assess the cumulative induced effect. The cumulative assessment approach is based on a consideration of the approval status or existence of the 'other' activity and the nature of information available to aid in predicting the magnitude of impact from the other activity.

690. Induced impacts are those that result from other activities (which are not part of the Project) that happen as a consequence of the Project. For example, as mentioned above induced economic effects of spending on goods and services by construction workers who will have increased disposable income and the ability to spend more money in the local economy is expected.

Anticipated Development in the Region

691. Road Network Development. As noted, the proposed Project road section is one part of a larger development plan to strengthen and improve the road network in the Black Sea coastal area within Samegrelo-Zemo Svaneti and Guria regions. This corridor comprises the area from Poti up to the Kobuleti bypass and represents a significant investment in upgrading

[71] Levan Kupatashvili, Roads Department, pers. comm. 2018
[72] Ibid.

the transportation infrastructure in west Georgia. While the timeframe for these future sections is yet to be determined, it is expected that greater connectivity of the Black Sea coastal area with the rest of country will provide increased accessibility to markets, ports, and growth centers. The length of the whole corridor is 20.7 km (including stage 1 Poti Bridge) which is divided into 3 stages.

692. This will lead to development of business (including agriculture and fisheries), industry, communication, tourism, urbanization, etc. The induced development has both negative and positive impacts. The positive impacts are increase in the socio-economic conditions of the region through employment generation and poverty reduction. The negative impacts are (i) air and noise pollution due to construction activities, increase in traffic levels, and industrial development; (ii) generation of wastes due to increased living standards and increased industry; (iii) consequent health impacts due to pollution and waste generation; (iv) loss of biodiversity and critical habitats; and (v) land acquisition and resettlement. A section of the larger Project corridor is likely to pass along the edge of the Kolkheti National Park boundary which has the potential for significant induced impacts and cumulative impacts.

693. Scaling-up multi-hazard early warning system and the use of climate information in Georgia. This UNDP project is financed through the Green Climate Fund and is focused on reducing exposure of Georgia's communities, livelihoods, and infrastructure to climate-induced natural hazards. One of the project's three outputs targets 13 sites for structural measures that aim to reduce the impacts of flooding. The types of flood protection structures to be erected include embankments with rock boulder; wire mesh mat lining; concrete regulation wall; wire mash gabion wall; climate proofing water regulation facility; canal widening and lining; and riverbed and channel cleaning. Based on the project's environment and social assessment report five sites are located on the Rioni River (see Figure 62).[73] The closest of the sites to the Project area is only 2.5 km away upriver.

694. Based on the project's environment and social risk assessment, activities undertaken in the river will require riverbank works and removal of sediment. The resulting impacts include: (i) the potential for erosion and sediment movement during rainfall events and as a result of dust, all of which could have impacts on water quality; (ii) noise impacts from the use of trucks and excavators; (iii) the potential leakage of chemicals and oils; and (iv) the potential for construction activities to generate sediment that may increase silt load through overland flow to other environments.

695. The project was approved in March 2018 and is expected to be implemented over seven years. The EIA team held a meeting with the UNDP in February 2019 to discuss their project and understand more about the kinds of activities being planned in the Rioni River. Based on our discussions it is understood that some sub-projects may be implemented this year, although it has not been decided which activities may go forward or if they include works in the Rioni River. It was also communicated to the team that a review process is still underway on the approved locations which may result in a change of project sites and the scope of work. The UNDP agreed to notify the RD and the ADB with further details on any planned activities within the Rioni River under this project.[74]

696. Urban Services Improvement Investment Program – Tranche 4 (Improvement of Poti Wastewater System Subproject). As detailed in Section **E.6.3 - Water and Sewage**, the ADB has been asked to finance the rehabilitation and extension of the wastewater network and the construction of a wastewater treatment plant (WWTP) in Poti. The wastewater project

[73] https://www.greenclimate.fund/projects/fp068

[74] Meeting held on February 1st, 2019 with Ms. Munkhtuya Altangerel, UNDP Deputy Resident Representative, and Ms. Nino Antadze, Environment & Energy Team Leader.

comprises the laying 150 km of new gravity pipes and 25 km of new pressure pipes. The sewer network is divided into two zones. Poti South and Poti North. The southern part will be served by an existing WWTP in the South of Poti – about 40%, while the northern part - about 60% of the total network – will be served by a new treatment plant to be constructed under the project.

697. The WWTP serving Poti South will be rehabilitated within the property of the existing WWTP on the right-hand side of the Rioni River close to Paliastomi Lake, comprising approximately an area of seven ha. The new WWTP serving Poti North will be located on the left-hand size of the Rioni River (see Figure 62). The WWTP has a capacity of 11 663 m3 in 24 hours and coordinates for the location of the WWTP infrastructure is the following:

#	X	Y
1	225921	4674521
2	226099	4674313
3	225954	4674229
4	225810	4674445

698. A sewage line will need to cross the Rioni River between the mouth of the Rioni River and the municipal landfill to connect the town of Poti and the Poti North WWTP. It is not known at this time whether the sewage line will be designed to cross the river above the water or on the riverbed.

699. At the time this EIA was developed, tendering for designs had been completed and the project end date was planned for March 2021 (for all sub-projects in all seven secondary cities). It is possible, that there could be an overlap on construction activities for this project and the one covered under this EIA, although this is not certain.

700. It is not possible at this time to determine whether cumulative impacts exist from the loss of natural habitat from the combined project footprints and projected land conversion. It is also not possible to assess the potential cumulative impacts on protected and priority species from construction activities in the Rioni River. The multiplier effect that these developments would have if under construction at the same time could potentially create a cumulative impact on employee demand in the vicinity of the Project as well.

701. Vartsikhe HPPs (HPP Vartsikhe) – The existing complex includes four hydroelectric power plants (HPP) of the same type in the lower reaches of the Rioni River (see Figure 62). It is included in the Rioni HPP cascade, as the bottom step. Vartsikhe HPPs are the classic diversion stations, located on the derivation channel with the main reservoir.

702. The presence of the Vartsikhe cascade of hydropower dams on the Rioni River likely provides the biggest challenge to long-term survival of sturgeon populations (alongside illegal fishing). These dams have largely dewatered or cut off 84% (48 km) of natural sturgeon spawning grounds in the river, dramatically reducing the reproductive viability of the species.[75]

703. Further, they are managed in a way that is likely to adversely impact sturgeon reproduction on the limited remaining spawning grounds downstream.[76] In the past, dam

[75] Freyhof, J., Guchmanidze, A., Rukhadze, A., Bitsadze, M. & Zazanashvili, N. (2015) *Feasibility Study on Strengthening Sturgeon Conservation in Georgia (A Call for Action: Sturgeons in the Rioni River).* WWF Caucasus Programme Office, Tbilisi, Georgia.
[76] Fox, D.A., Madsen, J.A. & Smedbol, S.J. (2018) Field trials on the application of acoustic telemetry and high-resolution side-scan sonar for sturgeon studies in the Rioni River, Georgia. Unpublished report to the WWF Caucasus Programme Office, Tbilisi, Georgia.

maintenance has been carried out without due consideration for the needs of the fish ascending to spawning grounds. Consequently, water levels have been observed to vary greatly over the diurnal cycle, the variations being as wide as 0.4 m in amplitude.[77] At low water levels, extensive swaths of the river bed were exposed. The rapidly changing flow velocity and the concomitant water level variability must have affected the sturgeon spawning migration, the spawning itself, and its success.

704. Anaklia Deep Sea Port Development. The proposed Anaklia Deep Sea Port Development (Phase 1) will realize the development of new port infrastructure and facilities to accommodate container vessels with cargo capacities up to 10,000 twenty-foot equivalent unit containers. The project will comprise port construction works and port operations of various marine and landside infrastructure. After the Phase 1 port development, subsequent port phases are planned for development from 2027 (Phase 2) to 2069 (Phase 9). There is also planning for development of a Free Industrial Zone on a 600ha land area close to the Anaklia Deep Sea Port Development.

705. Anaklia is approximately 30 km north of Poti (see Figure 62). The environmental impacts from the proposed Anaklia Deep Sea Port project are complex and extensive. The most relevant activities which could contribute to cumulative impacts with the Project covered in this EIA are the following:

- Marine Resources and Coastal Processes
    - The development of the various projects will affect 224 ha of the seabed due to dredging for the approach channel, turning basin, berthing pockets and the construction of the breakwater and quay wall. The development of the various projects will cause temporary indirect disturbance of marine sediment and water quality by causing the dispersion of sediment in the water column and the deposition of sediment on the seabed.
- Land Resources
    - The development of the various sub-projects will cause the direct loss and indirect disturbance of land resources (approximately 1,050 ha) by removing land uses and changing the topography, geology, and soil conditions.
- Soil Quality, Surface Water Quality and Groundwater Quality
    - The development of the various sub-projects will have the potential to cause accidental /incidental spills / leaks of contaminating materials and substances that could lead to direct and/or indirect impacts (e.g., pollution events) on soil quality, surface water quality, and/or groundwater quality.
- Terrestrial Species and Habitats
    - The development of the various projects will cause the direct loss of terrestrial habitats (approximately 1,050 ha) and indirect disturbance of protected species (including species listed in the Red Data Book of Georgia and under the IUCN's Red List). The key activities causing this impact include site clearance, land reclamation and the construction of new infrastructure.
- Marine Species and Habitats
    - The key activities causing this impact include the underwater noise emissions during clearance of unexploded ordinance (e.g., explosions), dredging of dredged material (e.g., dredging vessel movements), construction of new structures such as quay walls (e.g., piling), and cargo imports and exports (e.g., cargo vessel movements). Unexploded ordinance clearance and piling works are most likely to generate underwater noise at levels that could affect marine

[77] Kolman, R. & Zarkua, (2002) Environmental conditions of Common Sturgeon (*Acipenser sturio* L.) spawning in River Rioni (Georgia). *Electronic Journal of Polish Agricultural Studies* 5: 1.

mammals. The underwater noise impacts of projects as far away as Poti may be relevant.

706. E-60 Samtredia-Grigoleti Highway (Lot 1 and 2). Lot 1 and 2 are portion of the Georgia East-West Highway project (out of a total of four Lots) designed to ease transportation across the length of Georgia. The Samtredia-Grigoleti road section of E-60 Highway starts at new Kutaisi-Samtredia bypass road section under construction, near the Ochopa bridge, ending at Supsa River near Grigoleti, close to the Black Sea (see Figure 62). Lot 1 of the project crosses the Rioni river near Samtredia, while Lot 2 begins where Lot 1 ends close to the Rioni river and adjacent to the town of Lanchkhuti. The status of works and the expected completion dates for both projects is unclear. The project will potentially contribute to cumulative impacts to biodiversity and water quality in the Rioni River.

707. Urban Services Improvement Investment Program – Tranche 3 (Improvement of Kutaisi Water Supply System Sub-project). This ADB funded Multitranche Financing Facility Investment Program focuses on investments in improvement of basic urban infrastructure (i.e., water supply and sewerage). The Kutaisi sub-project involves the following: (i) rehabilitation of the network; (ii) construction of one new reservoir (New East); (iii) construction of two small collector reservoirs for the pumping stations at Partkhanakanebi and Mukhniari; (iv) extension of TV Tower Reservoir (second chamber); and (v) rehabilitation of Kvitiri and Mukhnari pumping stations.

708. The design envisages the conveyance of raw potable water from the right bank of the Rioni River, where Vartsikhe hydroelectric power station (HPS) is situated, upstream about six km to the left bank of the Rioni River and adjacent to the water pumping station. The water would pass through a water supply pipe, which will be conducted through the aqueduct, which is perpendicularly crossing the Rioni River. It was envisaged that 10 piers of the aqueduct will be constructed directly into the course of the Rioni River and 2 pile type abutments on the Rioni River bank.

709. The project in Kutaisi is approximately 125 km upriver from the Project covered in this EIA and construction is in progress (see Figure 62). According to the project's Initial Environmental Examination (IEE), there is medium risk of temporary impacts to the aquatic ecology of the River Rioni during the construction of the aqueduct. To minimize an impact to fish and to produce the least amount of noise for the local community, the Contractor bored piles during the winter when the water in the Rioni River is shallowest. Also, the number of piles was reduced as much as possible to minimize the footprint in the Rioni River. Small coffer dams were used during the construction to reduce sediment flow of the river. Currently, construction activities of aqueduct are completed.

710. Namakhvani HPP Cascade Project. The proposed Namakhvani HPP Cascade is approximately 150 km upriver from the Project covered in this EIA and is currently in the planning stage (see Figure 62). The design envisages the following:

- Hydropower capacity:
    - 60m high dam (Upper) and 100m high dam (Lower)
    - 400 MW (~ 400,000 Georgian households)
    - 1,500 GWh per year - 15% of current power generation capacity in Georgia
    - 280 m3 /s (Upper) and 334 m3 /s (Lower)
    - Ecological Flow = 7.8 m3 /s (Upper) and 16 m3 /s (Lower)
- Namakhvani-Alpana By-pass highway road:
    - 20 km of new road
    - 8 km of existing road will be upgraded

- 800m Tvishi Gorges road tunnel

711. According to records from public meetings held in early 2018, land acquisition and pre-construction works began in 2018, including geotechnical investigations and survey work.[78] The start of construction is planned for early 2019, but this will depend on agreement to land acquisition and resettlement. Resettlement will be phased over three years (2018-2021). Scheduled reservoir filling and start of power generation is planned for 2022 and construction will last 3.5 years.

712. Fish species currently living in the fast flowing Rioni River environment will be unlikely to adapt to living in the still waters of the two reservoirs. The Project will aim at stocking the reservoirs with suitable fish species.[79]

713. It is not possible to determine the significance of these impacts since to fully evaluate the impact would require consideration of the future proposed development. However, it is possible this development could potentially affect flow rates and water quality further down the Rioni River.

714. Sand and gravel abstraction on the Rioni. Ongoing and planned construction and transport projects in the region are likely to require large amounts of aggregate from local sources during construction. There may be significant cumulative impacts from transportation of aggregates from the borrow pits and quarries to the construction sites, and from the operation of concrete batching plants. The abstraction of sand and gravel from sites within the Rioni River has been identified in the BAP analysis as having a devastating impact on the survival of the sturgeon species due to the destruction of the few remaining spawning grounds (See BAP, Section **3.2 - Priority biodiversity**). This would be of particular concern in the areas of the Rioni River near Samtredia, which are thought to be important spawning areas for sturgeon. During site visits in November 2018, gravel abstraction was observed in the Rioni River outside Samtredia. The potential for cumulative impacts exists if the Contractor for this project is permitted to source materials from the Rioni River.

715. Non-point source pollution. Legal and illegal waste disposal and dump sites pose high threats to the waters and land resources of the Rioni Basin. Another significant diffused source of pollution is old industrial and mining sites (e.g., old arsenic and barite mines in Racha region). Ongoing mining operations of ferrous and non-ferrous metal represent significant threats to the natural resources of the Rioni Basin, including water resources. Abandoned storage facilities with stock piles of obsolete pesticides in the Rioni Basin, which in accordance with persistent organic pollutant (POPs) inventories conducted in 2004-2005 consisted of about 65% PoPs, were sources of water and land pollution in the past.[80]

Mitigation of Potentially Significant Cumulative Impacts

716. Understandably, there is considerable uncertainty associated with the anticipated development in the region identified above that are outside of the control of this Project and/or for which information is limited or not available. Any cumulative impacts are likely to relate to aquatic habitat and protected and priority species, particularly in terms of water quality.

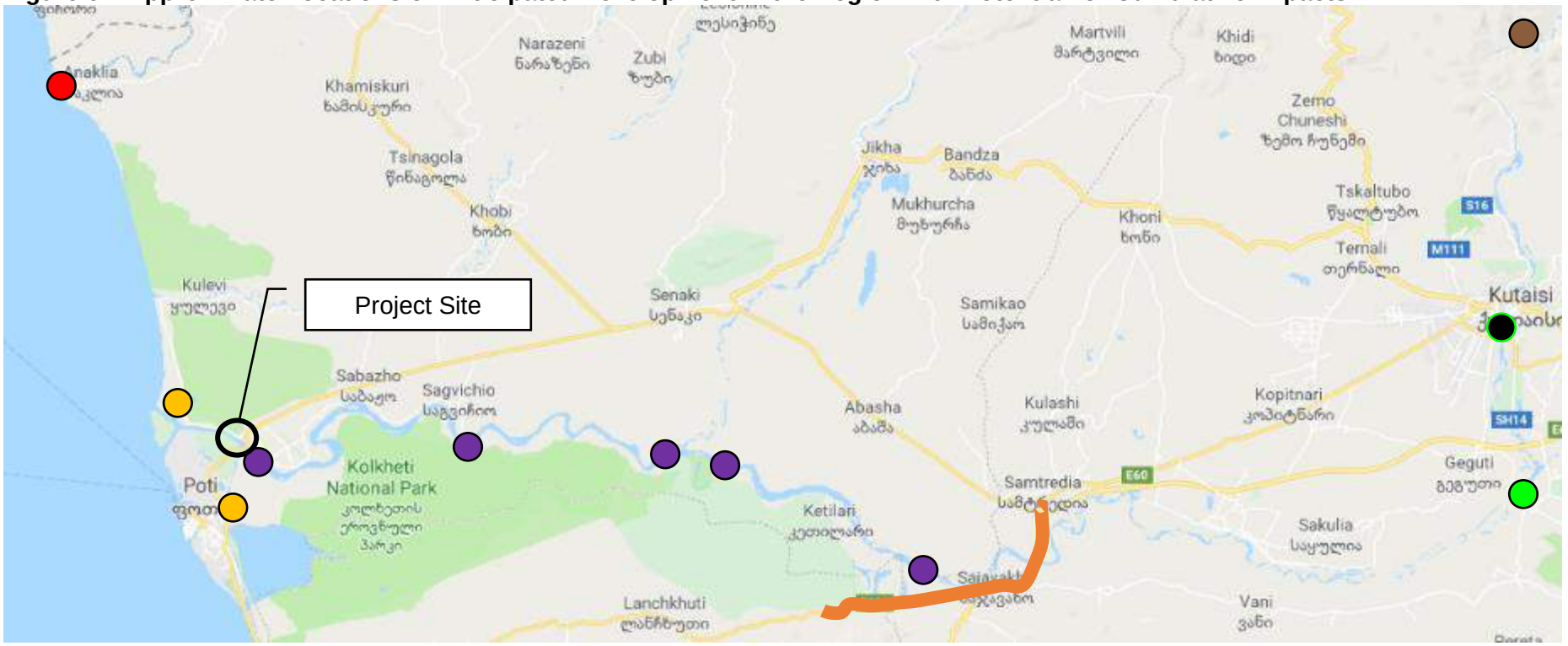
[78] http://www.namakhvani.com/wp-content/uploads/2017/08/Public-Information-Meeting-February-2018.pdf
[79] Ibid.
[80] GLOWS-FIU. 2011. Technical Summary Report: Rapid Assessment of the Rioni and Alazani-Iori River Basins, Republic of Georgia. Global Water for Sustainability Program, Florida International University, p.48

717. Taking this into account, ensuring that quarry materials are not taken from the Rioni River and downstream of the Vartsikhe hydropower cascade, represents a practical (i.e., cost-effective, and relatively easy to implement) mitigation measure that can be implemented to address potential cumulative impacts on sturgeon species. Adherence to good construction and operational practices will also minimize the chance of land and water contamination which could have cumulative impacts with existing or future pollution of the Rioni River.

718. The two main approaches assessed in the BAP as potentially suitable compensation measures for this Project's residual impacts on sturgeon species would also mitigate against potential cumulative impacts. The measures include (i) support to a high standard mixed-method monitoring system; and (ii) support to a cumulative impacts working group to improve hydropower management upstream and reduce sand/gravel quarrying in the Rioni River. Refer to the BAP in **Annex 1. Biodiversity Action Plan (BAP)** for further analysis on this recommended net gain approach.

719. As a general mitigation measure, the Project will be carefully managed and monitored by the RD and consultation with donors and implementing units on other projects that are likely to contribute to cumulative impacts will be undertaken so as to reduce uncertainty and, where necessary, take appropriate action to minimize environmental harm.

Figure 62. Approximate Locations of Anticipated Development in the Region with Potential for Cumulative Impacts



- **Anaklia Deep Sea Port Development**
- **E-60 Samtredia-Grigoleti Highway (Lot 1 and 2) (EIB for Lot 2, Lot 1 unknown)**
- **Urban Services Improvement Investment Program – Tranche 3 (Improvement of Kutaisi Water Supply System Sub-project) (ADB)**
- **Namakhvani HPP Cascade Project**
- **Scaling-up multi-hazard early warning system and the use of climate information in Georgia (UNDP)**
- **Urban Services Improvement Investment Program – Tranche 4 (Improvement of Poti Wastewater System Subproject) (ADB)**
- **Vartsikhe HPPs (HPP Vartsikhe) (ongoing operations and dam maintenance)**

F.2.10 - Climate Change Risks and Adaptation

Scope of the Assessment

720. Climate change is one of the several factors considered in the EIA as required under the ADB's SPS under Safeguards Policy 1 - Environment. The climate change analysis was conducted with the following objectives:

- Manage or reduce the potential risk posed by the impacts of climate change to the Project.
- Help decision makers to address climate change implications in a risk management context.
- Provide assurance to the public that climate change risks and mitigation measures as well as community concerns are being appropriately considered in the design of the proposed Project.

721. Two approaches were considered when incorporating climate change analysis into the EIA:

1) GHG Considerations: where the proposed project may contribute to GHG emissions
2) Impacts Considerations: where climate change may affect the proposed Project

722. Analysis on GHG emissions resulting from construction and operation of the Project road and their effect on climate change have been incorporated into Section **F.2.2.1 - Air Quality**. Therefore, the analysis in this section will focus on how climate change may affect the proposed project.

723. Specifically, the analysis will center on the effects of climate change on river hydrology at the proposed bridge site since impacts on hydrometeorological processes due to climate variability are the most relevant to the Project and pose the greatest risks.

Climate Change Trend Analysis

724. Georgia is subject to both geological and hydrometeorological natural hazards including landslides, mudflows, erosion, avalanches, floods and flash floods, drought, and strong winds. There is evidence that the frequency of these climate-induced disasters and associated damages have been increasing over the past decades.[81] Climate change studies have indicated that these hazards will further increase in frequency, intensity and geographical spread over time and will have significant negative impacts on various sectors, including agriculture, health, critical infrastructure, tourism and protection of culture heritage, environment, natural resources, and ecosystems.

725. Baseline information, including forecasted changes to the climate due to impacts of climate change, is provided in Section **E.1.1 - Meteorology and Climate**.

726. Analysis conducted for Georgia's first National Communication to the UNFCCC concluded that the system most vulnerable to climate change in Georgia is the Black Sea

[81] Georgia's Third National Communication to the UNFCCC (2015), National Statistic Office of Georgia.

coastline, which has a strategic importance for the country's economy and development of foreign trade.[82]

Hydrometeorological Hazards

727. There is a growing literature on the evidence linking anthropogenic climate change with natural disasters. In the Rioni River Basin, the river water level increases in spring (April) and reaches its maximum in June. Flooding typically continues until the end of August. By the end of September, flooding is caused by heavy rains and reaches its maximum in October – November. Minimum water level is observed during December-February. Overall, 38.8 percent of total run off occurs in spring, 28.5 percent - in summer, 18.4 percent in fall and 14.3 percent in winter. 34.7 percent of the runoff is created by groundwater, 32.5 percent - by rain water, 28.2 percent - by snow melting and 4.6 percent - by glaciers.[83]

728. As discussed in Sections **E.1.4 - Hydrology** and **E.4 - Natural Hazards**, hydrometeorological events represent the greatest hazards to the Project. Flash floods and floods are frequently experienced with sometimes devastating effects on inhabited areas and infrastructure. Approximately 40 densely populated settlements and villages are found downstream of Rioni River and around 35-40 percent of agricultural lands are under permanent risk of flooding.

729. The north of Poti lies adjacent to the Rioni River and one of the river's tributaries, the Rioni Canal, crosses the town from the west to east bordering the Black Sea and Paliastomi Lake. A diversion dam was built in 1939 to reduce flooding effects and on which road traffic currently crosses the Rioni River. The structure consists of two parts: (i) Main weir on the Rioni River; and (ii) Left bank regulator on Poti Channel. The diversion dam is less than 750 m from the Project site.

730. The main weir has ten openings that discharge up to 400 m3/s each (total flow, 4,000 m3/s), and divert the river flood flow towards the Black Sea, away from the town of Poti. The main diversion structure is approximately 180 m long and is located across the Rioni River channel. The left bank regulator discharges 400 m3/s into the canal that goes through the town of Poti. The diversion dam has had to be rehabilitated several times due to inadequate design, inappropriate gates operation, and a lack of maintenance, most recently in 2018.[84, 85]

[82] Georgia's Initial National Communication Under the United Nations Framework Convention on Climate Change (1999), National Climate Center.
[83] GLOWS-FIU. 2011.
[84] Emergency Underwater Rehabilitation of the Poti Main Diversion Weir, Georgia. Ljiljana Spasic-Gril. Improvements in reservoir construction, operation and maintenance. January 2006, 330-344.
[85] Gocha Kurdgelia, Poti Municipality, pers. comm. 2018

Figure 63. Diversion Dam on the Rioni River

731. Data provided by the SakTsqalProekti Design Institute (Georgian hydroengineering institute), indicate the flow values corresponding to the different recurrent periods are as following:

Table 78. Rioni River flow values corresponding to different recurrent periods

River- section	Basin area, km2	Flood Recurrence Interval			
		100	50	20	10
Rioni River – Poti (northern branch)	13,300	3,150	2,950	2,500	2,200
Rioni River – Poti (southern branch)	13,300	250	250	250	250

Water discharge m3/s

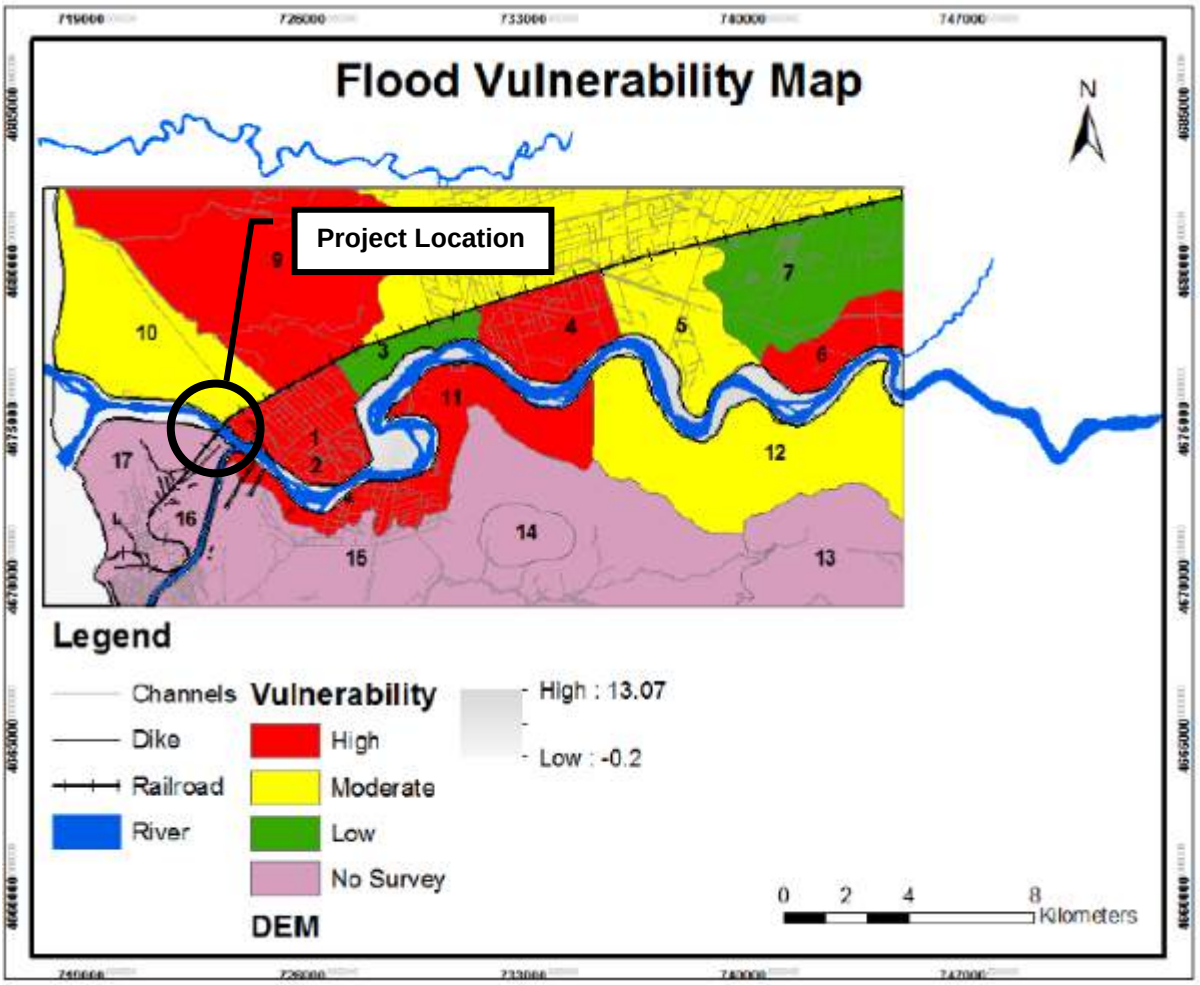
732. The northern branch corresponds to the main river and the southern branch, to the canal. It should be noted that other documentation reviewed as part of this analysis showed higher flow values for the northern branch, up to 4,311 m3/s for a 100-year period.

733. Despite the benefits provided by the diversion dam, the Rioni flood plain remains at serious risk of flooding each year. The results from a study in 2011 show that the area has high and moderate vulnerability to flood hazards annually by combining historic information on flood depth and duration.[86] As Figure 64 shows, the south east part of the area is

[86] Ghimire, Samjana. (2011). *Rural Risk Assessment in Western Georgia with Emphasis on Flood Risk.* Retrieved from Caucasus Environmental NGO Network (CENN)

moderately vulnerable while the south west part has high vulnerability to flood. This is because that the south west area has lower elevation than the eastern part. The northern part of the railway track, where Patara Poti village is located and where the Project road section begins, has high to moderate vulnerability. The highly vulnerable region is due to the discharge from the river Khobi during the rainy seasons. Also, the presence of river Tshivi in the eastern part aids in high vulnerability in the area.

Figure 64. Flood Vulnerability Map



Note: To generate the flood depth and duration map using the digital elevation model (DEM), the area was delineated into sub-compartments (numbered on the map). The high vulnerability is the area where both the depth and duration is high (i.e. flood depth of 1-1.5m and duration greater than 3 days; or duration greater than 5 days) while the moderate vulnerability (i.e. flood depth of 1-1.5m and duration 1-3 days; or flood depth of 0.5-1m and duration 1-3 days) refers to the area where it have high depth but low duration and finally the low vulnerability (i.e., flood depth of 0-0.5m and duration 1-3 days) means the area that have low risk of flood, normal as perceived by the local people.

Sea Level Rise

734. Global average sea level rose at a rate of 1.8 mm per year over 1961 to 2003. There is broad consensus that the rate of observed sea level rise increased from the 19th to the 20th century and the total 20th century rise is estimated to be around 0.17 m. In comparison, the

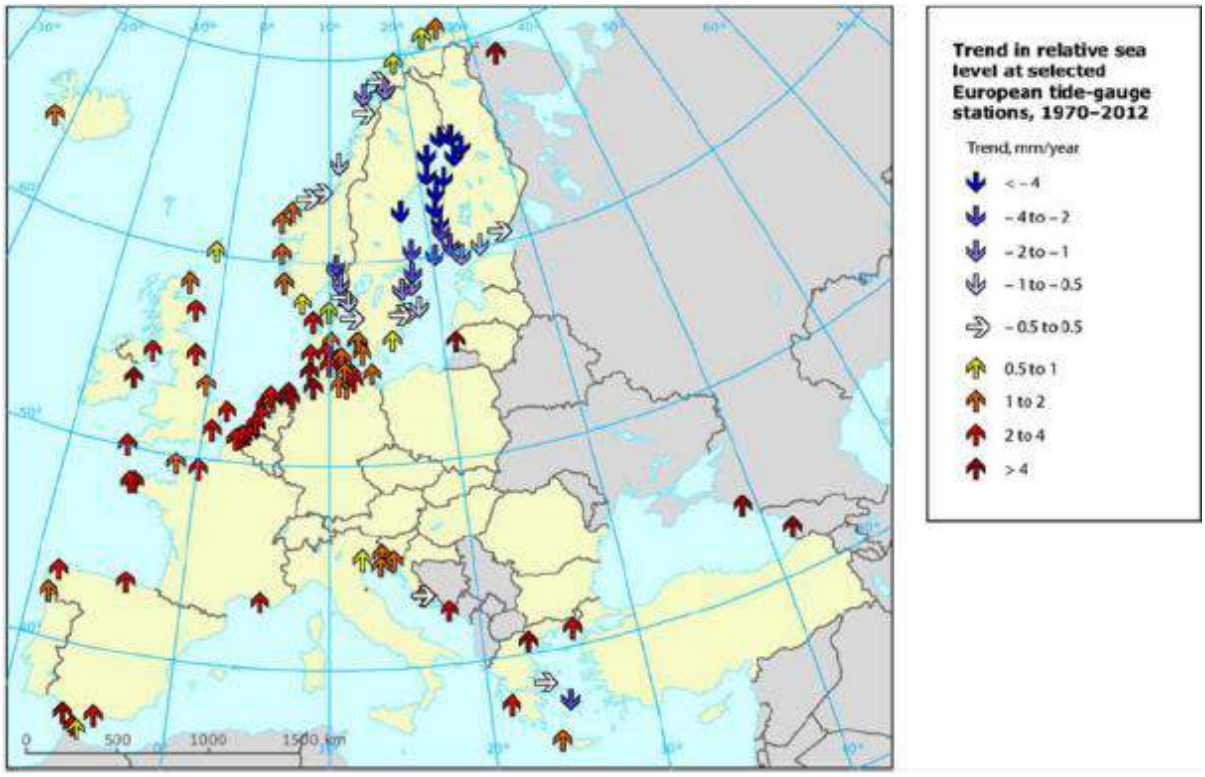
Website: http://drm.cenn.org/Local_Case_studies/Rural%20risk%20assessment%20in%20the%20Rioni%20area%20with%20emphasis%20in%20flood%20risk.pdf

increase of sea level in the Black Sea Basin was by 2.5 mm annually over the last 60 years.[87] This marks a rate higher than global average. The departure of the sea level in the Black Sea from the global mean trend is largely caused by variations in the surface freshwater flux, while land movements are also likely to partly contribute.

735. Critical infrastructure and key assets, especially along coastal areas, are vulnerable to sea level rise caused by climate change, and perhaps more importantly, to extremes of precipitation, wind, and storm surges, which in turn are likely to be exacerbated by climate change and consequent rise in sea levels. In the coastal zone of Georgia, the city of Poti is facing certain risks from the threat of rising sea levels.

736. The trend in relative sea level at selected European tide gauge stations since 1970 is shown in Figure 65. The geographical coverage reflects the reporting of tide gauge measurements to the Permanent Service for Mean Sea Level (PSMSL).[88,89]

Figure 65. Trend in Relative Sea Level at Selected European Tide Gauge Stations Since 1970



Note: These measured trends are not corrected for local land movement and no attempt has been made to assess the validity of any individual fit, so results should not be treated as suitable for use in planning or policymaking.

737. In Batumi where the closest tide gauge station to the Project area is located, the trend in relative sea level is more than 4 mm/year. Assuming an estimated useful life of 40 years for the Poti-Grigoleti-Kobuleti Bypass road, the sea level at the end of this period has the potential

[87] M. N. Tsimplis, S. A. Josey, M. Rixen, E. V. Stanev: On the Forcing of Sea Level in the Black Sea. J. of Geophysical Research, 109, C08015 (2004).
[88] Trend in relative sea level at selected European tide gauge stations, European Environment Agency EEA
[89] European Environment Agency EEA (accessed 1.24.2019). https://www.eea.europa.eu/data-and-maps/indicators/sea-level-rise-3/assessment

to rise more than 160 mm. In other words, the expected maximum tide level at the end of the useful life of the highway will be 0.46-0.56 m.

738. The potential physical impacts to sea level rise in the region include the following:

- Inundation, flood, and storm damage
    - Surge (sea)
    - Backwater effect (river)
- Wetland loss (and change)
- Erosion (direct and indirect change)
- Saltwater intrusion
    - Surface waters
    - Groundwater
- Rising water tables and impeded drainage

Adaptation to Climate Change

739. Climate change is no longer perceived as an impending hazard in the distant future, it is a global transformation that has been taking place for decades and is expected to go on at a faster pace during this century.

740. The transport sector is vulnerable to changes in climate variables, including changes in the frequency and intensity of extreme weather events. Potential effects may include:

- changes in temperature—both a gradual increase in temperature and an increase in extreme temperatures are likely to impact road pavements (for example, heat-induced heaving and buckling of joints);
- changes in precipitation and water levels will impact road foundations;
- extreme weather events such as stronger and/or more frequent storms will affect the capacity of drainage and overflow systems to deal with stronger or faster velocity of water flows; and
- stronger or faster velocity of water flows will also impact bridge foundations; and
- high levels of precipitation may threaten embankment stability.

741. This analysis focused on the effects of climate change on river hydrology in the Project area since the effects of climate change on hydrometeorological processes was identified as the primary impact.

742. Long-term climate change threats have been considered in the planning and designing of the Project, including the incorporation of climate change predictions with respect to bridge hydraulics and scour. The Project bridge has been designed for a 100-year flood event using 4,000 m3/s as the flow value for the main river and 400 m3/s for the canal. Other adaptation measures for the Project include (i) increasing ditch capacity; (ii) plans to maintain positive cross slope to facilitate flow of water from surface; and (iii) plans for all embankments to be seeded to help increase stability. In addition, the material that will form the embankment will be properly selected according to international standards and consistently compacted to assure that if any possibility of flooding processes in the basement, the embankment will remain unchanged and steady.

G. Public Consultations and Information Disclosure

G.1 - General

743. National regulations. Public consultation is a mandatory part of the EIA process in Georgia. The competent authority for the EIA process is MoEPA.

744. Georgian legislation provides a general legal framework governing the public disclosure of information on environmental issues but it lacks any specific requirements related to the design and organization of the stakeholder consultation and engagement process. The Constitution of Georgia guarantees public access to information and states the right of an individual to obtain full, unbiased, and timely information regarding his/her working and living environment.

745. Public participation in project development is regulated under the Law on Environmental Impact Permit. This Law also provides a list of activities subject to the EIA procedure. According to paragraphs 6 and 7 of the Law, the project owner prepares EIA report and is responsible for public engagement, which includes announcing public disclosure of the document in the central and local printed media. The Law states that public participation and provision of access to information are obligatory procedures of the environmental permitting process. This is conducted in the form of a public discussion of the proposed activity with participation by the investor, the MoEPA, and local administrative authorities.

746. It should be noted that that a new procedure which applies to screening, scoping and EIA stages is has been introduced which replaced the Law on Environmental Impact Permit. However, because this Project was started prior to January 1, 2018, when the new law came into effect, the procedures laid out in the original law apply. More information on this and relevant permit application and issuance procedures are provided in Chapter **B. Policy, Legal, and Administrative Framework**.

747. In accordance with the Law on Environmental Impact Permit, public consultation occurs once a draft of the EIA has been prepared. There are no additional requirements for disseminating information, e.g., by means of leaflets, posters and other visual displays, radio/television etc. Neither are there requirements/practices for identifying possible stakeholders (including vulnerable groups) and ensuring their participation. The national regulatory framework also does not contain any specific requirements for development of stakeholder engagement plans (SEP) and/or stakeholder engagement beyond completion of the EIA process.

748. In line with standards described above, two public information meetings with local community representatives in the Project impact corridor and other key stakeholders were held during the feasibility and designs stage in support of the EIA development, which received national government approval in 2018.

749. ADB Safeguards Policies. According to the ADB SPS (2009):

"*The borrower/client will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. Meaningful consultation is a process that:*

1. *Begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle;*

2. *Provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people;*
3. *Is undertaken in an atmosphere free of intimidation or coercion;*
4. *Is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and*
5. *Enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.*

Consultation will be carried out in a manner commensurate with the impacts on affected communities. The consultation process and its results are to be documented and reflected in the environmental assessment report."

750. ADB SPS states that "For environment category A projects, such consultations will necessarily include consultations at the early stage of EIA field work and when the draft EIA report is available during project preparation, and before project appraisal by ADB".

751. In order to complete a full EIA of the Project to meet ADB internal standards as well as Georgian National legislation, additional consultations with stakeholders were undertaken from October 2018 through January 2019. In addition, further consultations will be undertaken as part of the still on-going LARP process. The findings of these consultations will be added to this report once it becomes available.

G.2 - Objectives of Consultations

752. Stakeholder engagement (including consultation and the disclosure of information) is a key element of project planning, development, and implementation. Effective stakeholder engagement assists good design, builds strong relationships with local communities, and reduces the potential for delays through the early identification of issues to be addressed as a project progresses. The objectives of these consultations are:

- to inform and educate the common public, especially potentially impacted communities/ individuals and stakeholders about the proposed project activities;
- to familiarize the people with technical, environmental, social, and economic issues of the project for better understanding;
- to solicit the opinion of the affected communities/ individuals on environmental issues and assess the significance of impacts due to the proposed development;
- to foster cooperation among officers of RD, the communities, and the stakeholders to achieve a cordial working relationship for smooth implementation of the project;
- to identify the environmental issues relating to the bridge and approach roads construction work;
- assess the views of the beneficiary communities and their willingness to participate in the project in a bottom up planning and decision-making process;
- to secure people's inputs in respect of project planning, selection of mitigation measures, and monitoring strategies; and
- to ensure lessening of public resistance to change by providing them a platform in the decision-making process.

G.3 - Methodology Used for Consultations

753. The RD is committed to transparent and respectful dialogue with stakeholders throughout the lifecycle of the project. The approach to stakeholder engagement adopted by

the RD is in line with Good International Industry Practice (GIIP) for EIA and ensures that all stakeholders with an interest in the Project have been identified and consulted.

754. Stakeholder engagement should include:

a) the provision of relevant, timely, and accessible information to stakeholders in a culturally appropriate and understandable format;
b) consultation with stakeholders on their opinions, concerns, preferences and perceived gains and risks with respect to the Project planning and implementation, including the design and proposed management and mitigation measures to reduce potential impacts and to enhance possible benefits; and
c) a grievance mechanism to guide a response and resolution process for stakeholder concerns or grievances.

755. The stakeholder engagement approach employed by the RD for the Project focuses on:

- national and good international practice requirements for public consultation and disclosure that the company will conform to;
- identifying project stakeholders;
- strategy, format, and timetable for consultation and information disclosure from feasibility design phase through operation phase;
- the RD's resources and management structure for developing and implementing the stakeholder engagement activities;
- grievance mechanism(s) for stakeholders; and
- means of reporting on consultation and disclosure activities.

756. Resources and Responsibilities. The RD will take overall responsibility for consultation with all stakeholders in relation to the Project and will use available resources to ensure that all consultation activities are conducted to the appropriate standard.

757. The RD Environmental and Social team will be responsible for (i) communication with stakeholders, within the scope of its field of competence, throughout the EIA process; and (ii) consideration of the comments received from the stakeholders in the final version of the EIA report.

758. The Contractor will be responsible for nomination of a Community Liaison Officer (CLO) and implementation of grievance procedure. During the project implementation phase, the Contractor's staff will be responsible for communicating with the local community and handling grievances. The RD will be kept informed (a copy of the grievances, if any, will be sent to the RD) and will closely monitor the grievance resolution mechanism. The scale of RD's involvement will depend on the scale and subject of the grievance raised.

759. Monitoring and Reporting. It is important to monitor stakeholder engagement to ensure that consultation and disclosure efforts are effective, and in particular that stakeholders have been meaningfully consulted throughout the process. Monitoring will include:

- monitoring consultation activities conducted with government authorities and non-governmental stakeholders;
- monitoring the effectiveness of the engagement processes in managing impacts and expectations by tracking feedback received from engagement activities and recording and tracking commitments made to stakeholders; and
- monitoring any grievances received and their resolution.

760. The stakeholder engagement process will be revised and updated as needed and appropriate during construction stage of the project.

G.4 - Identification of Stakeholders

761. The IFC's Handbook on Stakeholder Engagement (2007) defines stakeholders as "persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively."[90]

762. The stakeholder identification has been done based on following criteria:

- **Dependence:** Stakeholders who can be directly or indirectly affected by the project implementation or company activities
- **Influence:** Stakeholders who are able to influence the project progress and the ability of the proponent to develop the project successfully
- **Partnership:** Stakeholders who have a potential for building mutually advantageous partnerships and long-term relationships
- **Expressed interest:** Stakeholders who expressed an interest in the EIA process

763. In addition, 'legitimate stakeholder representatives' were identified for stakeholder consultation (e.g., elected officials, non-elected community leaders, leaders of informal or traditional community institutions, and elders within the affected community).

764. Taking into consideration the location and scope of activities to be implemented under the planned development, the following list of key stakeholder groups were consulted:

- Local communities within the Project's area of influence – Poti and Khobi municipalities. Vulnerable groups within the affected communities were specifically targeted.
- NGO and conservation groups (e.g., Fauna & Flora International (FFI), World Wildlife Fund (WWF), Fisheries and Black Sea Monitoring Service, and Sabuko).
- Municipal government – Poti Municipality.
- Ministries and departments (e.g., Roads Department, Ministry of Environment Protection and Agriculture, and Ministry of Environment Protection and Agriculture (MoEPA)).
- Other relevant institutions (e.g., Kolkheti National Park).

765. In compliance with ADB's SPS requirements, consultations will continue throughout the planning and implementation phases. The public consultation process will also be open for review and comment and revised as appropriate throughout the course of the project. Therefore, this list of stakeholders is expected to expand/change in composition as the Project moves to construction and operations. Additional stakeholder groups might include:

- Suppliers and businesses
- IFI's, donors, and implementing units on other projects that are likely to contribute to cumulative impacts

[90] International Finance Corporation, 2007, Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets, https://www.ifc.org/wps/wcm/connect/938f1a0048855805beacfe6a6515bb18/IFC_StakeholderEngagement.pdf?MOD=AJPERES

- Shareholders
- Contractor and Subcontractors (when identified)
- Employees of the Vartsikhe HPP

766. Table 79 below details the processes undertaken and planned for stakeholder engagement at different stages of the Project to date.

Table 79. Stakeholder Engagement and Format of Information Disclosure

Stakeholder	Engagement procedure/method	Format and information disclosed
○ Decision makers, regional governmental authorities, community	○ Information ○ Interviews ○ Meetings	○ Information on internet, emails ○ Technical and non-technical documents ○ Project summary
○ Stakeholders in the Project area	○ Meetings during site visit ○ Participatory process / public meetings	○ Information about the planned development, location of the project sites, employment requirements, objectives of the environmental assessment ○ Leaflets
○ Governmental officials including local/regional officials, and environmental protection authorities	○ Interviews ○ Meeting ○ Participatory process / public meetings	○ Non-technical documents ○ Technical and non-technical documents ○ Project summary
○ Environmental and other NGOs and initiative groups	○ E-mail, phone ○ Interviews ○ Meetings ○ Participatory process / public meetings	○ Non-technical documents ○ Project summary
○ Businesses	○ Participatory process / public meetings ○ E-mail, phone	○ Leaflets ○ Non-technical documents ○ Project summary
○ Affected Community	○ Interviews and focus group discussions ○ Surveys ○ Meetings during site visit ○ Participatory process / public meetings	○ Leaflets ○ Non-technical documents ○ Project summary
○ All stakeholders invited	○ Public meeting as required under the Georgian legislation once the draft EIA is disclosed	○ Leaflets ○ Non-technical documents ○ Project summary

Note: Hard copies of the full EIA (which received national government approval in 2018) were made available in governmental offices in the project affected municipalities, RD, and Gamma Consulting offices; and electronic copies were made available on the RD's website.

G.5 - Stakeholder Engagement Activities

767. Stakeholder outreach has been an ongoing process which began during the preparation of initial environmental screening at feasibility study stage through consultations held during preparation of the national EIA and this detailed EIA.

768. In accordance with standards described above, two public information meetings with local community representatives in the Project impact corridor and other key stakeholders were held during the feasibility and designs stage in support of the EIA development, which received national government approval in 2018. Both meetings were held in Poti and took

place in on June 30, 2017 and January 12, 2018. Minutes from those meetings are provided in **Annex 2. Stakeholder Engagement Meeting Minutes**.

769. In order to complete a full EIA of the Project to meet ADB internal standards as well as Georgian National legislation, additional consultations with stakeholders were undertaken from October 2018 through January 2019. Those discussions, and the information gathered from site visits, directly informed this EIA. The targeted consultations were also integral in supporting development of the BAP, which assesses the potential risks to Critical Habitat in alignment with the ADB SPS. Meeting minutes from those stakeholder discussions is also available in **Annex 2. Stakeholder Engagement Meeting Minutes**, Section **2.c - Targeted Supplemental Consultation for EIA**.

G.6 - Public Disclosure

770. Environmental information on the project was and will be disclosed as follows:

1) the domestic EIA reports are available for review on the RD's website. The electronic copies of the mentioned reports will remain in the public domain up to completion of the construction phase.
2) this current EIA will be disclosed on ADB's website for 120 days prior to Management consideration of the financing requests for Lot 2, Stage 1. Any further updates to the EIA will also be disclosed.
3) Hard copies of the project EIA reports will be made available upon request; and
4) during implementation, semi-annual monitoring reports on compliance with the EIA and EMP will be disclosed on ADB's website.

771. The RD will be responsible for notifying and informing the public of construction operations prior to construction works, publish an emergency response plan disclosing intentions to deal with accidents and emergencies, including environmental/public health emergencies associated with hazardous material spills and similar events, etc. During operation, information about any maintenance (location, type of maintenance required, etc.) will be communicated to the stakeholders by the RD through established procedures.

H. Grievance Redress Mechanism

H.1 - Introduction

772. Grievance Redress Mechanisms (GRMs) are a locally based, formalized way to accept, assess, and resolve community feedback or complaints. They provide predictable, transparent, and credible processes to all parties, resulting in outcomes that are relatively low cost, fair, and effective. They build on trust as an integral component and facilitate corrective action and pre-emptive engagement. GRMs also set out a timeframe in the resolution of complaints.[91] The Project GRM will serve as a venue for receiving and addressing project-affected peoples' concerns and grievances about environment and social related impacts. It will address concerns promptly through an understandable and transparent process that is accessible to all members of the community, gender responsive and culturally appropriate. The overall approach of the GRM is to deal with grievances at a local level first in an efficient manner and escalate to the next level or higher level of authority if grievance cannot be resolved.

773. The ADB Accountability Mechanism (AM) provides an independent forum and process for people to voice and seek solutions to their problem as well as alleged non-compliance by ADB with its operational policies and procedures. As ADB adheres to early problem prevention and problem-solving, Project complaints and concerns should first be addressed promptly and effectively at the Project, through the GRM, and operational levels. The AM is the "last resort" process for dealing with problems and compliance issues that were not prevented or solved at GRM and operational levels.

774. The GRM should be established and operated in compliance with the Georgian Regulations and ADB Policy requirements. The ADB's 2009 Safeguards Policy Statement[92] requires the borrower/client to establish a mechanism that will receive and facilitate the resolution of affected persons' concerns and grievances about physical and economic displacement and other Project impacts, paying particular attention to vulnerable groups.

H.2 - Georgian Regulations

775. The Administrative Code of Georgia is the legal document defining the rules and procedures for any grievance review and resolution within the national regulatory framework.

776. According to the law, the Administrative body receiving officially lodged claims is obliged to review the claims and engage the claimant in the grievance review and resolution process, and issue final decision in that regard.

777. Clause 181. Of the law defines the content and the grievance submission forms. In particular, the grievance package should include: a) Name of the administrative body to whom the complaints are addressed; b) Name, address and contact details of the claimant; c) Name of the administrative body, who's decisions or administrative acts are the subject of complain; d) Name of the administrative act or decision, which is subject of complain; e) Content of the claim; f) The context and facts, based on which the complaint is substantiated; g) list of attachments

778. Clauses 194 and 198 define the rules and procedures ensuring participation of the claimants in the grievance review process.

[91] World Bank. 2014. Global Review of Grievance Redress Mechanisms in World Bank Projects. Washington, DC. © World Bank.
[92] ADB. 2009. *Safeguards Policy Statement.* Manila.

779. According to the clause 202, the decision issued by the Administrative Body in relation with the reviewed claim has a status of individual administrative legal act.

780. The standard period given for the issuance of the decision in relation with the grievance is one month.

H.3 - Grievance Redress Mechanism Structure

781. The EIA includes in its scope the establishment of a responsive, readily accessible and culturally appropriate grievance redress mechanism (GRM) capable of receiving and facilitating the resolution of affected persons' concerns and grievances related to the project. An established grievance redress mechanism allows an AP to appeal any decision, practice or activity arising from land or other assets compensation that they disagree with. The scope of the GRM is to address issues related to involuntary resettlement, social and environmental performance, and information disclosure.

782. The APs will have the right to file complaints and/or queries on any aspect of the project, including environmental issues and other social aspects such as land acquisition and resettlement. Under the adopted grievance mechanism, the APs may appeal any decision, practice or activity related to the project. All possible avenues will be made available to the APs to voice their grievances. The IA will ensure that grievances and complaints on any aspect of the project are addressed in a timely and effective manner.

783. The fundamental objectives of the Grievance Redress Mechanism are:

- To reach mutually agreed solutions satisfactory to both, the Project and the APs, and to resolve any grievances locally, in consultation with the aggrieved party;
- To facilitate the smooth implementation of the EIA and LARP, particularly to cut down on lengthy litigation processes and prevent delays in Project implementation;
- To facilitate the development process at the local level, while maintaining transparency as well as to establish accountability to the affected people.

784. APs were fully informed of their rights and of the procedures for addressing complaints whether orally or in writing during the EIA and LARP consultations and surveys and will be informed again when the compensation is disbursed. Care will be taken to prevent grievances rather than relying solely on the redress process. This can be achieved by establishing extensive communication and coordination between the affected communities, the EA, and local governments in general.

785. The GRM consists of two systems: (i) the project-specific system established at the municipal level; and (ii) a regular system established at RD. Local Grievance Redress Mechanisms (LGRM), are established at a municipal level as a project-specific instrument and function for the duration of Project implementation. The Grievance Redress Commission (GRC) was formed as an informal structure within the RD / MRDI to record and ensure grievance review and resolution.

786. Local Grievance Redress Mechanisms (LGRM). The LGRM is an informal, project-specific grievance redress mechanism established to administer grievances at Stage 1. This informal body will be established at project affected site/community level and will comprise Khobi Municipality and Poti Mayor's Office. The core team of LGRM will be formed by the local social safeguards/resettlement officers of RD / MRDI, Contractor, and Engineer. The chief social safeguards/resettlement specialist of RD / MRDI is nominated as a coordinator of LGRM

(Coordinator). Currently, the key local resettlement officer of RD / MRDI is Mamuka Gelekva. Social safeguards/Resettlement specialist of the Engineer will be nominated as a Secretary of LGRM responsible for establishment and maintenance of the local level grievance log and recording all grievances.

787. Participation of the representatives of Poti Mayor's Office, Khobi Municipality and local Sakrebulo in LGRM is important, as very often significant part of grievances is directed by project affected people (PAPs) to the local municipalities. Apart from that, there are many issues at local level that may require involvement of local authorities (i.e., issues related to determination of the land ownership rights; impacts on community infrastructure, etc.).

788. LGRM will be established as informal structure during a meeting in Poti Mayor's Office prior to Project construction and will be fixed by the minutes of meeting. Internal regulations of LGRM will be developed by LGRM Coordinator and will be reviewed and adopted by the majority of LGRM members. The LGRM will include following members:

Table 80: Local Grievance Redress Mechanisms (LGRM) Members

Name	Position	Status
Mamuka Gelekva	The chief social safeguards/resettlement specialist of RDMRDI	Coordinator
Archil Jorbenadze	ADB Project Coordinator RDMRDI/ETCIC	ADB Monitoring
To be determined	Representative assigned by Poti Mayor	Member
To be determined	Representative of Poti Sakrebulo	Member
To be determined	Representative assigned by Khobi Municipality	Member
To be determined	Representative of Khobi Sakrebulo	Member
To be determined	Social safeguards specialist of CW Contractor	Member
To be determined	Social safeguards specialist of Engineer (CSC)	Member Secretary
Reno Jolokhava	Representative of APs	Member

789. The Grievance Redress Commission (GRC). The GRC was formed by the order (No. 224) of the Head of the RD as a permanent and functional informal structure, engaging personnel of RD from all departments to work on Land Acquisition and Resettlement (LAR) and environmental issues and complaint resolution. It consists of 17 permanent members, two secretaries and three non-permanent members without the right of vote. This includes the top management of the RD / MRDI, safeguard or LAR units, legal other relevant departments (depending on the specific structure of the IA). The GRC is involved in Stage 2 of the grievance resolution process. The order states that if necessary, a representative of local authorities, NGOs, auditors, APs and any other persons or entities can be included in the Commission as its members. The list of the permanent members is presented in the following table:

Table 81: Grievance Redress Commission (GRC)

No	Name of Member	Position
1	Irakli Karseladze	Head of the Commission
2	Aleksandre Tevdoradze	Deputy Head of the Commission
3	Levan Kupatashvili	Member
4	Giorgi Tsereteli	Member
5	Koba Gabunia	Member
6	Salome Tsurtsumia	Member
7	Pikria Kvernadze	Member
8	Davit Sajaia	Member
9	Giorgi Eragia	Member
10	Nodar Agniashvili	Member
11	Mikheil Ujmajuridze	Member
12	Nino Mtsuravishvili	Member
13	Gia Sopadze	Member
14	Akaki Mshvidobadze	Member
15	Davit Kaladze	Member
16	Davit Getsadze	Member
17	Pavle Gamkelidze	Member
18	Girogi Tsagareli	Non-permanent member of commission
19	Mariam Begiashvili	Non-permanent member of commission
20	Archil Jorbenadze	Non-permanent member of commission

H.4 - Grievance Redress Process

790. Stage 1: Grievance resolution at the local level and LGRM. Stage 1 of the grievance resolution process comprises collection of the grievances that have been submitted at the local level (to affected Municipalities; Contractor; RD / MRDI local representatives, etc.) and review and resolution of the grievances that could be administered at the local level without engagement of the GRC. The type of complaints that could be resolved at the local level include usually construction related environmental and social impacts, like damage of assets, community infrastructure, dust emissions or noise impacts, traffic safety issues, etc. LGRM has no competence to resolve many LAR related issues, like verification of the inventory of losses and repeated valuation of lost assets, however LGRM should support collecting such type grievances and directing them to the GRC central office for further review and resolution under the Stage 2 process. All types of grievances that have not been successfully resolved at the LGRM level through the Stage 1 process, will be redirected to the GRC with the supporting documents describing the efforts of LGRM to resolve the grievance.

791. After the grievance enters the LGRM through the local entry points (Municipality and contact persons nominated by RDMRDI, CW Contractor, Engineer) or from RD / MRDI central office, Coordinator and Secretary of LGRM together with the representative of Contractor shall meet with the aggrieved affected person (AP) and sign the minutes that record a description of the grievance, the dates when the grievance is submitted, and brief content of the agreements made. After receiving the grievance, the LGRM is the body where the grievance should be redirected and it should be the responsibility of LGRM to fix the grievance and check its validity. Despite the opinion of the Contractor, in case if the majority of the LGRM members decide that the damage is subject for compensation by Contractor, the Contractor is obliged to pay compensation or restore the damaged asset. In case if Contractor refuses to fulfil their

obligation, the local GRM directs the grievance to RD / MRDI and RD / MRDI management either enforces Contractor to pay compensation, or RD / MRDI pays compensation itself and later deducts the compensation amounts from next payments to Contractor. More detailed procedure in that regard should be agreed with ADB.

792. During the meeting with AP, they shall be informed of the overall grievance mechanism including their right to refuse the solutions offered under the grievance resolution procedures of Stage 1. Grievances submitted are registered in grievance log which is locally managed by the secretary of LGRM and the same logs will be sent to RD / MRDI weekly. These logs then are integrated within the entire log system centrally managed by the secretary of GRC (see below). Response should be sent to complainants at this stage together with the minutes and plan of agreed actions within 10 days of the reception of the grievance. If the AP is not satisfied with the solutions offered by the RD / MRDI, the grievance case will proceed to Stage 2. This mechanism enables unimpeded implementation of the Project and timely satisfaction of complaints. If the AP is not satisfied, the secretary of LGRM should assist him/her in lodging an official complaint in accordance with the procedures of Stage 2 (the plaintiff should be informed of his/her rights and obligations, rules and procedures of making a complaint, format of complaint, terms of complaint submission, etc.). The secretary of LGRM will assist the AP to collect and submit supplementary documents needed for grievance review at the Stage 2 and will supplement the grievance package with notes and documents describing the efforts of GRCE to resolve the grievance at Stage 1.

793. Stage 2 – GRC review of AP's complaint. For Stage 2 of grievance resolution process the RD / MRDI has established a GRCN as a formal mechanism that will be called upon each time a complaint reaches the Stage 2. The GRC notifies the AP about the receipt of the grievance within 10 days, reviews the written complaints of APs which were not satisfied at Stage 1 or are not of competence of LGRM, and within one month informs the AP about the decision in compliance with the Administrative Code of Georgia. If the complainant is not satisfied with the decision of GRC, then she or he may proceed with a court case.

794. The internal regulations for the GRC allows, if necessary, engagement of representative of local authorities, NGOs, auditors, APs and any other persons or entities in the work of commission. The GRC will convene every time a grievance is escalated to Stage 2. GRC has an appointed person as a secretary/convener responsible also for keeping the records of the minutes from GRC meetings. GRC has nominated person responsible for monitoring and keeping the log of grievances for this project, as well as other ADB financed projects. The GRC Monitor is responsible to track implementation of the GRC decision. GRC will be immediately notified if there are delays or hurdles in carrying out the decision. GRC will allocate all necessary resources to ensure implementation of a decision.

795. Stage 3 – Court decision. If complainants are not satisfied with the decision of the GRC, they have the right to bring the case to the court. The aggrieved AP can take a legal action not only about the amount of compensation but also any other issues, e.g. occupation of their land by the contractor without their consent, damage or loss of their property, restrictions on the use of land/assets, etc. The decision of the court is final.

Table 82: Grievance Resolution Process

Steps	Responsible Party	Process
Step 1		The complaint is informally reviewed by the local resettlement officer, which takes all necessary measures to resolve the dispute at local level. The response time is 10 days. The grievance has to be logged. RD / MRDI appropriate person have to be informed.

		If the grievance is not solved during the negotiations, the local resettlement officer has to assist the aggrieved APs to formally lodge the grievances to the RD / MRDI.
Step 2		The aggrieved APs shall submit their complaints to the GRC within 1 week after completion of the negotiations at the village level. The aggrieved AP shall produce documents supporting his/her claim. The GRCN member secretary has to review the complaint and prepare a Case File for GRC hearing and resolution. A formal hearing has held with the GRC at a date fixed by the GRC member secretary in consultation with Convener and the aggrieved APs. The hearing will include resettlement specialist, social safeguards specialist, and any other relevant employee or consultant. The hearing will be led by the Head of the RD / MRDI or by Deputy Head. The decisions from the majority of the members will be considered final from the GRC at Stage 2 and will be issued by the Convener and signed by other members of the GRC. The case record will be updated and the decision will be communicated to the complainant AP. The response period after decision is one week.
Step 3		If the RD / MRDI decision fails to satisfy the aggrieved APs, they can pursue further action by submitting their case to the appropriate court of law (Rayon Court). The aggrieved AP can take a legal action not only about the amount of compensation but also any other issues (e.g., occupation of their land by the contractor without their consent, damage or loss of their property, restrictions on the use of land/assets, etc.).

H.5 - GRC Records and Documentation

796. RD will keep record of all complaints received for its use as well as for any review by ADB during regular supervisions. The records in Grievance Logs should include the following information:

- Number of claims
- Name and contact details of the claimant
- Date of receiving claim
- Form of claim – (oral or written)
- The entry point/source that received the claim initially
- The brief description of the essence of claim
- Identification number or index of the package of documents related to the case
- The interim status of the grievance resolution process (key actions planned or agreed: stages, dates and participants of negotiations with the AP with GRC (stage 2)
- Final status of the grievance resolution (a. pending; b. closed to satisfaction of both parties; and c. Negative decision – GRM denies the claim)
- Date of the final decision of GRM/ date of closure

797. Additional information on the resolution of LARP related grievances is provided in the LARP.

H.6 - Communication

798. Prior to start of site works, the Contractor shall:

- Communicate the GRM to communities in the project impact zone.
- Set-up and publicize a 24-hour hotline for complaints.
- Ensure that names and contact numbers of representatives of LGRM, the RD and the Contractor are placed on the notice boards outside the construction site.

799. In addition, it is recommended that the RD consult with PAP representatives prior to implementation of the GRM to make any necessary revisions, if appropriate, to make the process more effective and ensure PAPs ownership/active participation in the process.

800. The complaints resolution process was presented formally during the public consultations. The grievance redress mechanism will also be presented during routine community meetings in the Project area during the construction phase of the Project.

I. Environmental Management Plan and Institutional Requirements

I.1 - Environmental Management Plan

801. Through a systematic assessment, the EIA has identified a number of significant environmental and social impacts which may potentially result from the construction and operation of the Project. In order to manage and mitigate these impacts, a range of measures have been developed to reduce the overall residual impacts to acceptable levels and as low as reasonably practicable. Implementing and tracking the effect of these management and mitigation measures is an essential element to ensuring that the assessed residual impact levels are confirmed.

802. The Environmental Management Plan (EMP) provides details on the implementation of mitigation measures, monitoring program, cost estimates, and institutional arrangement to ensure that no significant adverse impacts results from the investment.

803. The basic objectives of the EMP are to:

- establish the roles and responsibilities of all parties involved in the Project's environmental management;
- ensure implementation of recommended actions aimed at environmental management and its enhancement; and
- ensure that the environment and its surrounding areas are protected and developed to meet the needs of the local communities including other stakeholders and safeguard the interests of the local people.

804. The environmental mitigation measures have been differentiated into the following three stages: (i) Pre-Construction Stage; (ii) Site Preparation, Construction and Worksite Closure (i.e., project closure) Phases; and (iii) Operation Stage.

805. Pre-Construction Stage. The mitigation measures adopted during design or pre-construction stage are preventive in nature and include the following scope of management actions:

- baseline monitoring pre-development (e.g., noise monitoring, walkover surveys);
- environmental engineering design requirements for operations phase (e.g., to ensure that the necessary mitigation measures for key environmental variables such as climate change are investigated and incorporated into the design);
- approvals, permits, and licensing requirements for construction (e.g., licenses for quarry operation and relocation of utilities); and
- environmental management planning to be undertaken during the construction phase (i.e., thematic management plans. Guidance and direction are provided in **Annex 7. Thematic Management Plans**).

806. Site Preparation, Construction and Worksite Closure (i.e., project closure) Phases. To address the adverse impacts during construction, the EMP includes measures to avoid, minimize, or mitigate potentially adverse impacts and risks and, as a last resort, propose compensatory measures. Various physical, biological, and socio-economic impacts have been summarized in the EMP.

807. Operation Stage. The operation phase mitigation measures cover good operating practices to ensure the sustainable management (i.e., to avoid and / or minimize environmental damage) of the environment through the operational life of the road section.

808. The EMP will be included into the bidding documents so that bidders can consider and incorporate their environmental responsibilities into their bid proposals. Later the EMP becomes an integral part of a contract for the provision of works and is binding for implementation.

809. A detailed EMP is presented in Section **I.10 - Management Plans** below.

I.2 - Environmental Monitoring Plan (EMoP)

810. A companion document of the EMP, the Environmental Monitoring Plan (EMoP) provides the procedures and actions that recognize and analyze environmental and social changes consequent to the pre-construction, construction, and operational phases of the project. The monitoring ensures that:

- legal standards for environmental parameters are not exceeded;
- mitigation measures are implemented in the manner described in the ESMP;
- changes to baseline environmental and social conditions during the project activities are continually monitored;
- early warning of environmental and social damage is recognized so that action may be taken, if possible, to prevent or reduce the seriousness of the unwanted impact; and
- corrective actions or new adaptive management programs are implemented, as required, if proposed mitigation measures are unable to reduce and/or eliminate potential project related impacts or meet the predetermined level of performance.

811. Regular monitoring of air quality, water quality and noise levels against Georgian and IFC standards shall be carried out throughout the construction and commissioning periods. The party responsible for monitoring will be the Engineer who will report the results to the RD. The reports shall clearly indicate the monitoring dates, times, locations, weather conditions, types of equipment used and calibration information.

812. A monitoring plan defining all parameters to be monitored, with tentative location, project stages for measurements, implementation and institutional responsibility for different environmental components is prepared for all stages of project and presented in Section **I.10.4 - Environmental Monitoring Plan**.

I.3 - Specific EMP (SEMP)

813. The SEMP is the document that the Contractor shall prepare outlining how he intends to implement the EMP and ensure that all of the mitigation and monitoring is completed according to the implementation arrangements specified in this EMP and the EIA as a whole.

814. The SEMP will describe the precise location of the required mitigation / monitoring, the persons responsible for the mitigation / monitoring, the schedule and reporting methodology. The SEMP and all of its thematic management plans (i.e., topic and location specific plans) will be submitted to the Engineer and RD for approval at least 10 days before taking possession of any work site. No access to the site will be allowed until the SEMPs are approved by the Engineer and RD, and where indicated in the tables below, the ADB. The SEMP will include the following thematic management plans:

Table 83: Approvals for Thematic Management Plans

Plan	Approvals		
	RD	Engineer	ADB
Waste Management Plan	Yes	Yes	No
Wastewater Management Plan	Yes	Yes	No
Spoil Disposal Management Plan	Yes	Yes	Yes
Soil Erosion Management Plan	Yes	Yes	No
Traffic Management Plan	Yes	Yes	No
Method Statement for Temporary Roads	Yes	Yes	No
Aggregate and Borrow Pits Management Plan	Yes	Yes	No
Employment and Procurement Procedure	Yes	Yes	No
Occupational and Community Health and Safety Management Plan	Yes	Yes	No
Emergency Response Plan	Yes	Yes	No
Waterway Safety Plan	Yes	Yes	No
Method Statement for River Crossings	Yes	Yes	No
Air Quality Plan	Yes	Yes	No
Spill Management Plan	Yes	Yes	No
Clearance, Revegetation, and Restoration Management Plan	Yes	Yes	No
Noise Management Plan	Yes	Yes	No
Biodiversity Management Plan	Yes	Yes	Yes
Laydown Area and Construction Camp Management Plan	Yes	Yes	Yes *(for Construction Camp Management plan if needed)*
Asphalt, Rock Crushing, and Concrete Batching Plant Management Plans	Yes	Yes	No
Bridge Construction Method Statement	Yes	Yes	Yes
Chance Finds Procedure (included in **Annex 6. Chance Find Procedure**)	NA	NA	NA

815. Direction and guidance on what the above-mentioned thematic management plans should cover is provided in **Annex 7. Thematic Management Plans**. A template for the SEMP is provided in **Annex 8. Specific Environmental Management (SEMP) Plan**.

816. A standalone Project Biodiversity Action Plan (BAP) for those specific species or habitats of greater note has been prepared and included as part of this EIA (see **Annex 1. Biodiversity Action Plan (BAP)**). The BAP will help ensure net gain of natural habitats and support notable species of conservation importance. The responsibility for the implementation of the BAP is with the Engineer and the RD.

I.4 - Reporting and Review of the EMP

817. **Reporting.** The following reporting requirements will be followed during the implementation of the EMP and Contractor's SEMP:

Table 84: Reporting Requirements

Responsibility	Requirement	Submitted to
Contractor	Quarterly Environmental and Social Reports	Engineer / RD

Engineer	Monthly Environmental, Social and Health and Safety Reports, to include at least the following items:
	• Summary of Works to Date.
	• Status of EMP.
	• Status of Licenses and Permits.
	• Summary of camp site and work site inspections, i.e. observational monitoring by the Engineer.
	• Results of instrumental monitoring undertaken by the Contractor, including:
	  o Air Quality
	  o Noise
	  o Soil
	  o Surface Water
	• Non-compliances identified during the reporting period.
	• Update on previously identified non-compliances.
	• Correspondence with the Contractor regarding environmental and social issues.
	• Findings from stakeholder meetings (per the SEMP).
	• Table of grievances and actions to manage on-going grievances.
	• Summary of accidents during the reporting period.
	• Summary of meetings between the Engineer and Contractor regarding environmental, social and health and safety issues.
	• Overview of training provided by the Contractor during the reporting period.
	
	The report will be published monthly on the RD website.
		RD

RD / Engineer	Bi-annual Environmental and Social Reports summarising the findings of the monthly and quarterly reports prepared by the Contractor and the Engineer	ADB
External Monitoring Consultant	Annual Report	ADB

818. Review of EMP. The EMP shall be reviewed periodically to evaluate environmental controls and procedures to make sure they are still applicable to the activities being carried out. Reviews will be undertaken by the Contractor's ESO and Engineer as follows:

- The full EMP shall be reviewed at least annually;
- Relevant parts of the EMP shall be reviewed following a reportable incident;
- In case any issues of failure of mitigation measure to reduce the impact occurs;
- Relevant parts of the EMP shall be reviewed following the receipt of an updated site specific or topic specific plan; and
- At the request of stakeholders.

819. The review shall include analysis of the data collection and analysis of data, monitoring reports, incident reports, complaints/grievances and feedback from stakeholders.

I.5 - Bid Documents

820. The Bid Documents for the potential Contractor will contain two sections relating to environmental issues, firstly a basic clause indicating that the Contractor will be responsible for following the requirements of the EMP and that he should prepare his own SEMP for the

Project. Secondly, the EMP shall be repeated in its entirety as an Annex to the Bid Documents so as the bidder is aware of his environmental requirements under the Project and help him put environmental costs to his proposal.

I.6 - Contract Documents

821. The Contract Documents will follow a broadly similar pattern to the Bid Documents. It is not considered necessary to repeat the mitigation measures verbatim in a list of environmental contract provisions, rather the Contract will specify that the Contractor is responsible for implementation of the EMP via his SEMP. Again, the EMP will be included as an Annex to the Contract so the Contractor will be liable for any non-conformance with the EMP, and thereby this EIA.

I.7 - Contractor Requirements

822. The Contractor will be responsible for the preparation of the SEMP. The SEMP will need to be fully compliant with the EMP and this EIA as a whole and will need to be prepared within 30 days of Contract award and approved 10 days prior to access to the site.

823. The Contractor is also responsible for engaging external services from a certified laboratory for instrumental monitoring of air quality, noise, soil, and water during the construction phase (see **I.10.4 - Environmental Monitoring Plan**).

824. Further, at completion of the construction phase and prior to the start of the defects liability period, the Contractor shall be responsible for preparing an Operational Phase EMP for the Project. The Contractor shall implement the plan during the defects liability period and hand over the plan to the RD for continued implementation after this period.

825. Environmental and Social Officer. During construction, the Contractor must retain the expertise of an Environmental and Social Officer (ESO) to implement and continually update the SEMP and to oversee and report on the operation throughout the contract period.

826. The required qualifications of the ESO are as follows:

- Degree in environmental sciences and related expertise
- Fluent in Georgian and English
- Experience of at least one construction project of a similar size and scale

827. The ESO will be responsible for the preparation of weekly environmental checklists and an environmental section of the Contractor's monthly progress reports that shall be submitted to the Engineer for review. The Engineer shall provide a template of the checklist to the Contractor.

828. The monthly reports, which will include the weekly environmental checklists, shall contain sections relating to:

1) general progress of the Project;
2) environmental Incidents; e.g., spills of liquids, accidents, etc.;
3) progress of any environmental initiatives, e.g. energy savings, recycling, etc.;
4) records of any environmental monitoring, both observational and instrumental; and
5) conclusions and recommendations.

829. The ESO shall provide relevant training at the construction camp (if constructed) and also at construction sites. The ESO shall keep a record of all monthly training undertaken.

830. The ESO will also act as the Focal Person at the Project site for receiving and fixing grievances in the Log Book. The ESO shall also manage all social and labor related issues. The ESO will also act as the Contractors 'Environmental Manager' as required by Article 15 of the Waste Management Code (2015).[93]

831. Health and Safety Specialists. The Contractor shall also hire qualified Health and Safety (H&S) Specialists for the Project duration. According to Georgian Law at least 1 H&S specialist is required for every 50 workers. The H&S specialists shall have at least five years on-site experience of similar sized infrastructure Projects. A Lead HSS shall be nominated to lead the health and safety team, the Lead HSS will also deputize for the ESO when he is absent from the site.

832. The H&S specialists shall report directly to the ESO. The main responsibilities of the H&S specialists will be:

- Provide H&S training, including daily toolbox training sessions at each work site.
- Approve H&S Plans for specific work activities.
- Conduct routine site inspections and issue internal stop notices if necessary, for unsafe activities.
- Maintain H&S statistics log for near misses, as well as incidents.
- Provide H&S input to Contractor reports.

833. Community Liaison Officer. The Contractor will be responsible for nomination of a Community Liaison Officer (CLO) who will ensure that the grievance mechanism is available to all stakeholders, involves an appropriate level of management and addresses concerns promptly. They will ensure that the process is understandable and transparent and provides feedback to those concerned without any retribution.

834. **Staff Costs.** The following table provides a summary of the anticipated staff cost.

Table 85: Contractor Environmental, Health and Safety Staff Costs

#	Position	No. of Months	Month Cost ($)	Total Cost ($)
1	Environmental and Social Officer	48	1,500	72,000
2	Health and Safety Specialist	48 per HSS	1,500	72,000 per HSS
3	Community Liaison Officer	48	1,500	72,000

I.8 - Engineer Requirements

835. The Engineer is tasked with specific responsibility to review designs and ensure safeguard compliance of civil works – with particular emphasis on the monitoring of implementation of EMP through the Contractor's SEMP and related aspects of the project. The specific tasks will include the following:

836. Prior to commencement of the works:

[93] Article 15 – Environmental Manager **-** The persons under Article 14 of this Law shall nominate a suitable person as a company environmental manager.

- organize a training program for MRDI and RD staff on how the environmental aspects of the project will be monitored, giving emphasis on SEMP evaluation; compliance monitoring of construction activities and preparation of corresponding reports; supervision responsibilities and interaction with contractors; and documentation, resolution and reporting of non-compliance issues and complaints;
- provide guidance to the RD's environment specialist on the environmental and social aspects of the project with emphasis on compliance monitoring and reporting;
- assist the RD with establishing and operating the grievance redress mechanism, including creating a grievance chart (format to be agreed with the RD) which is to be updated on a weekly basis;
- evaluate the environmental aspects of the contractors' method statements and working drawings and recommend corrective actions needed, if any, to ensure compliance with the project's environmental and social requirements;
- review the Contractors' SEMP and all topic specific (such as waste) and site specific (such as construction camp) plans; recommend modifications to these documents to be compliant with: (a) the environmental and social requirements of the construction contracts as reflected in the EMP; and (b) the conditions of environmental approvals of the Government, if required;
- develop the compliance monitoring system to be used during the construction period for monitoring the contractors' performance relative to environmental requirements, including the preparation of: (a) monitoring and corrective action forms and checklists; (b) inspection procedures; and (c) documentation procedures;
- conduct orientation sessions with the contractors on the compliance monitoring system to be used, notification of non-compliance, and the process of requiring contractors to implement corrective measures when necessary; and
- provide guidance to the contractors on how their respective SEMP will be implemented including the: (a) requirements for each mitigation measure; and (b) implementation schedule of each mitigation measure taking into consideration the general requirement that no specific construction activity will be approved to be commenced if the associated mitigation measures for such activity are not ready before work commences.

837. During implementation of the works:

- supervise the implementation of the SEMPs and its relevant topic and site specific EMPs;
- evaluate the contractors' submitted works activities and schedules relative to the requirements of the approved SEMP;
- undertake monthly inspection, monitoring and reporting of construction sites and all construction-related facilities (workers' camps, asphalt batching plants, concrete batching plants, borrow pits, disposal sites for tunnel and other spoil and unsuitable materials, equipment maintenance areas, fuel and materials storage sites, project-specific quarries and crushers, etc.) to assess the contractors' compliance with the SEMP and the Project EMP.
- require the contractors to update their respective SEMP when necessary;
- monitor the contractors' compliance with health and safety, and labor requirements of the project as stipulated in the contract documents and their approved health and safety, and labor plans (including the outcome of labor audits), and require the contractors to provide updated plans when necessary;

- record non-conformance cases, inform contractors of improvements needed, respond to contractors' proposals, prepare corrective action plans for contractors, and monitor their implementation;
- assess and approve use of temporary construction areas identified during construction such as camps, laydown areas, access roads, etc;
- include environmental and social monitoring in monthly monitoring reports for submission to the RD; and
- draft semi-annual environmental safeguard monitoring reports, as required by ADB;

838. Upon completion of the works:

- prepare a report on the project's environmental and social compliance performance, including lessons learned that may help MRDI and the RD in their environmental monitoring of future projects. The report will be an input to the overall project completion report.

839. The Engineer should retain the use of national and international environmental / biodiversity specialists and national health and safety specialist to provide oversight of the Contractor's environmental performance as outlined above. Terms of reference for the specialists is provided below.

840. National Environmental Specialist. He/she will (i) review all documents and reports regarding the integration of environmental mitigation measures including contractor's environmental action plan, (ii) supervise the contractors' compliance to EMP and BAP, and (iii) prepare monthly compliance reports.

841. Qualified with a degree in environmental sciences or equivalent. Preferably five years' experience in conducting environmental impact assessments and implementation of environment mitigation plans and/or monitoring implementation of environmental mitigation measures during implementation of projects including highway projects funded by developing partners.

842. International Environmental / Biodiversity Specialist (IES). The IES will prepare a detailed action plan including environmental monitoring checklists to be completed by the NES. The IES will be responsible for implementing the BAP, he/she will commission various surveys and monitoring activities by specialists for implementation of the BAP and will be responsible for developing the BMEP to ensure the BAP is properly implemented. He/she will work closely with the Contractor ESO on biodiversity focused tasks and will work on more general environment focused tasks such as conducting environmental training and briefings to provide environmental awareness on ADB and the government environmental safeguards policies, requirements and standard operating procedures in conformity with the government's regulations and international practice for project and RD Safeguards staff; ensure baseline monitoring and reporting of Contractor's compliance with contractual environmental mitigation measures during the construction phase.

843. The IES is also expected to both support development of as well as participate in the cumulative impacts working group proposed in the BAP to improve hydropower management upstream and reduce sand/gravel quarrying in the Rioni River. The working group is described in more detail within Section **5.3 – No Net Loss / Net Gain Approach** of the BAP.

844. Qualified with a degree or diploma in environmental sciences or equivalent. Preferably fifteen years' experience in conducting environmental impact assessments and implementation of environment mitigation plans and/or monitoring implementation of

environmental mitigation measures and health and safety plans during implementation of projects including road projects funded by developing partners, including twelve years' international experience. Working knowledge of Georgia is preferred.

845. National Occupational Health and Safety Specialist. Professionally qualified specialist in all health and safety aspects of major civil works construction, including high level bridgeworks and road works, preferably with 5 years of experience with projects similar to the project. The specialist will be responsible for ensuring that all aspects of the project comply with the health and safety provisions of the Project's civil works contracts, and with relevant Georgian laws and regulations.

Table 86: Engineer Environmental, Health and Safety Staff Costs (estimates)

#	Position	No. of Months	Month Cost ($)	Total Cost ($)
1	National Environmental Specialist	48	1,500	72,000
2	International Environmental and Biodiversity Specialist	8	20,000	120,000
3	National Occupational Health and Safety Specialist	48	1,500	72,000

I.9 - Project Management Unit Requirements

846. The RD of the MRDI is responsible for general oversight of environmental compliance of works through ensuring quality performance of the technical supervisor and of the Contractor.

847. During the pre-construction and construction phase the RD and their staff will be responsible for:

- Reviewing and approving the SEMP and all the site and topic specific EMPs.
- Weekly site visits to audit site works.
- Approving bi-annual monitoring reports from the Engineer.
- Reporting on any key issues to lenders and management.
- Engage external expert(s) to undertake annual independent verification of monitoring information submitted to ADB, to determine if various EMP/SEMP provisions are being implemented in thorough and timely manner and in accordance with budget identified within the EMP/SEMP.
- Review (annually) the EMP/SEMP and approve the changes.

848. RD will perform these functions through its Resettlement and Environment Division comprising twelve staff members with relevant education and professional skills, as well as the safeguards consultants with international experience hired for the technical supervision of operations. This in-house capacity will be supported by external individual consultants upon demand.

849. A review of the capacity of the RD was undertaken as part of this EIA. The review indicates that the existing RD has sufficient expertise to adequately manage the Contractor's environmental performance. The RDs safeguard department has extensive experience of implementing road projects for a range of donors, including ADB. As such no further capacity building is recommended within the RD. Staffing needs to grow proportionally as the portfolio grows to ensure projects are covered adequately by the PIU. Furthermore, as western Georgia

is a significant area of project work, resources must be allocated to this region so that coverage is adequate.

850. Copies of the site records, certificates, permits and documents shall be maintained kept by the RD. This includes:

- Work program and schedule
- Environmental permits and licenses
- Approval for using the site for topsoil stockpiling from local municipal authorities and/or owners
- List of equipment
- Agreement with Solid Waste Management Company of Georgia (non-hazardous waste disposal)
- Agreement with company(ies) authorized for management of hazardous waste
- Records of maintenance and cleaning schedules for sediment and oil/grease traps
- Records of quantity of discharged wastewater and concentration of pollutants; Records of sewage disposal (if relevant)
- List of mitigation measures
- Waste disposal records
- Log of material inventories and consumption
- Route/program of construction material transportation
- Equipment control and maintenance log
- Copies of correspondence related to environmental issues
- Chance find records (if any)
- Complaints register
- Incidence register (environmental limits expedience forms, injuries records, etc.)
- Corrective and preventive action request records
- Training records

I.10 - Management Plans

I.10.1 - Mitigation Plan for Pre-Construction Phase

Table 87. Mitigation Plan for Pre-Construction Phase

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Pre-Construction Stage					
No Net Loss / Net Gain Approach	Impacts to sturgeon species in the Rioni River	• Measure to achieve no net loss / net gains: Implement high standard monitoring program for sturgeon.	Project Cost	RD, ADB	N/A
EMP contractual obligations	Implementation of Project EMP and Specific Environmental Management Plan (SEMP)	• Prior to commencement of civil works, the Contractor shall prepare a Specific EMP (SEMP) for Engineer endorsement and RD approval. The SEMP shall also be reviewed by ADB. The SEMP will present detailed implementation plan based on the Contractor's actual construction methodologies, work schedule, type/specifications, and number of construction plants to be used • The SEMP shall be (a) consistent with the SEMP template included in the EIA (see **Annex 8. Specific Environmental Management (SEMP) Plan**); (b) consistent with the project EMP; and (c) prepared based on the Contractor's activities and corresponding locations. • The SEMP will provide the following: i. Contractor's organizational structure showing the implementation, supervision and reporting and responsibilities of key personnel ii. The Project program and work activities iii. The Contractor's topic and site-specific plans as follows: ○ Waste Management Plan ▪ Wastewater Management Plan	Contractor Cost	Contractor to Implement Mitigation	Engineer, RD, ADB

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		▪ Spoil Disposal Management Plan o Soil Erosion Management Plan o Traffic Management Plan o Method Statement for Temporary Roads o Aggregate and Borrow Pits Management Plan o Employment and Procurement Procedure o Occupational and Community Health and Safety Management Plan o Emergency Response Plan o Waterway Safety Plan o Method Statement for River Crossings o Air Quality Plan o Spill Management Plan o Clearance, Revegetation, and Restoration Management Plan o Noise Management Plan o Biodiversity Management Plan o Laydown Area and Construction Camp Management Plan o Asphalt, Rock Crushing, and Concrete Batching Plant Management Plans o Bridge Construction Plan • The Occupational and Community Health and Safety Management Plan shall be consistent with the template provided in the EIA (see **Annex 9. Occupational and Community Health and Safety Plan Template**). • The Soil Disposal Management Plan shall utilize the assessment template include in the EIA (see **Annex 10. Soil Disposal Assessment Template**). • The Contractor will retain the expertise of a qualified Environment and Social Officer (ESO) and Community Liaison Officer (CLO). • The Contractor will obtain all necessary [permits and approvals before commencing construction activities.			

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Training	Contractors training and awareness raising programs	• All personnel shall be required to undergo a Project site induction that includes the environmental requirements of the Project.	Contractor Cost	Contractor to Implement Mitigation	RD, ADB
Climate Change	Future climate changes may cause damage to the bridge and approach roads	• The Project road will be constructed based on an embankment height (road centerline level) which accommodates the historic P1% (1 in 100 year) flood event. • Further climate change studies must be carried out as necessary to ensure that climate change considerations have been incorporated in the design of the bridge and approach roads.	Project Cost	Detailed Design Consultant	RD
Noise/Vibration	Vibration emissions resulting from the use of machinery and equipment and vehicle circulation	• The status of the buildings nearest to the project site will be surveyed. The surveys will cover the following aspects: o Overall condition of the structures, both exterior o and interior. o Documentation of defects and preexisting cracks observed in the structure using digital imagery along with notes, measurements, and sketches. o The findings of the survey shall be agreed upon by the property owner who shall be in attendance during the survey and will sign official documentation agreeing to the findings of the survey. • Conduct additional pre-construction noise survey to confirm site conditions. Incorporate findings of such investigations in the updated EIA and EMP if necessary.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Flora and Fauna Habitat, Distribution, and Species	Rehabilitation of the secondary road from Patara Poti to the oil terminal may extend into a proposed extension of the	• Consult with the MoEPA to determine the extent of the proposed extension of the National Park (currently being considered by parliament) which will cover the Rioni River and may extend as far east as the railway bridge neighboring the Project. • Ensure that the rehabilitation of the secondary road does not extend into the proposed extension of the National Park.	Project Cost	Detailed Design Consultant	RD

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
	National Park (close to where the gas line crosses the Rioni River).				
	Cumulative impacts from the multiple development in the region.	• Consultation will be taken with IFI's, donors, and implementing units on other projects that are likely to contribute to cumulative impacts so as to reduce uncertainty and, where necessary, take appropriate action to minimize environmental harm.	Project Cost	RD	N/A
Aquatic Fauna Habitat, Distribution, and Species	Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species	• Ensure that all guidance on sand and gravel abstraction sites is followed as outlined in the ***Site Preparation, Construction and Worksite Closure (i.e., project closure) Phases*** EMP table below are followed.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Displacement of species due to noise, presence of machinery, and equipment and of staff	• Before starting any in the water construction activities conduct underwater noise measurements using hydrophones to establish in the water background noise levels. • The contractor shall predict planned impact pile-driving noise levels in the water utilizing interim good practice guidelines before starting to pile. Where planned impact pile-driving appears likely to exceed Project thresholds, alternative pile-driving methods or mitigation will be selected.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Reduction of sturgeon abundance in the Rioni River	• Sturgeon abundance surveys annually, from before the preparation phase until the end of the defect liability period. • To understand the potential for longer-term impacts, it would be necessary for sturgeon abundance monitoring to	Project Cost	Ecological Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
	from Project activities	continue into the operational phase of the project, annually until the third year of operation after defect liability and then twice more at five-yearly intervals. It is recommended that the RD identify parties best placed to undertake such surveys and to report to ADB and other relevant stakeholders on the findings.			
	Mortality of individuals, from operation of equipment and construction activities	• The Contractor will ensure staging of in-river construction activities are undertaken in periods least likely to affect the sturgeon fish spawning period. • All in-river activities will be avoided during March-September inclusive. Where possible, in-river activities will also be avoided in October and November.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Flora species	Mortality of individuals	• The Contractor shall conduct a survey prior to construction to identify natural and modified habitat to ensure that natural habitat can be rehabilitated as well as compensated for where it will be permanently lost. • The Contractor shall identify through a site survey if any Georgian Red-listed tree species are located within five meters of the site boundary. This survey will form part of the Contractor's Clearance, Revegetation, and Restoration Management Plan. In case taxation [walkover surveys pre-construction] reveals any protected plant species in the area, the latter will be removed from the environment [and translocated] in accordance with sub-paragraph (v), Article 24, first paragraph of the law of Georgia on 'Red List and Red Book'. • Relocation of any specimens found during the surveys where practical will be provided with the help of biodiversity experts to ensure proper handling. This is especially important for species of conservation importance (e.g., Colchis Water-Chestnut (Trapa colchica) and Spring snowflake (Leucojum vernum)). The practice will provide the best possible chance of survival for wildlife. A plan and	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		schedule must be developed by the Contractor prior to implementation of this task.			
Change of Land Use and Livelihoods	Land acquisition and livelihood loss to affected persons	• Before the commencement of the construction works of the Project, the RD must finalize and implement the Land Acquisition and Resettlement Plan (the LARP) designed in compliance with the ADB Safeguards Policy Statement 2009.	LARP Cost / Project Cost	RD to finalize the LARP and implement the Plan.	ADB to approve the LARP
	Barrier effect (impacts on mobility and access of locals to areas such as farmlands, aquaculture ponds, etc., across the Project road)	• Ensure designs retain a strip of riparian habitat along the edge of the river to reduce impact on species (retain connectivity and possibility for free movement along the river edge).	Project Cost	Detailed Design Consultant	RD
Services Demand	The disruption of services, including energy, to surrounding communities due to relocation of utilities.	• All telephone and electrical poles/wires and underground cables should be shifted before start of construction. • Necessary permission and payments should be made to relevant utility service agencies to allow quick shifting and restoration of utility services. • Local people must be informed through appropriate means about the time of shifting of utility structures and potential disruption of services if any.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Grievance Redress	Complaints due to project implementation	• Prior to commencement of site works, the contractor will develop a grievance redress mechanism (GRM) or system that will allow for receiving/recording and immediate response to and resolution of construction-related complaints. The GRM shall be consistent with the GRM described in this EIA.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• The Contractor will inform the communities along the alignment and other stakeholders affected by the Project about the GRM in place to handle complaints and concerns about the Project. • The Contractor will also install notice boards at the construction sites to publicize the name and telephone numbers of the representatives of the Contractor, and the RD.			

I.10.2 - Mitigation Plan for Site Preparation, Construction and Worksite Closure Phases

Table 88. Mitigation Plan for Site Preparation, Construction and Worksite Closure Phases

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Site Preparation, Construction and Worksite Closure (i.e., project closure) Phases					
Air Quality	Localized emissions of dust resulting from the use of machinery and equipment and circulation of vehicles.	• Dust generating areas will be controlled by water spraying, particularly under dry weather conditions. • Stockpiles will be planned and sited to minimize the potential for dust generation by taking into account prevailing wind directions and the locations of sensitive receptors. • The drop height of potentially dust generating materials will be kept as low as possible. • Where practicable, stockpiles will be located away from sensitive receptors. • If crushing of construction materials is required, crushers will be located away from sensitive receptors. Keeping at least 300 m distance from residences windward to concrete production plants should be ensured.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• An environmental impact permit for an asphalt plant (if planned to run own facility) will be obtained before operation. • On-site speed limits will be applied and enforced for trucks travelling on unpaved surfaces (20 km/h). • Trucks transporting spoil or other dusty materials off-site will be covered before leaving the sites. • Wheel washing facilities will be available and used so that trucks leaving the site do not spread dust onto neighboring roads. • Public roads used by site traffic will be swept regularly to prevent accumulation of dirt.			
	Localized and long-term emissions of combustion gas resulting from the use of machinery and equipment and circulation of vehicles.	• Machines and construction plant items (e.g., trucks) that may be in intermittent use will be shut down or throttled down between work periods. • The burning of waste or vegetation on site is prohibited. • Special attention will be given in storage and handling of petrochemicals in order to avoid environmental hazards and risks. • Maintenance procedures will be implemented in order to keep equipment in good working condition to minimize exhaust emissions caused by poor performance. • Training will be provided for the operators of equipment and truck drivers regarding the air pollution potential of their activities.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Noise	Noise and vibration emissions resulting from the use of machinery and equipment and vehicle circulation	• Work hours will be restricted between 07:00 to 20:00 hours within 500 m of the settlements. • Optimum travel speed during offsite travel will be established by the Contractor. • Install temporary noise barriers made of plywood or acoustical blankets around noisy operation where necessary to comply with project noise limits. • Use newer equipment with improved noise muffling and ensure that all equipment items have the manufacturers'	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		recommended noise abatement measures, such as mufflers, engine covers, and engine vibration isolators intact and operational. Newer equipment will generally be quieter in operation than older equipment. All construction equipment should be inspected at periodic intervals to ensure proper maintenance and presence of noise control devices (e.g., mufflers and shrouding, etc.). • The number of equipment operating simultaneously will be reduced as far as practicable. • Reduce the number of equipment operating simultaneously as far as practicable. • Orientate equipment known to emit noise strongly in one direction so that the noise is directed away from receptors as far as practicable. • Locate noisy plants as far away from receptors as practicable. • Avoid transportation of materials on- and off-site through existing community areas during nighttime hours. • Use material stockpiles and other structures, where practicable, to screen noise sensitive receptors from on-site construction activities. • Record and respond to complaints according to the established grievance redress mechanism. • Keep nearby residences informed in advance about noisy activities during various construction phases. • Perform independent periodic noise and vibration monitoring to demonstrate compliance with Project noise and vibration limits. • When there is a possibility of human annoyance from construction activities, conduct such activity only during weekday daytime hours when the ambient background noise and vibration is higher and many residents are away from their homes at work.			

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Soil Quality	Land pollution due to wrong management of solid waste, as well as possible dripping of hydrocarbons from machinery and equipment, and wrong storage of oil and fuel.	• Temporary fuel tanks will be located at least 50 m away from any watercourse, drain, or channel leading to a water course. The tank will be placed in covered areas with berms or dikes installed to intercept spills, if any. Any spill will be immediately localized and cleaned up with absorbent materials. The bund will be able to accommodate 110% of the volume of the tank. • Onsite repairs /maintenance and fueling activities will be limited to the extent possible. • On-site vehicles and equipment shall be inspected regularly for leaks and all leaks shall be immediately repaired. Leaking vehicles/equipment will not be allowed on-site. • Secondary containment devices (drop cloths, drain pans) shall be used to catch leaks or spills while removing or changing oils from vehicles or equipment. For small spills, absorbent materials will be used. • Tire washing units will be equipped with drainage settling facilities. The washout pit will be cleaned immediately upon 75% filling. • No washing of vehicles etc. in the river will be allowed. • Usage of off-site vehicle wash racks or commercial washing facilities will be used whenever feasible. Bermed wash areas for cleaning activities will be established if on-site cleaning is required. • Contractor will implement a training program to familiarize staff with emergency procedures and practices related to contamination events. Operating personnel will be trained to visually inspect discharged water quality for oil and grease traces (that will be visible on the surface) periodically and take appropriate corrective actions.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Soil Structure	Land erosion due to loss of vegetation coverage and changes in its structure	• Materials and waste will be stockpiled so as to avoid erosion and washing off into the river. Drainage trenches will be established to divert surface runoff from the site. • To avoid loss of the productive soil layer, all suitable topsoil and other material shall be saved and stockpiled separately for the future recultivation of the area. • Stockpiles of removed topsoil will be properly designed/shaped and managed. • Temporary detention ponds or containment to control silt runoff will be provided. • Construct intercepting ditches and drains to prevent runoff entering construction sites • Soil compaction may be reduced by strictly keeping to temporary road boundaries • Slopes of embankment will be protected from erosion by vegetation and slope drainage. The design considers selection of a reasonable embankment height, establishment of temporary berms, slope drains, temporary pipes, contour ditches, ditch checks, diversions, and sediment traps • Disturbed vegetation must be replanted immediately after the construction/disturbance stops • Appropriately set up temporary construction camps (if determined needed) and storage areas to minimize the land area required and impact on soil erosion.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Relief	Modification of geological formations - Quarries	• The Contractor will carry out operation of quarries and borrow pits, as well as extraction of gravel from river terraces (if utilized), in strict accordance with the conditions of a license issued by the Ministry of Economic Development (MoED) and cleared by the Ministry of Environment Protection and Agriculture (MoEPA); and • The Contractor will be responsible to develop, agree and strictly adhere to quarry/borrow pit operation and re-	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		cultivation plan (if the Contractor owns or establishes a new quarry site). • Borrowing from the stream [at the project site] will be prohibited. • Sourcing of construction materials (e.g., sand, gravel) will avoid use of any licensed or unlicensed sites in the Rioni River or on its banks. • Borrow areas for materials, other than dredged sand fill, shall not be located in productive land, forested areas and near water courses such as rivers, streams, etc.			
Water Quality	Pollution of nearby water bodies due to poor storage and management of construction materials	• Discharge of any untreated water into the surface water body will be strictly prohibited. • Discharge of cement contaminated water will be prohibited as cement pollution results in high alkalinity and raises the pH, which can be toxic to aquatic life. • To prevent runoff contamination, paving will be performed only in dry weather. • In disturbed soil areas, compacted straw (straw bales), silt fence, fibber rolls, gravel bags, or other approved sediment control must be ensured. At a minimum, all bare soil (whether it's an abutment slope or a stockpile) must be protected before it rains. • Drainage systems and erosion control and silt removal facilities will be regularly inspected and maintained to ensure proper and efficient operation at all times. • Vegetation will be preserved where feasible, in particular in the areas near the river bank to avoid erosion/sedimentation. Areas will be promptly revegetated, where practicable and appropriate. • The construction camp (if needed), permanent or temporary, will not be located within 500 meters of any river, or irrigation channel.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Wastewater Management Plan and proper sewage collection and disposal system will be available to prevent pollution of watercourses (if discharge in surface water is planned). • Storm water drainage and wastewater will be treated in accordance to the applicable World Bank/IFC guidelines. • Where applicable (i.e., to irrigation canal in Patara Poti), the Project will, as much as possible, control the effluent and runoff discharged to the irrigation channel to below the "Severe" restriction on use according to the FAO Guidelines for Interpretations of Water Quality for Irrigation.			
	Impact to surface water contamination from inappropriate waste management	• Construction materials and wastes will be properly stored to minimize the potential damage or contamination of the materials. • A construction materials inventory management system will be implemented to minimize over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period. • Hazardous and non-hazardous waste will be segregated and appropriate containers for the type of waste type will be provided. • Waste will be stored systematically to allow inspection between containers to monitor leaks or spills. • Waste will be disposed of systematically by licensed contractors. • Storm water drainage and wastewater will be treated in accordance to the applicable World Bank/IFC guidelines.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Impacts to surface water due to contamination from accidental releases of hazardous substances	• Implementation of the specific mitigation measures outlined under Contamination of Soils above.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
	Water pollution from bridge construction	• Coffer dams, silt fences, sediment barriers or other devices to prevent migration of silt during construction within the river will be provided. • Dewatering and cleaning of cofferdams to prevent siltation by pumping from cofferdams to a settling basin or a containment unit will be performed. • Ensure no waste materials are dumped in the river, including re-enforced concrete debris. • Generators will be placed more than 20 meters from the river. • No concrete waste from concrete mixers will be dumped in the river. • Areas where concrete mixers can wash out leftover concrete without polluting the environment will be provided. This may be in the form of a lined settling pond. 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. (as long as not contaminated).	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Vegetative Coverage	Loss of vegetation coverage in specific areas of the project	• Delimitation of areas to be cleared will be made before the beginning of the construction activities in order to limit as much as possible the surface of vegetation to be cleared. • Boundaries of ROW and operation area will be strictly kept to - to avoid impact on the adjacent vegetation; Strict keeping to traffic routes during the construction will be ensured to avoid impact on vegetation. • The planned clearance area for the construction works shall be clearly identified and marked to avoid accidental clearing. • Fencing of critical root zones of the trees at the boundary with the project area or on the way will be carried out. • Project will utilize or upgrade existing roads where possible to minimize unnecessary clearing requirements.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Training of the staff in environmental and safety issues, including protection of vegetation outside the boundaries of the project corridor. • Care will be taken to avoid introduction of new invasive species to, and spread of existing invasive species within, the Project area through: washing of vehicles, equipment and supplies before entry to the Project area; monitoring for invasive species; and control/eradication of invasive species where found. • Implement Clearance, Revegetation, and Restoration Management Plan. Dispersion of fine dust and aerosol will be limited to the narrowest area possible through protective revegetation activities on both sides of the road.			
	Planting of vegetation on the site after rehabilitating disturbed areas	• Disturbed sites will be recultivated after completion of works. • The Clearance, Revegetation, and Restoration Management Plan prepared prior to construction will be followed. • No net loss of natural habitat will be ensured based on the site survey conducted during Pre-Construction Stage.	Contractor Cost	Contractor to Implement Mitigation	Supervision Contractor to Monitor Success Rate (RD to determine success rate criteria)
	Tree cutting	• Plant maintenance will be carried out for at least two years. • The Contractor shall be responsible for replanting of any trees cut in these areas on a 1:3 basis using species native to the area.	Contractor Cost	Contractor and RD to Implement Mitigation	RD, Engineer
Terrestrial and Aquatic Fauna Habitat	Modification, fragmentation, and degradation of habitat	• Air, water, soil, and noise impact mitigation measures will be implemented. • Waste management – regular clean-up of the areas, management of waste according to the type and category. • Refueling of all plant, vehicles and machinery will not be allowed within 50 m of any watercourse, drain or channel leading to a water course.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Construction materials and chemicals will be appropriately secured during flood season to avoid accidental release to the natural environment. • Oil, chemical and solid waste will be stored, and handled and disposed of by appropriately licensed waste management contractors. • Dropping structures into rivers/streams will be avoided [construction will instead take place from the river bank or pontoons].			
	Introduction of invasive alien species	• Care will be taken to avoid introduction of new invasive species to, and spread of existing invasive species within, the Project area through: washing of vehicles, equipment and supplies before entry to the Project area; monitoring for invasive species; and control/eradication of invasive species where found.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Terrestrial Fauna Species	Fauna mortality	• Speed limits to maximum of 20 km/hr for construction vehicles will be enforced to minimize potential for fauna strike. • Commitment will be made to raise awareness of values of natural habitat areas to construction work force and arrangements will be made for restriction of poaching and forest product collection. • Hunting wild animals will be strictly prohibited to apply for all staff.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Terrestrial Fauna Distribution	Displacement of species due to noise, presence of machinery and equipment and presence of staff.	• Adherence to no horn policy will be enforced. • All vehicles, equipment and machinery used for construction will be regularly maintained and inspected/certificated to ensure that the noise levels conform to the standards prescribed. • If lights are installed on the road or bridge in the future, ensure that lower wattage lamps are used in street-lights which direct light downwards to reduce glare.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Aquatic Fauna Distribution	Displacement of species due to noise, presence of machinery, and equipment and of staff.	• Movement of machines inside rivers, streams, or on their banks will be prevented except when it is unavoidable due to the construction of a structure. • All in-river activities will be avoided during March-September inclusive, to avoid disturbance to sturgeon during their overall spawning season. Where possible, in-river activities will also be avoided in October and November. • The central bridge pier and adjoining two piers will be constructed (referring specifically to construction using coffer dams in the river) at two different times. • Implement a build-up of activity which slowly increases construction activities within the Rioni River to allow aquatic fauna to exhibit avoidance responses.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Aquatic Fauna Species	Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.	• Use of propeller-driven boats will be minimized during construction. • Warning signs and CCTV cameras will be installed on both sides of the bridge to deter and detect illegal fishing activities. • Poaching animals will be strictly prohibited to apply for all staff. • Fishing and using of illegal fishing gear anywhere along the river will be prohibited.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
	Reduction of sturgeon abundance in the Rioni River from Project activities	• Sturgeon abundance surveys annually, from before the preparation phase until the end of the defect liability period. • To understand the potential for longer-term impacts, it would be necessary for sturgeon abundance monitoring to continue into the operational phase of the project, annually until the third year of operation after defect liability and then twice more at five-yearly intervals. It is recommended that the RD identify parties best placed to undertake such surveys and to report to ADB and other relevant stakeholders on the findings.	Project Cost	Ecological Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
	Cumulative impacts from the multiple development in the region.	• Consultation will be taken with IFI's, donors, and implementing units on other projects that are likely to contribute to cumulative impacts so as to reduce uncertainty and, where necessary, take appropriate action to minimize environmental harm.	Project Cost	Contractor to Implement Mitigation	RD, Engineer
	Pile driving for in-river construction	• Noise from pile-driving will be kept below current international interim good practice guidelines. • Ensure compliance with construction specifications which envisage the arrangement of cofferdams to protect water quality during construction minimize the impacts to aquatic fauna during pile driving in the Rioni River. Noise from pile-driving will be kept below current international interim good practice guidelines • The contractor will model planned pile-driving and assess alignment with international interim good practice guidelines before starting to pile.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Landscape Quality	Change to existing landscape and character	• Implementation of mitigation measures defined for soil, vegetation, and waste management. • Visual impact of construction works will be mitigated by keeping to the boundaries of the worksites and traffic routes; preservation of vegetation; cleanup and good management of construction sites and camps; timely removal of waste from the area; material stock control (to avoid accumulation of surplus material on the site) • An approved recultivation plan will be implemented. • After completion of works, the worksite will be cleaned up; surplus materials, temporary structures, and machinery will be removed. • Site compounds within the landform will be carefully placed. • Existing woodland, land features, and other key elements will be retained and protected within the proposed development corridor.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Commitment to high quality design, materials, and specification for the road and Rioni crossing.			
Change of Land Use and Livelihoods	Land acquisition and livelihood loss to affected persons	• Impacts of physical and economic displacement will be addressed through the resettlement plans that have been designed in compliance with the ADB Safeguards Policy Statement 2009. • Written agreements with local landowners for temporary use of the property will be required and sites must be restored to level acceptable to the owner within a predetermined time period.	Project Cost	RD to Implement the Plan / Corrective Action Plan	ADB to Approve the LARP / Corrective Action Plan
Jobs	Impacts on employment and economy	• An Employment and Procurement Procedure should be established. Development of the plan should involve consultation with relevant stakeholders, including government authorities and local villagers. • Opportunities to establish a skills training program with an aim of training interested local villagers to contribute to the Project should be reviewed. • Local villagers should be informed of job opportunities in a timely manner. • Local businesses should be informed of contracting opportunities in a timely manner.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Services Demand	Impacts on community infrastructure and services	• Traffic advisory signs (to minimize traffic build-up) will be posted in coordination with local authorities. • Accidentally damaged private property and/or infrastructure should be prompt restored. • The community will be kept informed about the schedule of works which could cause temporary restriction of services and the potential duration of the 'impact' in advance.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Community Health and Safety	Impacts on social cohesion	• Construction camps (if established) will be located away from communities in order to avoid social conflict in competition for resources and basic amenities such as water supply. • Local residents should be given priority in hiring of construction workers.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• Employment of women will be encouraged. • Goods and services will be sourced from local commercial enterprises to the extent possible.			
	Risks to community health and safety due to increased traffic; the transport, storage, and use and/or disposal of materials (e.g., fuel and chemicals); and access to structural elements or components of the project by members of the community.	• Air, water, soil, waste, and noise impact mitigation measures will be implemented. • The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations. • Noise, vibration, and emission impact mitigation measures will be implemented. • Signs advising road users that construction is in progress will be provided, specifically at the points where the new road connects with the E-60. • Flag persons will be employed to control traffic when construction equipment is entering or leaving the work area.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer
Occupational Health and Safety	The exposure of workers to various physical hazards that may result to minor, disabling, catastrophic, or fatal injuries.	• Measures will be implemented to reduce the likelihood and consequence of the potential hazards. This shall include (but not limited to) the following hazards: o Falling from height; o Falling into water; o Entanglement with machinery; o Tripping over permanent obstacles or temporary obstructions; o Slipping on greasy walkways; o Falling objects; o Contact with dangerous substances; o Electric shock;	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		○ Variable weather conditions; ○ Lifting excessive weights; and ○ Traffic operations. • Competent and adequately resourced Subcontractors will be used where construction activities are to be sub-contracted. • All persons working on site will be provided information about risks on Site and arrangements will be made for workers to discuss health and safety with the Contractor. • The Contractor will prepare and implement a Occupational and Community Health and Safety Management Plan prior to commencing work. This plan will include provisions on clean water, sewage and wastewater, solid waste, liquid chemical waste, personal protection, emergency preparedness and response, records management, safety communication, and training and awareness. • All workers will be properly informed, consulted and trained on health and safety issues. • Personal Protective Equipment (PPE) shall be worn at all times on the Site. This shall include appropriate safety shoes, safety eyewear, and hard hats. Non-slip or studded boots will be worn to minimize the risk of slips. • Before starting work all the appropriate safety equipment and the first-aid kits will be assembled and checked as being in working order. • All lifting equipment and cranes will be tested and inspected regularly. • All scaffolding will be erected and inspected, and the appropriate records maintained by the Contractor. • When there is a risk of drowning, lifebelts shall be provided and it shall be ensured that personnel wear adequate buoyancy equipment or harness and safety lines, and that rescue personnel are present when work is proceeding.			

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		• All safety harnesses, life-lines, reviving apparatus and any other equipment provided for use in, or in connection with emergencies will be properly maintained and thoroughly examined at least once a month, and after every occasion on which it has been used.			
Cultural Heritage	Risks to built heritage, objects, and sites that have archaeological, historical, religious, or other cultural value and significance.	• The chance find procedure for managing cultural heritage will be implemented if any cultural heritage is discovered during construction.	Contractor Cost	Contractor and RD to implement mitigation	RD, Engineer
Grievance Redress	Complaints due to project implementation	• The Contractor will be responsible for nomination of Community Liaison Officer (CLO) and implementation of grievance procedure. • Continuous monitoring and review of complaints received from neighboring communities around the Project activity areas as per the grievance redress mechanism.	Contractor Cost	Contractor and RD to implement mitigation	RD, Engineer
Waste	Pollution of land, water, or air from poor waste Management	• The Contractor will classify waste streams (hazardous, non-hazardous, or a waste that requires a full assessment to determine classification – so-called 'mirror entry' waste) and manage them according to international best practice and Georgian law. • The Contractor will conclude an agreement with Poti municipality and solid non-hazardous and inert waste will be removed to the Poti municipal waste dump. • Hazardous wastes will be handed over to licensed companies authorized for utilization of this types of the waste. • Water from bridge will be collected and retained prior to discharge.	Contractor Cost	Contractor to Implement Mitigation	RD, Engineer

I.10.3 - Mitigation Plan for Operation Phase

Table 89. Mitigation Plan for Operation Phase

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
Operation Stage					
Air Quality	Localized emissions of combustion gas and dust resulting from the circulation of vehicles.	• Local communities should be motivated to maintain greenery in the project area, including protective revegetation on both sides of the road. • Regular maintenance of the road will be done to ensure good surface condition.	Included in Operation / Maintenance cost	Local Communities / Road Maintenance Contractor	RD
Soil Quality	Pollution due to littering	• Awareness raising and education of community on waste management (no illegal dumping or littering) should be provided. • Regular maintenance and cleanup of the drainage system will be carried out to prevent impact on soil erosion or flooding.	Included in Operation / Maintenance cost	Local Communities / Road Maintenance Contractor	RD
Water Quality	Surface water contamination from accidentally spilled fuel/oil and road surface runoff.	• Implementation of mitigation measures set for pre-construction and construction stages of the project during the road maintenance works as appropriate. • Runoff water from the bridge structures will be handled by the built drainage structures and runoff and spill containment chambers. The Terms of Reference for the Road Maintenance Contractor for the operations phase will include regular monitoring of retention structures, and safe disposal of contents after any spills. • Maintenance paving of the road sections and bridge decks will be performed only in dry weather to prevent runoff contamination. • Staging techniques will be used to reduce the spread of paving materials during the repair of potholes and worn	Included in Operation / Maintenance cost	Road Maintenance Contractor / RD	RD

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
		pavement. These can include covering storm drain inlets and manholes during paving operations, using erosion and sediment controls to decrease runoff from repair sites, and using drip pans, absorbent materials, and other pollution prevention materials to limit leaks of paving materials and fluids from paving machines. • Roadside strips will be regularly maintained and cleaned.			
Terrestrial and Aquatic Fauna Habitat	Degradation of habitat	• The presence of invasive species will be monitored. • Roadside waste collection and clean up (sweeping) of the road will be done regularly.	Included in Operation / Maintenance cost	Road Maintenance Contractor	RD
Aquatic Fauna Species	Aquatic fauna mortality	• Monitoring of the bridge piers will be ensured throughout the operation period to prevent poaching of sturgeon by using fishing gear bridge structures.	Included in Operation / Maintenance cost	Road Maintenance Contractor / RD	RD / Environmental NGOs
	Reduction of sturgeon abundance in the Rioni River from Project activities	• Sturgeon abundance surveys annually, from before the preparation phase until the end of the defect liability period. • To understand the potential for longer-term impacts, it would be necessary for sturgeon abundance monitoring to continue into the operational phase of the project, annually until the third year of operation after defect liability and then twice more at five-yearly intervals. It is recommended that the RD identify parties best placed to undertake such surveys and to report to ADB and other relevant stakeholders on the findings.	Project Cost	Ecological Contractor to Implement Mitigation	RD, Engineer
Landscape Quality	Modification of the original landscape from the presence of new infrastructure	• Roadside vegetation will be preserved/maintained to shield the visual change in the landscape related to the new infrastructure (in addition to providing other benefits). • Periodic inspections will be done to detect signs of slope instability and ensure revegetation where necessary.	Included in Operation / Maintenance cost	Road Maintenance Contractor	RD
Occupational Health and Safety	The exposure of workers to various physical	• Applicable occupational health and safety measures taken during the construction phase will continue to be followed.	Included in Operation / Maintenance	Road Maintenance Contractor	RD

Affected Aspect	Potential Impact / Issue	Mitigation/Enhancement Measures (all that apply)	Estimated Cost	Responsibility	
				Development/ Implementation	Control
	hazards that may result to minor, disabling, catastrophic, or fatal injuries.		cost		
Community Health and Safety	Road accidents resulting from higher travel speeds and increased traffic	• Road safety facilities have been incorporated in the Project design at both preparatory and detailed design phases. These include traffic separation medians, pedestrian sidewalks, and signs and pavement markings complying with international and Georgian standards. These will be put in place by the Contractors during construction and will be maintained by the Project owner during the Project's service life. • Monitoring and maintenance of road safety furniture will be done to sustain road safety facilities constructed under the project.	Included in Operation / Maintenance cost	Road Maintenance Contractor / RD / Local Government and traffic authorities	RD

I.10.4 - Environmental Monitoring Plan

Table 90. Environmental Monitoring Plan

Issue	What parameter is to be monitored?	Where is the parameter to be monitored?	How Is the parameter to be monitored?	When is the parameter to be monitored? (Frequency)	Institutional responsibility
Site Preparation, Construction, and Worksite Closure (i.e., project closure) Phases					
EMP contractual obligations	• Development of thematic management plans (specific guidance and direction included in **Annex 7. Thematic Management Plans** of the EIA).	• N/A	The RD will clear the plans.	• Thematic management pans should be cleared once before construction begins • Information from the plans should be included in regular	RD

Issue	What parameter is to be monitored?	Where is the parameter to be monitored?	How Is the parameter to be monitored?	When is the parameter to be monitored? (Frequency)	Institutional responsibility
				reports to the RD and ADB	
Air quality	• SOx • NOx • PM	• Construction sites • Receptors such as dwellings near the alignment (e.g., Patara Poti village)	Measurements of exhaust emissions	• Monthly • Unannounced inspections during construction works	RD, Engineer
Air quality – dust	Fugitive dust emissions	At construction sites	Visual monitoring	Twice monthly during construction	RD, Engineer
Noise	Hourly average noise levels Leq, dBA.	• At noise sensitive sites, such as houses • At locations where baseline noise was monitored	Mobile noise meter	• Monthly during construction • Upon complaint	RD, Engineer
Noise (in-river construction)	(i) Use of sheet pile cofferdams for in-river construction. (ii) Noise levels from pile-driving against good practice guidelines • Peak and sound exposure level (SEL) (iii) Absence of in-river activities during March-September inclusive	• Worksite in the Rioni River • Noise testing should be done at a distance of 5m, 50m and 100m from edge of coffer dam	• Visual monitoring • Inspections • Noise levels on decibels (dB) scale over a range of frequencies which the level is measured (1µP a2 /Hz for Peak, SEL and RMS noise levels using hydrophones	(i) Unannounced inspections, twice-yearly in March-September during the preparation and construction phases (ii) Unannounced inspections quarterly during preparation and construction phases (iii) At least monthly from March-September inclusive, during the preparation, construction, and worksite closure phases	RD, Engineer

Issue	What parameter is to be monitored?	Where is the parameter to be monitored?	How Is the parameter to be monitored?	When is the parameter to be monitored? (Frequency)	Institutional responsibility
Soil erosion	• Adequacy of soil erosion prevention measures; • and Soil Erosion Management Plan	All active construction sites	Visual inspection	Weekly	RD, Construction Supervision
Soil quality	• Adequacy of soil contamination prevention techniques • Adherence to Spill Response Plan • Texture, bulk density, pH, conductivity, cation exchange capacity, organic matter, Total N, P, K, and heavy metals	At all project sites including construction yards, approach roads, bridge end facilities	• Ensure no contaminated effluent is leaving from the filling area to agricultural lands or the Rioni River. • Water quality sampling of all effluent prior to discharge	Every 3 months	RD, Construction Supervision
Quarry material	Location of borrow pits according to EMP, Spoil Waste Management Plan; Soil Erosion Management Plan; Aggregate and Borrow Pits Management Plan, and Clearance, Revegetation, and Restoration Management Plan.	At all sites where quarry materials are being sourced	• Visual inspection • Review of quarry Licenses and contract	Before construction begins and inspections of the quarry site(s) every three months	RD, Construction Supervision
Surface water quality	Turbidity, TSS, pH, TDS, TSS, EC, Cl, NH3, N, Fe, As, Coliforms	Sampling downstream the worksite and in the canal near Patara Poti village	Water quality analysis using international best practice	• Every three months • Unannounced inspections during works near watercourses	RD, Construction Supervision
Hydrocarbon and chemical storage	Construction camps	• Worksite • Car Maintenance servicing area • Staging/lay down area • Campsite (if available)	• Inspections • Observations	• Monthly • Unannounced inspections during construction	RD, Construction Supervision

Issue	What parameter is to be monitored?	Where is the parameter to be monitored?	How Is the parameter to be monitored?	When is the parameter to be monitored? (Frequency)	Institutional responsibility
Impact on planted areas	(i) Completion of Pre-Construction Stage site survey to ensure no net loss of natural habitat. (ii) • Adequacy of Clearance, Revegetation, and Restoration Management Plan • Status of vegetation • Plantation survival rate	Planted vegetation areas	Visual inspection	(i) Prior to site preparation and construction phases (ii) • Monthly • Unannounced inspections during preparation, construction, and worksite closure phases	RD, Engineer
Impacts on trees near the working area	• Adequacy of Clearance, Revegetation, and Restoration • That trees located close to the project area protected by fence	At sites where trees and forests are located along the construction site	Visual inspection	Monthly	RD, Construction Supervision
Possible loss or damage to cultural resources	Presence of chance finds	Dependent on findings during construction	Visual inspection	Throughout construction works	RD, Construction Supervision, and Ministry of Culture and Monument Protection
Local Roads	Existing roads	• Local roads are not damaged • Grievance and redress	• Visual inspection	Monthly	RD, Engineer
Traffic Safety and Management	• Haul and all affected roads as identified in the Traffic Management Plan • Adequacy of Traffic Management Plan	As identified in the Management Plan	• Visual inspection	Daily	RD, Engineer
Occupational Health and Safety	• Adherence to the approved Occupational Health and Safety Plan • Worker complaints and concerns and recorded incidents	Worksite	• Inspection • Interviews • Comparisons with the Contractor's	• Weekly • Unannounced inspections during Construction	RD, Engineer

Issue	What parameter is to be monitored?	Where is the parameter to be monitored?	How Is the parameter to be monitored?	When is the parameter to be monitored? (Frequency)	Institutional responsibility
	• Use of personal protective equipment (PPE) relevant to the task • Training records • Organization of traffic on the construction site • Keeping to the safety rules while working on height		approved Occupational Health and Safety Plan	• Upon complaint	
Drinking water and sanitation	Safe water and sanitation facilities are provided on the site	In construction yards and construction camps (if applicable)	• Visual inspection • Interviews	Weekly	RD, Engineer
Community Health and Safety	• Availability of information on GRM • Adequacy of construction site signage and fencing • Adequacy of temporary noise mitigation measures • Accidents involving public and workers • Emergencies and responses • Public complaints about issues such as	All active construction sites	• Visual inspection of all active construction sites • Informal interviews with nearby residents (within reason given the possible distances between sites)	Monthly	RD, Engineer
Impacts on employment and economy	• Employment of local workforce and women.	All active construction sites	The Contractor to record and provide figures regarding employment of local workforce and women to RD.	Semi-Annually	RD
Solid and Liquid Waste Management	• Adherence to Waste Code • Adherence to Waste Management Plan and Laydown Area and Construction Camp Management Plan	Construction camps (if applicable) and construction sites	Visual inspection	Weekly	RD, Engineer

Issue	What parameter is to be monitored?	Where is the parameter to be monitored?	How Is the parameter to be monitored?	When is the parameter to be monitored? (Frequency)	Institutional responsibility
	• That solid waste is disposed at designated site				
Adherence with EMP and loan covenants	• EMP /SEMP • Loan covenants	All active construction sites	• Visual inspection • Supervision	Semi-Annually	RD, ADB
Sturgeon abundance	• Sturgeon abundance in the river	Project site	• Surveys by specialist contractor	Annually, from before the preparation through the construction period.	RD, Ecological Contractor
Operation Phase					
Post-construction site inspection	Performance checked against the management plans submitted before construction for specific aspects (e.g., Clearance, Revegetation, and Restoration Management Plan and if relevant - Spoil Waste Management Plan, and Aggregate and Borrow Pits Management Plan).	All former construction sites	Visual inspection	Twice: two weeks before completion of construction activities and once after completion	RD, ADB
Road safety	Proper signage and traffic control arrangements in place	Entire length of constructed section	Inspection	Recurrent	RD
Adequate operation and maintenance of drainage and retention systems	Drainage/retention infrastructure in good technical condition and cleaned regularly	Entire length of constructed	Inspection	Recurrent	RD
Regular maintenance and periodic replacement of greenery within the alignment corridor	Trees planned for compensation of removed plants and grass seeded for slope stabilization properly safeguarded, watered as needed, and replaced when necessary	Greened areas within the ROW	Inspection	Recurrent	RD
Sturgeon abundance	• Sturgeon abundance in the river	Project site	• Surveys by specialist contractor	Annually, from before the preparation phase until	RD,

Issue	What parameter is to be monitored?	Where is the parameter to be monitored?	How Is the parameter to be monitored?	When is the parameter to be monitored? (Frequency)	Institutional responsibility
				the end of the defects liability period.*	Ecological Contractor

Note: To understand the potential for longer-term impacts, it would be necessary for sturgeon abundance monitoring to continue into the operational phase of the project, annually until the third year of operation after defect liability and then twice more at five-yearly intervals. It is recommended that the RD identify parties best placed to undertake such surveys and to report to ADB and other relevant stakeholders on the findings.

I.10.5 - Biodiversity Monitoring Plan (taken from Biodiversity Action Plan)

Table 91. Biodiversity Monitoring Plan (taken from Biodiversity Action Plan)

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
Kolkheti National Park, Ramsar Site and Important Bird Area; White-headed Duck (*Oxyura leucocephala*); Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Habitat	P, C	IP 11: Introduction of invasive alien species.	Care will be taken to avoid introduction of new invasive species to, and spread of existing invasive species within, the Project area through: - washing of vehicles, equipment and supplies before entry to the Project area; - monitoring for invasive species; and - control/eradication of invasive species where found.	Washing of vehicles, equipment and supplies before entry to Project area	Transit site outside Project Area of Influence	Inspections	Unannounced inspections at least quarterly during preparation, construction and worksite closure phases	RD, Construction Supervision (referred to as the 'Engineer" in the ADB EIA)
					Abundance/spread of invasive alien species in Project area	Project Area of Influence	Surveys by specialist sub-contractor	Annually, in summer during preparation, construction and worksite closure phases	Construction Contractor ecological sub-contractor
					Control of new/spreading areas of invasive alien species in Project area	Project Area of Influence	Records of invasive species control; inspections	Quarterly, during preparation, construction and worksite closure phases	Construction Supervision, Construction Contractor ecological sub-contractor
Kolkheti National Park, Ramsar Site and Important Bird Area	Vegetation coverage	P	IP 9: Loss of vegetation coverage in specific areas of the project.	Ensure that the rehabilitation of the secondary road [from Patara Poti to the oil terminal] does not extend into the proposed extension of the National Park.	Rehabilitation of secondary road within NP extension	Worksite	Comparison of maps of proposed NP extension with those of secondary	Before finalisation of project workplans	RD

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
							road rehabilitation		
Kolkheti National Park, Ramsar Site and Important Bird Area	Vegetation coverage	P	IP 9: Loss of vegetation coverage in specific areas of the project.	Boundaries of ROW and operation area will be strictly kept to - to avoid impact on the adjacent vegetation; Strict keeping to traffic routes during the construction will be ensured to avoid impact on vegetation.	Vegetation disturbance by Project vehicles and contractors; mortality of priority bird and plants	Project Area of Influence	Review of Project incident logbook; visual inspection	Unannounced inspections at least quarterly, during preparation, construction and worksite closure phases	RD, Construction Supervision
Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus*	Mortality	P, C	IP, IC 10: Mortality of individuals.						
White-headed Duck (*Oxyura leucocephala*)	Habitat	P	IP 12: Modification and fragmentation of habitat due to loss of vegetation coverage.						
	Mortality	P	IP 13: Mortality of individuals due to equipment operation.						
Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus*	Mortality	P, C	IP, IC 10: Mortality of individuals.	Vegetation will be preserved where feasible, in particular in the areas near the river bank to avoid erosion/sedimentation.	Mortality of individuals	Project Area of Influence	Review of Project incident logbook; visual inspection	Unannounced inspections during preparation, construction and worksite closure phases	RD, Construction Supervision

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
				In case taxation [walkover surveys pre-construction] reveals any protected plant species in the area, the latter will be removed from the environment [and translocated] in accordance with sub-paragraph (v), Article 24, first paragraph of the law of Georgia on 'Red List and Red Book'. Relocation of any specimens found during the surveys where practical will be provided with the help of biodiversity experts to ensure proper handling... A plan and schedule must be developed by the Contractor prior to implementation of this task.	Number of plants requiring translocation	Within the Project area, where ground/water disturbance may take place	Surveys by specialist sub-contractor	During walkover surveys, pre-construction	Construction Contractor ecological sub-contractor
White-headed Duck (*Oxyura leucocephala*); Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Distribution	P, C	IP 13, IC 11: Displacement of species due to noise, presence of machinery and equipment and presence of staff.	All vehicles, equipment and machinery used for construction will be regularly maintained and inspected/certificated to ensure that the noise levels conform to the standards prescribed.	Noise levels of Project vehicles, equipment and machinery against prescribed standards	Worksite	Review of certificates; inspections	Unannounced inspections quarterly during preparation and construction phases	RD, Construction Supervision
Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus*	Mortality	P, C	IP, IC 10: Mortality of individuals.	Training of the staff in environmental and safety issues, including protection of vegetation outside the boundaries of the project corridor.	Staff adherence to best practice	Worksite	Review of training records; review of Project incident logbook; inspections	Unannounced inspections quarterly during preparation and construction phases	RD, Construction Supervision
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper	Habitat	C	IC 12: Modification and fragmentation of habitat, including loss of spawning grounds for						

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
(*Capoeta ekmekciae*)			wild sturgeon species.						
	Mortality	C	IC 14: Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.						
Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus*	Mortality	P, C	IP, IC 10: Mortality of individuals.	Disturbed vegetation must be replanted immediately after the construction/disturbance stops.	Physical restoration of the sites to their original state	At all Project-disturbed areas	Inspections	Before the end of the worksite closure phase	RD, Construction Supervision
					Successful progress of re-vegetation, and need for any additional re-vegetation	At all Project re-vegetation sites	Surveys by specialist sub-contractor	Annually, in summer, from the last year of the worksite closure phase until the fifth year of the operations phase, inclusive	MoEPA, Construction Contractor ecological sub-contractor

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Habitat	C	IC 12: Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species.	Slopes of embankment will be protected from erosion by vegetation and slope drainage. Dewatering and cleaning of cofferdams to prevent siltation by pumping from cofferdams to a settling basin or a containment unit will be performed. Construction materials and chemicals will be appropriately secured during flood season to avoid accidental release to the natural environment. Materials and waste will be stockpiled so as to avoid erosion and washing off into the river. Drainage trenches will be established to divert surface runoff from the site. Ensure no waste materials are dumped in the river, including re-enforced concrete debris. In disturbed soil areas, compacted straw (straw bales), silt fence, fibber rolls, gravel bags, or other approved sediment control must be ensured. At a minimum, all bare soil (whether it's an abutment slope or a stockpile) must be protected before it rains. No concrete waste from concrete mixers will be dumped in the river. Temporary fuel tanks will be located at least 50 m away from any watercourse, drain, or channel leading to a water course. The tank will be placed in covered areas with berms or dikes installed to intercept spills, if any. Any spill will be immediately localized and	Adherence to approved Project plans for soil and erosion, storage of fuels and chemicals, sewage management, and fuelling and maintenance	Project Area of Influence	Inspections	Unannounced inspections at least monthly during preparation, construction and worksite closure phases	RD, Construction Supervision
					Aquatic macroinvertebrate diversity and abundance	Close downstream of the Project site	Surveys by specialist sub-contractor, using driftnets	Quarterly, during preparation, construction and worksite closure phases, and first two years of operations phase	MoEPA, Construction Contractor ecological sub-contractor

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
				cleaned up with absorbent materials. The bund will be able to accommodate 110% of the volume of the tank. Refueling of all plant, vehicles and machinery will not be allowed within 50 m of any watercourse, drain or channel leading to a water course. Oil, chemical and solid waste will be stored, and handled and disposed of by appropriately licensed waste management contractors.					
				Borrowing from the stream [at the project site] will be prohibited. Dropping structures into rivers/streams will be avoided [construction will instead take place from the river bank or pontoons]. Discharge of sediment-laden construction water (e.g., from areas containing dredged soil) directly into surface watercourses will be forbidden. Sediment laden construction water will be discharged into settling lagoons or tanks prior to final discharge.	Absence of borrowing from; movement of machines or dropping structures in; and discharge of sediment-laden water to the Rioni River at the project site	Project Area of Influence	Visual inspection	Unannounced inspections monthly, during preparation, construction and worksite closure phases	RD, Construction Supervision
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Habitat	C	IC 12: Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species.	Movement of machines inside rivers, streams, or on their banks will be prevented except when it is unavoidable due to the construction of a structure. No washing of vehicles etc. in the river will be allowed.	Absence of movement of machines in the Rioni River	Project Area of Influence	Visual inspection	Unannounced inspections monthly, during preparation, construction and worksite closure phases	RD, Construction Supervision

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
	Distribution	C	IC 13: Displacement of species due to noise, presence of machinery, and equipment and of staff.						
	Mortality	C	IC 14: Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.						
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Habitat	C	IC 12: Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species.	Sourcing of construction materials (e.g., sand, gravel) will avoid use of any licensed or unlicensed sites in the Rioni River or on its banks.	Sourcing of materials	n/a	Review of records for sourcing of materials; inspections	Unannounced inspections quarterly, during preparation, construction and worksite closure phases	RD, Construction Supervision
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper	Distribution	C	IC 13: Displacement of species due to noise, presence of machinery, and equipment and of staff.	Coffer dams, silt fences, sediment barriers or other devices to prevent migration of silt during construction within the river will be provided. [Coffer dams will also significantly reduce pile-driving noise.]	Use of silt migration barriers	Worksite	Visual inspection	Unannounced inspections, twice-yearly in March-September during the preparation and construction phases	RD, Construction Supervision

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
(*Capoeta ekmekciae*)				Ensure compliance with construction specifications which envisage the arrangement of cofferdams to protect water quality during construction minimize the impacts to aquatic fauna during pile driving in the Rioni River. Noise from pile-driving will be kept below current international interim good practice guidelines.	Use of sheet pile cofferdams for in-river construction	Worksite	Visual inspection	Unannounced inspections, twice-yearly in March-September during the preparation and construction phases	RD, Construction Supervision
				The contractor will model planned pile-driving and assess alignment with international interim good practice guidelines before starting to pile. Where planned pile-driving appears likely to exceed such thresholds, alternative pile-driving methods or mitigation will be selected	Noise levels from pile-driving against good practice guidelines	Worksite	Inspections	Unannounced inspections quarterly during preparation and construction phases	RD, Construction Supervision
				Implement a build-up of activity which slowly increases construction activities within the Rioni River to allow aquatic fauna to exhibit avoidance responses.	Appropriate construction build-up	Worksite	Inspections	Unannounced inspections quarterly during preparation and construction phases	RD, Construction Supervision
				All in-river activities will be avoided during March-September inclusive, to avoid disturbance to sturgeon during their overall spawning season. Where possible, in-river activities will also be avoided in October and November.	Absence of in-river activities	Worksite	Visual inspection	At least monthly from March-September inclusive, during the preparation, construction and worksite closure phases	RD, Construction Supervision
				The central bridge pier and adjoining two piers will be constructed (referring specifically to construction using coffer dams in the river) at two different times.	Appropriate constructon sequencing	Worksite	Visual inspection	At least monthly from March-September inclusive, during the preparation, construction and worksite closure phases	RD, Construction Supervision

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Mortality	C	IC 14: Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.	Fishing and using of illegal fishing gear [by construction workers] anywhere along the river will be prohibited.	Absence of fishing	Worksite	Visual inspection	Unannounced inspections, quarterly during the preparation, construction and worksite closure phases	RD, Construction Supervision
				Use of propeller-driven boats will be minimised during construction.	Absence of propeller-driven boats except during set-up and removal of pontoons	Worksite	Visual inspection	Unannounced inspections, quarterly during the preparation, construction and worksite closure phases	RD, Construction Supervision
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Habitat	O	IO 8: Degradation of aquatic habitat from accidentally spilled fuel/oil or surface runoff from bridge.	Runoff water from the bridge structures will be handled by the built drainage structures and runoff and spill containment chambers. The Terms of Reference for the Road Maintenance Contractor for the operations phase will include regular monitoring of retention structures, and safe disposal of contents after any spills.	Drainage/retention infrastructure in good technical condition and cleaned regularly	Project site	Inspection	Recurrent [as needed for operational life of the Project]	RD, Maintenance Contractor
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Mortality	O	IO 9: Mortality of sturgeon from illegal fishing activities using the bridge structures.	Warning signs and CCTV cameras will be installed on both sides of the bridge to deter and detect illegal fishing activities.	Installation of warning signs and CCTV cameras	Project site	Inspection	Before the end of the worksite closure phase	RD, Construction Supervision
				Monitoring of the bridge piers by CCTV will be ensured throughout the operation period to prevent poaching of sturgeon by using fishing gear on bridge structures.	Illegal fishing using the bridge	Project site	Inspection of CCTV camera footage	At least weekly from March-September inclusive, for the operational life of the Project	RD, Maintenance Contractor

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
					Sturgeon abundance in the river	Project site	Surveys by specialist contractor	Annually, from before the preparation phase until the end of the defect liability period.*	RD, ecological contractor

Note: To understand the potential for longer-term impacts, it would be necessary for sturgeon abundance monitoring to continue into the operational phase of the project, annually until the third year of operation after defect liability and then twice more at five-yearly intervals. It is recommended that the RD identify parties best placed to undertake such surveys and to report to ADB and other relevant stakeholders on the findings.

J. Cost Estimate of Environmental Mitigation Measures

851. Most costs associated with the environmental recommendations of the EMP are a normal part of preparing the bid and contract documents and ensuring that proper environmental provisions are incorporated therein. The installation of septic systems at construction camps, for example, is an environmental necessity, but not generally considered an "environmental cost". Table 92 lists the proposed mitigation measures and indicates where they would be "included in the project budget" as part of a bid document and where additional costs are a likely "environmental cost" beyond what would normally be included in a project budget.

Table 92. Rough Cost Estimate for Mitigation Measures and Monitoring

Action	Cost ($USD)	Timing	Frequency and duration
Dust suppression measures	5,500	Construction Phase	Throughout the construction phase
Seeding and sodding	6,500	Construction Phase	Once according to Clearance, Revegetation, and Restoration Management Plan, and as necessary during the construction phase
Planting	6,200	Construction Phase	Once according to Clearance, Revegetation, and Restoration Management Plan, and as necessary during the construction phase
Retention chambers	6,300	Construction Phase	Once
Monitoring during construction (air quality, noise, water, biodiversity)	15,250	Construction Phase	Throughout the construction phase
Monitoring during operation (air quality, noise, water, biodiversity)	5,000	Operation Phase	For three years
Modelling of planned pile-driving to assess alignment with international interim good practice guidelines	20,000	Pre-construction Phase	Once
Installation of warning signs and CCTV cameras	13,000	Construction Phase	Once
Sound Exposure Level (SEL) and Root Mean Square (RMS) noise levels using hydrophones	50,000	Construction Phase	Beginning of cofferdam construction and periodically during impact driving
Sturgeon abundance surveys (standard monitoring)*	20,000	Prior to Preparation Phase through Operation Phase	Annually, from before the preparation phase until the end of the defect liability period.
Measure to ensure no net loss / net gains: high standard monitoring system for sturgeon.*	140,000 for each of two years	Preparation & Operation Phases	Once pre-construction and once in early operations phase; more frequently if possible
Grand Total	**417,750**		

**It should be noted that Sturgeon abundance surveys will likely overlap with the wider conducted high standard monitoring system and therefore surveys may be done as part of the same program, at the choice of the contractor.*

Action	Annual Cost ($USD)	Timing	Frequency and duration
Monitoring for illegal fishing activities via CCTV	$50 plus 24-person days	Operations Phase	Throughout the operations phase

K. Conclusions and Recommendations

K.1 - Conclusions

K.1.1 - Project Context

852. The expected impact and outcome from the Poti-Grigoleti Road Section (Lot 2, Stage 1) is the following:

- Impact: Inclusive economic growth promoted by enhanced local and regional connectivity and competitiveness in the western Georgian region.
- Outcome: Improved transport accessibility within the Project area and between countries leading to increased access to markets, health, and education facilities.

853. This Project is one part of a larger development plan to strengthen and improve the road network in the Black Sea coastal area within Samegrelo-Zemo Svaneti and Guria regions. This corridor comprises the area from Poti up to the Kobuleti bypass and represents a significant investment in upgrading the transportation infrastructure.

854. Currently the Project area suffers from deteriorating road infrastructure which lacks the capacity to handle increased levels of traffic expected in the future from construction of the Anaklia deep sea port and further development of the Port of Poti. Negative environmental and social impacts from traffic jams, noise, low speed, high emissions, and safety issues related to the use of the existing bridge structure over the Rioni River would continue without action.

855. In order to address issues with existing road infrastructure in the Project area, Alternatives were examined which relate to the Project's location, design, technology, and components, as well as their potential environmental and social impacts. The 'No Action' Alternative was also considered, addressing the likely consequences of not undertaking the proposed intervention. The Alternative Analysis considered that failure to develop the road section of Lot 2, Stage 1 would have implications for cross border trade and development in the region.

856. Location and technical alternatives were also considered. Three alternatives to the design alignment were originally proposed for the section. Several alternative bridge designs were considered to meet Project road specifications while addressing concerns with the following: (i) climate change (flooding in particular); (ii) nature of soils present in the area (very soft), seismicity in the area; and (iii) aquatic biodiversity and water flow (total number of bridge piers reduced to seven). Alternatives were also considered regarding the pavement and sub-layer design because of the geological and geotechnical characteristics of the Project area. In consideration for protected and priority aquatic species in the Rioni River, a number of alternatives were considered to manage potential spillage of hazardous substances caused by accidental spills or runoff on the bridge. The final decision for the road alignment and the technological alternatives was made based on technical, economic, and environmental considerations.

K.1.2 - Primary Environmental Impacts and Mitigation Measures

Primary Impacts During Site Preparation, Construction, and Worksite Closure Stages

857. Water quality. Without mitigation, one of the principal impacts during construction will be on water bodies, particularly during construction over the Rioni River. The activities posing

the highest risk to deterioration in the surface water environment would be the temporary works associated with bridge construction and release of contaminants, sediment loading, and other runoff into watercourses. Therefore, water quality will be measured regularly throughout the construction phase and emphasis will be placed on local consultations with Kolkheti National Park, which is adjacent to and downstream from the bridge, and residents to ensure their water quality is not impacted on to an unacceptable degree. Control of water, materials, and construction equipment will be of utmost importance during construction.

858. Noise. The greatest in-river disturbance impacts are likely to come from pile-driving. Although sturgeon suffer lower mortality from noise impacts than some other fish, pile-driving has been demonstrated to result in injuries to sturgeon. For ease of all in-water construction, this Project is already planning to use cofferdams dewatered down to the mud line. The use of coffer dams substantially reduces underwater pile driving sound,[94] and is likely to provide sufficient mitigation to avoid any mortality or serious injury impacts. Before starting any in the water construction activities, underwater noise measurements will be taken using hydrophones to establish in the water background noise levels. Modeling of the planned pile driving activities will also be done before construction to ensure noise from pile-driving is kept below current international interim good practice guidelines. Then regular noise measurements will be taken during pilling activities to determine compliance with the Project in the water SEL and Peak noise limits.

859. Aquatic fauna mortality. In-river construction might possibly cause direct mortality or injury of fish through accidental collision from propeller-driven boats, crushing of individual fish by machinery or equipment, or poaching of fish by construction workers. Given limited need for the use of propeller-driven boats here, they will not be used in this Project other than to set-up and remove pontoons that will be used during construction. Staff will be trained in construction best practice and poaching will be prohibited. Dropping structures into rivers/streams will be avoided [construction will instead take place from the river bank or pontoons].

860. Aquatic habitat. The potential for indirect modification of the Rioni River is of great concern. Licensed sand and gravel quarry sites in the Rioni River downstream of the Vartsikhe hydropower plants are currently having devastating impacts on the limited remaining spawning grounds of sturgeon species in the river. As such, sourcing of construction materials (e.g., sand, gravel) will avoid use of any licensed or unlicensed sites in the Rioni River or on its banks. There is potential that too large a proportion of the river may be blocked by cofferdams at any one time if construction of the bridge piers is not staged appropriately. Sheet piling coffer dams for all three piers will span approximately 100 m of the river (two of c. 25 m width and one of c. 50 m width[95]) – a relatively small proportion if split into two periods, but of concern if constructed simultaneously.[96] Therefore, the central bridge pier and adjoining two piers will be constructed at two different times. All in-river activities will be avoided during March-September, inclusive, to avoid disturbance to sturgeon during their overall spawning season. Where feasible, in-river activities will also be avoided in October and November. Care will also be taken to avoid introduction of new invasive species to, and spread of existing invasive species within, the Project area through washing of vehicles, equipment and supplies before entry to the Project area; monitoring for invasive species; and control/eradication of invasive species where found.

861. Terrestrial habitat. It is unlikely that construction of the new road section will exert any significant additional impact on the existing flora and fauna in the project area over and above the current situation due to the relatively small footprint of the Project and presence of largely

[94] Caltrans, 2015
[95] Levan Kupatashvili, Roads Department, pers. comm. 2018
[96] Radu Suciu, pers. comm. 2019

modified habitat. Short-term disturbances to fauna and fragmentation of habitat in the ROW of the project are unavoidable. A strip of riparian habitat along the edge of the river will be retained to reduce impact on species (ensuring connectivity and possibility for free movement along the river edge).

862. Protected areas and internationally-recognized areas. The Project's location near the Kolkheti National Park, Ramsar Site and IBA, and unavoidable disturbance and habitat loss due to construction, have the potential to impact fauna beyond the immediate Project site. Significant direct impacts are, however, unlikely since the most important parts of these sites, and concentrations of migratory and wintering birds, are not found near the Project footprint.

863. Dust and noise. The dust generated and mobilized by construction activities is likely to impact on residents close to the Project construction sites. However, dust suppression measures are clearly specified and will seek to manage dust to acceptable levels. Noise will be managed to the extent possible using best practice and mitigation measures aimed at reducing and or directing construction related sounds that may impact sensitive noise receptors.

864. Health and safety. Project workers will be exposed to different hazards during construction including noise and vibration, dust, handling heavy materials and equipment, falling objects, work on slippery surfaces, fire hazards, drowning and chemical hazards such as toxic fumes and vapors etc. There are a number of potential health and safety related impacts which may result from construction activity on the Project, including traffic accidents, presence of new infrastructure, management of hazardous materials and waste, and spread communicable disease. Potential risks will be eliminated or reduced using good practice and known control and management solutions.

865. Socio-Economic. Several socio-economic beneficial impacts are expected including: (i) generation of skilled and unskilled employment opportunities; (ii) induced economic effects of spending on goods and services by construction workers; and (iii) long-term capacity enhancement for the local workforce. From the analysis provided by the LARP, we know that there will also be negative impacts associated with the Project. They include acquisition of 33,647 sq m of land from 30 plots, including 14 private plots and 16 public land plots. The project has impact on 12 affected households (AHs) and 1 company (59 individuals). All of these mentioned 12 AH and 1 company are losing land. Only 1 AH loses his buildings (abandoned and not finished residential house and ancillary building), 4 AHs are losing fences. There are no AH losing crops, trees, business, employment and other sources of income. No agricultural tenants or businesses will be affected. No physical relocation is planned under the LARP. The 11 AHs are deemed as severely AH (households losing > 10% of their income or productive land) and 2 AHs are recognized as the vulnerable AH (women headed AHs). Given the impacts identified in the LARP, the Project has been classified as "B" for resettlement.[97]

Primary Impacts during Operation Phase

866. Community health and safety. This EIA indicates that one of the main potential impact during operation will be the increased traffic volume and higher speed that could result in increased risk to drivers and the communities the road section passes through. The risk will be reduced to acceptable levels through installation of road signs, pavement marking, installation of guide posts and steel guardrails, cast in situ concrete parapets in the dividing strip, sidewalks, and enforcement of speed limits to ensure traffic regulations and safety.

[97] Based on the *ADB Safeguards Policy Update (2009) a Project is classified as A for LAR when it entails severe impacts (*> 200 persons lose >10% of their income or are resettled). For category A projects a full LARP is to be prepared.

867. Noise. Traffic noise prediction results indicate that the future noise levels after the completion of the project would be higher by less than 0.5 dB from the existing noise levels which is not noticeable. Therefore, no noise mitigations such as noise barriers are needed.

868. GHG emissions. The Project road section will help to increase the economic development of the region and result in increased traffic. This will lead to higher levels of GHG emissions. The overall contribution to GHG emissions will be low and no adverse air quality impacts are expected at the air sensitive receptors in the vicinity of the Project site above what already exists.

869. Poaching. A potential longer-term impact of the Project would also be to elevate poaching levels of sturgeon. Where bridges exist, methods of catching sturgeon in the region include stringing nets or snag lines between bridge piers, with hanging nooses or unbaited hooks to catch the sturgeon. While occurring at a small spatial scale, such activity could be persistent and thus have high consequences. CCTV cameras will be set up on the bridge and maintained through operation. A live feed will be provided to the relevant authorities and key stakeholders to ensure that no illegal fishing occurs on the bridge. Regular (at least weekly) monitoring of installed CCTV cameras during the overall spawning season (March-September inclusive) will be undertaken as well as reporting of incidents to the RD and the MoEPA Biodiversity Service under the Department of Biodiversity and Forest Policy.

Induced and Cumulative Impacts

870. Socio-Economic. These impacts will be mainly positive. The full scale of positive indirect impacts will be achieved once the Western Regional Road corridor is completed. These benefits include improved access to education, social, health and community services, and improved economic development opportunities.

871. Ecology and biodiversity. With regards to potential cumulative impacts from anticipated development in the region, there is significant uncertainty considering that information is limited or not available and the development activities are outside of the control of this Project. The Rioni River and its biodiversity are already suffering impacts from issues such as pollution, gravel and sand extraction, and unsustainable fishing practices. Surrounding areas have been extensively cleared for agriculture and are increasingly being impacted by urban or large-scale development. A number of other large-scale developments in the region of the Project may specifically impact sturgeon (including development of the Anaklia deep sea port 30 km to the north of Poti) or the Rioni River (including the Samtredia-Grigoleti highway; Namakhvani hydropower cascade c. 150 km upstream; improvement of the Poti wastewater system; improvement of the Kutaisi water supply system; and structural measures in the Rioni River to reduce impacts of flooding).

872. The Project will be carefully managed and monitored by the RD and consultations will be undertaken with IFIs, donors, and implementing units on other projects that are identified as likely to contribute to cumulative impacts so as to reduce uncertainty and, where necessary, take action to minimize environmental harm.

Residual Impacts

873. GHG emissions. Residual impacts from the generation of GHGs will remain throughout the lifecycle of the Project. This is deemed to be an unavoidable and acceptable impact for the Project as the economic and social benefits are considerable. As mentioned, the overall contribution of this Project to global GHG emissions is considered negligible.

874. Water quality. Water from bridge will be collected and retained prior to discharge. If not maintained appropriately by the Road Maintenance Contractor, residual impacts will occur

during the operational phase if polluted road water run-off drains directly into the Rioni River. It is noted that collection and treatment of water from road runoff should also be considered for the road drainage network in general.

875. Habitat. The clearing of natural habitat and modified habitat will have impacts to biodiversity in the area, including direct loses where the new road lies. The restoration and re-planting programs should go a long way to mitigating these impacts, but in some locations, such as river banks, residual impacts may remain. It will take a number of years for the habitat to be restored and for re-planted areas to develop into something similar to the habitats they are replacing. Overall the residual impact is low however considering the existing condition of the Project site.

876. Land use. No residual impacts are anticipated if the LARP is implemented correctly. However, there will still be disruption to the local community during the LARP implementation process. A GRM has been prepared to manage complaints received during this process.

877. Noise. Despite the fact that comprehensive mitigation measures have been set to manage construction noise, there may still be instances where construction works result in unanticipated elevated noise levels and vibration. However, these will only be temporary and localized. Good oversight from the Contractor's Health, Safety and Environment (HSE) team and the Engineer's environmental manager should limit the impact of these types of incidents. Additional measures in the operation phase may be required if actual noise levels exceed limits or if complaints from residents are received.

878. Critical Habitat-qualifying biodiversity. In only a few cases are impacts on priority biodiversity expected to remain greater than negligible by the Project operations phase, for plants and sturgeon (Stellate, Russian and Beluga Sturgeon). In neither case are such impacts anywhere near the level that could impair the ability of the nearby Critical Habitat to function. There remains a risk that the Project may facilitate illegal fishing, and thus result in reductions in the population of Critically Endangered sturgeon. These impacts are not predicted likely to impact on these species' ability to persist.

879. Based on analysis from the BAP, there is anticipated to be a limited residual impact on the two priority plant species (Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus*) remaining into the operations phase. Plants will suffer some mortality if translocated during the pre-construction phase and other will be lost under the Project footprint (to be confirmed during pre-construction walkover surveys), but this is predicted to be minimal (particularly within the context of available habitat nearby). Moreover, these two plants should be able to re-establish in temporarily disturbed areas after the construction period. As such, long-term residual impacts on the priority plants are considered negligible (non-measurable) (see BAP, Section **5.2 - Residual impacts**).

880. Restricting in-river construction and disturbance to periods outside of the sturgeon spawning season will dramatically reduce the potential for displacement and mortality impacts on the three priority sturgeon species (i.e., Stellate Sturgeon, Russian Sturgeon, and Beluga Sturgeon). Nonetheless, all three species are believed to still use the river in lower numbers outside of the spawning season. There is thus still (lower) potential for disturbance and mortality impacts on sturgeon during construction. These have the potential to negatively affect spawning or juvenile dispersal. The breeding populations of these species are now so limited that any such effects could have impacts on the sturgeon populations that last into the operational phase, though likely not at such a scale that they would last into the long-term. Such medium-term impacts are, nonetheless, of concern for species in such a perilous overall condition as these sturgeon. Overall, on a precautionary basis, significant, Low-level, residual impacts on Stellate, Russian, and Beluga Sturgeon may thus be anticipated from this Project (see BAP, Section **5.2 - Residual impacts**).

K.2 - Recommendations

881. The EMP and its mitigation and monitoring programs contained herewith will be included within the bidding documents for Project works. The bid documents state that the Contractor will be responsible for the implementation of the requirements of the EMP through his own SEMP which will adopt all of the conditions of the EMP and add site specific elements that are not currently known, such as the Contractor's camp locations (if needed). This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs.

882. The EMP and all its requirements will then be added to the Contractor's contract, thereby making implementation of the EMP a legal requirement according to the Contract. He will then prepare his SEMP which will be approved and monitored by the Engineer. Should the Engineer note any non-conformance with the SEMP (and the EMP) the Contractor can be held liable for breach of the contractual obligations of the EMP. To ensure compliance with the SEMP the Contractor should employ an Environmental Officer (EO) to monitor and report Project activities throughout the construction phase.

883. The ADB Safeguard Policy Statement requires *'measures to avoid, minimize, or mitigate potentially adverse impacts and risks'*. Nonetheless, some residual impacts cannot be fully mitigated, and – on a precautionary basis – it is recognized that this Project may have significant, though Low-level, residual impacts on Stellate, Russian and Beluga Sturgeon. In such cases, ADB requires *'compensatory measures, such as biodiversity offsets, to achieve no net loss or a net gain of the affected biodiversity'*. These compensatory measures should ensure that, overall, the high biodiversity value of the Critical Habitat is maintained, along with populations of Endangered and Critically Endangered species.

884. Two main approaches are assessed as potentially suitable compensation measures for this Project's residual impacts on sturgeon species: (i) support to a high standard mixed-method monitoring system; and (ii) support to a cumulative impacts working group to improve hydropower management upstream and reduce sand/gravel quarrying in the Rioni River. In both cases, funding would need to be allocated to non-governmental or research institution partners to implement these approaches. Refer to the BAP in **Annex 1. Biodiversity Action Plan (BAP)** for further analysis on this recommended no net loss / net gain approach. It is recommended that sufficient financing be provided to establish a high standard sturgeon monitoring program at a minimum as a suitable compensation action for this Project.

K.3 - Overall Conclusions

885. Based on the analysis of information and feedback received from various stakeholders, this EIA concludes that potential significant physical, biological, or socio-economic environment impacts from the Poti-Grigoleti Road Section (Lot 2, Stage 1) Project can be addressed and it is unlikely that there will be any significant environmental impacts remaining after planned mitigation and offset measures. The Project will have short term impacts during construction which can be mitigated to an acceptable level through measures which seek to reduce the potential for harm to the environment and human health.

886. Provided that all general and specific mitigation and compensatory measures are implemented, the Project is predicted to reach no net loss or net gain for all Critical Habitat-qualifying biodiversity. Only a few impacts on priority biodiversity are expected to remain measurable by the Project operations phase, for plants and sturgeon. In neither case are such impacts anywhere near the level that could impair the ability of the Critical Habitat to function.

887. There remains a risk that the Project may impact sturgeon during in-river construction, and that the bridge may facilitate illegal fishing into the long term. Either of these may result in reductions in the populations of three Critically Endangered sturgeon species, though are not likely to impact these species' ability to persist. The Project is thus planning to make a positive contribution to sturgeon conservation that will compensate for these risks of residual impacts in order to align with ADB safeguard requirements for projects in areas of Critical Habitat (ADB 2009), by achieving at least no net loss for these fish species.

888. Moreover, the stakeholder and community consultation during the development of the EIA demonstrated that the Project has local support as it will result in significant benefits in terms of accessibility to services, improved connectivity between communities, and importantly the economic development prospects of the area will be greatly increased.

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83) Water Resources of Georgia, Gia Khmaladze, 2009.

Annexes

Annex 1. Biodiversity Action Plan (BAP)

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Annex 1. Biodiversity Action Plan (BAP)

Poti-Grigoleti-Kobuleti Bypass, Poti-Grigoleti Road Section (Lot 2, Stage 1): Biodiversity Action Plan

Drafted for the Asian Development Bank by John Pilgrim Limited

1 Executive Summary

This document is for the Poti-Grigoleti-Kobuleti Bypass, Poti-Grigoleti Road Section (Lot 2, Stage 1), representing a bridge over the Rioni River and access roads (hereafter "the Project"), on the border between Khobi Municipality and the Poti administrative centre in western Georgia. An Environmental Impact Assessment for the Project was completed and received national government approval in 2018.

The Project is being financed by the Asian Development Bank (ADB) and has been identified as a Category A project owing to the potential for significant irreversible adverse impacts on the Rioni River – one of the few remaining spawning rivers globally for several Critically Endangered fish species. As a result, this draft Biodiversity Action Plan (BAP) has been developed to demonstrate Project compliance with ADB biodiversity safeguards (ADB 2009). There is extremely little recent information on the status, distribution and ecology of biodiversity in the Project area, so this BAP has taken a precautionary approach. It is a living document and can be adapted during the Project life in response to new information on the scale or significance of Project impacts or mitigation and management measures

The Project is situated in a landscape of varying land use and land cover, comprising a matrix of Natural and Modified Habitat. A full Critical Habitat Assessment (Appendix A) identified the Project area to be likely Tier 1 Critical Habitat for one globally Critically Endangered water plant (Colchis Water-Chestnut *Trapa colchica*), and likely or actual Tier 2 Critical Habitat for four freshwater fishes (Stellate, Russian and Beluga Sturgeon *Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*; and Grusinian Scraper *Capoeta ekmekciae*), one bird (White-headed Duck *Oxyura leucocephala*), one additional plant (*Hibiscus ponticus*), and Kolkheti National Park, Ramsar Site and Important Bird Area (Table 1; Section 3). There is a very slim possibility that Atlantic (European) Sturgeon (*Acipenser sturio*) and/or Ship (Fringebarbel) Sturgeon (*Acipenser nudiventris*) also still regularly occur in the Rioni River. If that were the case, they would also qualify the Project area as Critical Habitat (See BAP, Section **3.2 - Priority biodiversity**).

Without mitigation, the Project could have highly significant impacts on this Critical Habitat-qualifying biodiversity (Section 4). Particular risks are the sourcing of sand and gravel for construction, introduction of invasive alien species, in-river disturbance during construction, and facilitation of illegal fishing during the operational life of the bridge.

A number of general or standard mitigation/enhancement measures have already been outlined in the Project's national EIA. This BAP includes a small number of additional specific mitigation and management measures (Section 5) necessary to reduce residual impacts on Critical Habitat-qualifying biodiversity to levels in line with the ADB Safeguard Policy Statement (ADB 2009). For the most part, these are not anticipated to result in any significant Project time delays, and are only anticipated to incur minor capital and annual monitoring, maintenance and repair costs (Section 5.1, and as summarized in a table below). These additional measures are:

- Sourcing of construction materials (e.g., sand, gravel) will avoid use of any licensed or unlicensed sites in the Rioni River or on its banks (Section 5.1.1);
- All in-river activities will be avoided during March-September, inclusive. Where possible, in-river activities will also be avoided in October and November (Section 5.1.2);
- The central bridge pier and adjoining two piers will be constructed at two different times, to avoid a large proportion of the river being blocked by cofferdams at one time (Section 5.1.3);
- Noise from pile-driving will be kept below current international interim good practice guidelines (Section 5.1.4);

- Use of propeller-driven boats will be minimised during construction (Section 5.1.5);
- Warning signs and CCTV cameras will be installed on both sides of the bridge to deter and detect illegal fishing activities (Section 5.1.6); and
- Monitoring of the bridge piers by CCTV will be ensured throughout the operation period to prevent poaching of sturgeon by using fishing gear on bridge structures (Section 5.1.7).

After these general and specific mitigation measures, the Project is predicted to reach no net loss for most Critical Habitat-qualifying biodiversity. Only a few impacts on this priority biodiversity are expected to remain measurable by the Project operations phase, for plants and sturgeon. In neither case are such impacts anywhere near the level that could impair the ability of the Critical Habitat to function, and impacts on plants are predicted to be negligible after recovery during the Project operations phase (Section 5.2).

There remains a risk that the Project may impact sturgeon during in-river construction, and that the bridge may facilitate illegal fishing into the long term. Either of these may result in reductions in the populations of three Critically Endangered sturgeon species, though are not likely to impact these species' ability to persist (Section 5.2). Given risks, and the wider context of cumulative impacts on these highly-threatened fishes, the Project is also planning to make a positive contribution to sturgeon conservation that will compensate for these risks of residual impacts (Section 5.3), in order to achieve a net gain for the species and align with ADB safeguard requirements for projects in areas of Critical Habitat (ADB 2009).

The Project aims to support net gain programmes through non-governmental organisation or research institution partners. This support will be elaborated in a future version of this BAP, or a separate compensation plan. Of various conservation measures proposed for sturgeon in Georgia, the following are assessed as potentially suitable compensation measures for this Project's residual impacts:

- Support to a high standard mixed-method monitoring system (Sections 5.3.3 & 6.1);
- Support to a cumulative impacts working group (Box 1) to improve hydropower management upstream (Section 5.3.7) and reduce sand/gravel quarrying in the Rioni River (Section 5.3.9).

To ensure Project mitigation is successfully implemented and impacts avoided or minimized, the Project will undertake a programme of monitoring and evaluation (Section 6), which will proceed into the operational life of the Project in cases where there is a risk of long-term residual impacts.

Summary of estimated costs for additional specific mitigation, monitoring and No Net Loss / Net Gain actions for Critical Habitat-qualifying biodiversity in the Project area

Action	Capital cost ($USD)	Annual cost ($USD)	Timing	Frequency and duration
Modelling of pile-driving noise	20,000	-	Preparation Phase	Once
Installation of warning signs and CCTV cameras	13,000	-	Construction Phase	Once
Monitoring for illegal fishing activities via CCTV	-	$50 USD plus 24 person days	Operations Phase	Once

High standard monitoring system for sturgeon*	-	140,000 for each of two years	Preparation & Operations Phases	Once pre-construction and once in early operations phase; more frequently if possible

*It should be noted that Sturgeon abundance surveys as outlined in Table 92 will likely overlap with the wider conducted high standard monitoring system and therefore surveys may be done as part of the same program, at the choice of the contractor. Furthermore, there are additional conservation actions that are outlined in Section 7.2 of the report, the EMP and summarized in Table 92 and these references should be followed for further details.

2 Introduction

2.1 - Purpose and objectives

This document is a draft Biodiversity Action Plan (BAP) for the Poti-Grigoleti road section (stage 1) – bridge over Rioni River and access roads (hereafter "the Project"), on the border between Khobi Municipality and the Poti administrative centre in western Georgia.

An EIA for the Project was completed in 2018 (hereafter referred to as "the national EIA"), and received national government approval – with conditions – the same year (http://www.georoad.ge/?lang=eng&act=project&uid=1512467340). The Project is being financed by the Asian Development Bank (ADB). Under the ADB Safeguard Policy Statement (SPS: ADB 2009), this has been identified as a Category A project owing to the potential for significant irreversible adverse impacts on the Rioni River – one of the few remaining spawning rivers globally for several Critically Endangered fish species.

The ADB SPS requires projects in Natural Habitat to design mitigation measures to achieve at least no net loss of biodiversity. It requires projects in Critical Habitat to demonstrate '*no measurable adverse impacts, or likelihood of such, on the critical habitat which could impair its high biodiversity value or the ability to function*', no '*reduction in the population of any recognized endangered or critically endangered species or a loss in area of the habitat concerned such that the persistence of a viable and representative host ecosystem be compromised*', and mitigation of any lesser impacts. This BAP assesses these risks and presents the Project's strategy for alignment with the ADB SPS.

Following the draft ADB *Environmental Safeguards Good Practice Sourcebook* (ADB 2012), this BAP assesses the presence of Critical and Natural Habitat in the Project area (Section 3; Appendix A), evaluates potential impacts on priority biodiversity (Section 4), outlines Project commitments to mitigation and management measures to achieve at least no net loss for Critical and Natural Habitat (Section 5), and summarises an approach to monitoring and evaluation to give assurance of Project performance (Section 6). It is a living document and can be adapted during the Project life in response to new information on the scale or significance of Project impacts or mitigation and management measures.

2.2 - Approach

This BAP was developed through a review of existing Project documentation, other existing grey and published literature, consultations with government and non-government stakeholders within and outside Georgia (EIA Chapter **G. Public Consultations and Information Disclosure**), and a visit to the site in November 2018. It aligns with the ADB SPS

(ADB 2009) and International Finance Corporation Performance Standard 6 and its accompanying Guidance Note (IFC 2012a, b).[98]

Except where necessary, this document does not repeat extensive information available in other key project documents, such as the national EIA or the ADB EIA within which this annex sits, developed as part of the process of compliance with the ADB SPS ("the ADB EIA").

2.3 - Key information gaps

There is extremely little recent information on the status, distribution and ecology of biodiversity in the Project area, even for high priorities such as the globally Critically Endangered sturgeon species. This BAP has thus been developed on a precautionary basis, assuming – where there is doubt – that species may be present in the Project area and may be affected by the Project.

Some key aspects of Project implementation currently remain unclear or unknown. Where unclear, assumptions have been made and stated about likely construction methods, following discussion with Roads Department experts. One key impact remains very unclear – the location of sand/gravel extraction sites for the Project, which will be chosen by the selected construction contractor. Given this lack of clarity, an assumption was made that any licensed sand/gravel extraction site within 40 km of the Project may potentially be used.

3 Biodiversity

3.1 - Context

The nearby mountains of the Caucasus are associated with dynamic evolutionary processes that have resulted in high levels of endemism (Mittermeier *et al.* 2004). In comparison, the Project area is part of the Colchic region. This warm humid region was a stable refugium during the Pleistocene, particularly for eastern European flora (WWF undated). The complex of temperate wetlands, swamps, wet Alder (*Alnus*) forests, and bottomland broadleaf deciduous forests present in the vicinity of the Project is one of the best remaining representative extents of an ecosystem that was formerly much more widespread in Europe (UNESCO undated). Elsewhere, similar fertile low-lying areas have been extensively logged, drained and converted to agriculture. As a result, the broad "Caucasus-Anatolian-Hyrcanian Temperate Forests" region – stretching from Istanbul in the west almost to Afghanistan in the east and into southern Russia in the north – has been considered highly threatened (Olson & Dinerstein 2002). Although there is limited endemism, several relict plants are found only in this region.

The Rioni River is the largest river of Western Transcaucasia, originating on the southern slopes of the Great Caucasus. Its high sediment load, deposited in the western lowlands in and around the Project area, results in a complex river with islands and multiple channels. There is relatively high endemism among fish in the region (Bogutskaya undated). Most of these are broadly distributed within Western Transcaucasia, but at least one that occurs in the Project area can be considered truly restricted in range (Georgian Bitterling).

[98] Subsequent to initiation of this work, the International Finance Corporation issued two revised versions of its Guidance Note. The current version is dated 6 February 2019, and slightly updates a November 2018 version available at: https://www.ifc.org/wps/wcm/connect/a359a380498007e9a1b7f3336b93d75f/Updated_GN6-2012.pdf?MOD=AJPERES

The region also presents an important flyway for migratory soaring birds breeding in Europe and Russia (WWF undated). During migration, these are concentrated in the region by the Black Sea to the west and the Lesser Caucasus to the east (Verhelst *et al.* 2011).

3.2 - Priority biodiversity

A full Critical Habitat Assessment (Appendix A) identified the Project area to be likely Tier 1 Critical Habitat for one globally Critically Endangered water plant, and likely or actual Tier 2 Critical Habitat for four freshwater fishes, one bird, one additional plant, two protected areas, and one internationally-recognized area (Table 1). Some uncertainty remains in the conclusions of this assessment, given extremely limited recent information on a number of species in the Project area. Nonetheless, this uncertainty will not change the overall conclusions of this assessment. Although in some cases conclusions could be refined by further studies, on a precautionary basis the features listed in Table 1 should all be considered priority biodiversity for the Project to avoid, mitigate and – if necessary – offset impacts upon.

Based on Appendix A, Figures 1 and 2 summarise the location of Natural and Modified Habitat in the Project area. The entire aquatic DMU qualifies as Critical Habitat. Data are sufficiently sparse (e.g., on the distribution of *Hibiscus ponticus* and Colchis Water-Chestnut *Trapa colchica*) to preclude detailed mapping of terrestrial Critical Habitat. On a precautionary basis, it should therefore be assumed that all Natural Habitat may also qualify as Critical Habitat. Following this table and maps are a set of brief profiles for Critical Habitat-qualifying biodiversity, focusing on where and when each is likely to occur in the Project area. More extensive details of why each feature meets Critical Habitat criteria are given in Appendix A.

Table 1. Summary of Critical Habitat-qualifying biodiversity in the Project area

Biodiversity type	Biodiversity	Critical Habitat Tier qualified	Critical Habitat criterion qualified						Justification
			1	2	3	4	5	6	
Freshwater fish	Stellate Sturgeon *Acipenser stellatus*	2	X		X				Regularly supports at least one individual of this globally Critically Endangered migratory species, quite possibly more than 1% of its global population.
Freshwater fish	Russian ("Colchic") Sturgeon *Acipenser gueldenstaedtii*	2	X		X				Regularly supports at least one individual of this globally Critically Endangered migratory species, quite possibly more than 1% of its global population.
Freshwater fish	Grusinian Scraper (*Capoeta ekmekciae*)	2		X					Very likely supports more than 1% of the population of this restricted-range species.
Freshwater fish	Beluga Sturgeon *Huso huso*	2?	X						Quite possibly regularly supports at least one individual of this globally Critically Endangered species.
Bird	White-headed Duck *Oxyura leucocephala*	2	X						Nationally important concentrations of a species listed nationally as Endangered:

									10s of individuals winter in the Kolkheti wetlands.
Plant	*Hibiscus ponticus*	2?		X					Quite possibly supports more than 1% of the population of this restricted-range species.
Plant	Colchis Water-Chestnut *Trapa colchica*	1?, 2	X	X					Quite possibly supports more than 10% of the population of this globally Critically Endangered restricted-range species.
Protected area	Kolkheti National Park and Ramsar Site	n/a						X	Internationally and nationally recognized IUCN Category II protected area of high biodiversity value, due to be proposed as an Emerald Site and World Heritage Site.
Internationally recognized area	Kolkheti Important Bird Area	n/a						X	Area of high biodiversity value, internationally recognized as an Important Bird Area and Key Biodiversity Area.

There is a very slim possibility that Atlantic (European) Sturgeon (*Acipenser sturio*) and/or Ship (Fringebarbel) Sturgeon (*Acipenser nudiventris*) also still regularly occur in the Rioni River. If that were the case, they would also qualify the Project area as Critical Habitat. The historic decline of sturgeon in the Rioni is shocking (Guchmanidze 2009). Both Atlantic and Ship Sturgeon were still thought to regularly spawn in low numbers in the Rioni just ten years ago, and other species have declined dramatically – for example, Beluga may be on the verge of no longer spawning in the Rioni (if, indeed, it still does), yet just ten years ago it was estimated that 35-44 individuals spawned in the river each year.

Figure 1. Map of Project context, showing locations of Discrete Management Units and areas of Natural and Modified Habitat. On a precautionary basis, in the absence of much distribution data for biodiversity, all Natural Habitat may also qualify as Critical Habitat

Figure 2. Map of Project area, showing locations of Discrete Management Units and areas of Natural and Modified Habitat. On a precautionary basis, in the absence of much distribution data for biodiversity, all Natural Habitat may also qualify as Critical Habitat

Stellate (Starry) Sturgeon (*Acipenser stellatus*)

Photos and more information are available here.

This species is considered globally Critically Endangered (Qiwei 2010), and nationally Endangered (Government of Georgia 2014b). The species is very rare in Georgia, but the population seems relatively stable (Guchmanidze 2017). The Rioni is not believed to be a major spawning river for this species (Qiwei 2010), but ongoing reproduction there was confirmed in 2018 by the capture of one juvenile in the river (Council of Europe 2018; Fleur Scheele, FFI, pers. comm. 2018). Given that sturgeon are not believed to spawn every year, perhaps even only every three years (Radu Suciu, pers. comm. 2019), this is a very positive indicator of continued reproductive success. During this study, a freshly-caught adult was seen and photographed at a fish market in Grigoleti (just south of the Project area). The market stall owner said that it had been caught offshore, and incorrectly called it a Colchic Sturgeon.

Like most sturgeon, this has been severely impacted by a combination of historical overfishing, ongoing poaching, bycatch, loss of spawning grounds (primarily owing to hydropower dams and in-river quarries), hydrological changes, and pollution.

Adults of this species are most likely to occur in the Project area during its overall spawning season, which occurs from at least March-August (Qiwei 2010; Archil Guchmanidze, MoEPA, pers. comm. 2018). During that season, it could occur anywhere within the Rioni River within the Project area. The peak of spawning (upriver, towards Samtredia) is likely late April-early May (Kolman & Zarkua 2002). Further, spawning periods for sturgeon in the Rioni are very poorly known and could feasibly occur outside of these times (Radu Suciu, pers. comm. 2019). Outside of the overall spawning season, juveniles still travel downriver in September and October (Archil Guchmanidze, MoEPA, pers. comm. 2018), and potentially until November or December (Fleur Scheele, FFI, pers. comm. 2018), and may well use the downstream parts of the river – around the Project area – as a nursery ground (Radu Suciu, pers. comm. 2019). Individuals may still be found in the river throughout the year, though much more rarely (Archil Guchmanidze, MoEPA, pers. comm. 2018). Given all this information, but also major data gaps, it should be assumed that this species could be present in the Project area at any time of year, though it is clearly more common and vulnerable during spawning.

Russian Sturgeon (*Acipenser gueldenstaedtii*)

Photos and more information are available here.

This assessment includes Colchic Sturgeon (*A. g. colchicus*), which has at times been considered a subspecies of *A. persicus* or a separate species. Recent genetic studies have found no evidence for distinctiveness of *A. persicus* and *A. gueldenstaedtii* (Birstein *et al.* 2000; Ruban *et al.* 2008), so this taxon is currently considered a subspecies of *A. gueldenstaedtii* by IUCN (Gessner *et al.* 2010b; Arne Ludwig, IUCN Sturgeon Specialist Group, *in litt.* 2018), though it is still considered as *A. persicus* within Georgian legislation (Government of Georgia 2014b).

This species is considered globally Critically Endangered (Gessner *et al.* 2010b), and nationally Endangered (Government of Georgia 2014b). In Georgia, Colchic Sturgeon is legally considered a subspecies of *A. persicus*, which is also listed as nationally Endangered (Government of Georgia 2014b).

While reproduction of “Colchic Sturgeon” is now restricted to the Rioni River, Russian Sturgeon more broadly also still breeds around the Caspian Sea. It is now known to naturally spawn on only four rivers (the Rioni, Danube, Volga and Ural), but population numbers are obscured by release of tens of millions of fingerlings in Russia. Data from Georgian Black Sea waters suggest a slight increase in populations of this species in recent years (Guchmanidze 2009, 2017), but such figures should be interpreted cautiously as the methods have a few challenges (Radu Suciu, pers. comm. 2019). Ongoing reproduction was confirmed from the

Rioni River in 2018 by the capture of one juvenile in the river (Radu Suciu, pers. comm. 2019). This appeared to have been born in September, strongly suggesting a second spawning season for this species in the Rioni – multiple spawning periods for the same species are common in the Danube (Radu Suciu, pers. comm. 2019).

Like most sturgeon, this has been severely impacted by a combination of historical overfishing, ongoing poaching, bycatch, loss of spawning grounds (primarily owing to hydropower dams and in-river quarries), hydrological changes, and pollution.

Despite little recent information from the Rioni River, this species has historically spawned there and adults are most likely to occur in the Project area during its overall spawning season, which occurs at least from March-June, but may also extend into autumn (Gessner *et al.* 2010b; Archil Guchmanidze, MoEPA, pers. comm. 2018) as with Stellate Sturgeon. During March-August, it could thus occur anywhere within the Rioni River within the Project area. The peak of spawning (upriver, towards Samtredia) is likely late April-early May (Kolman & Zarkua 2002). Further, spawning periods for sturgeon in the Rioni are very poorly known and could feasibly occur outside of these times (Radu Suciu, pers. comm. 2019). Outside of the overall spawning season, juveniles still travel downriver in September and October (Archil Guchmanidze, MoEPA, pers. comm. 2018), and potentially until November or December (Fleur Scheele, FFI, pers. comm. 2018), and may well use the downstream parts of the river – around the Project area – as a nursery ground (Radu Suciu, pers. comm. 2019). Individuals may still be found in the river throughout the year, though much more rarely (Archil Guchmanidze, MoEPA, pers. comm. 2018). Given all this information, but also major data gaps, it should be assumed that this species could be present in the Project area at any time of year, though it is clearly more common and vulnerable during spawning.

Grusinian Scraper (*Capoeta ekmekciae*)

Photos and more information are available here.

This species is considered globally Near Threatened, and currently appears to have a range of just under 50,000 km^2 (Freyhof 2014a). It is only known from ten independent sublocations, one of which is in the Rioni River, in the northern part of its range (Freyhof 2014a). Little is known of its status and ecology. Though species of this genus are specialized to live in fast-flowing water and to feed on algae on stones in riffles and rapids (Turan *et al.* 2006), this species appears tolerant of a range of stream and river types (Freyhof 2014a) and so has the potential to occur throughout riverine areas in the vicinity of the Project.

While more likely to be found in fast-flowing areas outside of the direct Project site, this species could potentially occur in the Project area throughout the year.

Beluga Sturgeon (*Huso huso*)

Photos and more information are available here.

This species is considered globally Critically Endangered (Gessner *et al.* 2010a), and nationally Endangered (Government of Georgia 2014b). Since 2012, populations of this once common species have declined dramatically (Guchmanidze 2017), and there is no recent information on its status in the Rioni River. A recent Pan-European Action Plan considers the species to still sporadically reproduce in the Rioni, the only area it breeds outside of the Danube (Council of Europe 2018). During this study, a fisherman near Samtredia reported that no Beluga Sturgeon had been caught in that area (the spawning grounds within the Rioni) in recent years, but that a large one was caught in around 2013.

Like most sturgeon, this has been severely impacted by a combination of historical overfishing, ongoing poaching, bycatch, loss of spawning grounds (primarily owing to hydropower dams and in-river quarries), hydrological changes, and pollution.

This species is most likely to occur in the Project area during its overall spawning season, which occurs from at least March-June (Gessner *et al.* 2010a; Archil Guchmanidze, MoEPA, pers. comm. 2018), and potentially until August in line with other sturgeon in the Rioni. During March-August, it could thus occur anywhere within the Rioni River within the Project area. Further, spawning periods for sturgeon in the Rioni are very poorly known and could feasibly occur outside of these times (Radu Suciu, pers. comm. 2019). Outside of the overall spawning season, juveniles still travel downriver in September and October (Archil Guchmanidze, MoEPA, pers. comm. 2018), and potentially until November or December (Fleur Scheele, FFI, pers. comm. 2018), and may well use the downstream parts of the river – around the Project area – as a nursery ground (Radu Suciu, pers. comm. 2019). Individuals may still be found in the river throughout the year, though much more rarely (Archil Guchmanidze, MoEPA, pers. comm. 2018). Given all this information, but also major data gaps, it should be assumed that this species could be present in the Project area at any time of year, though it is clearly more common and vulnerable during spawning.

White-headed Duck (*Oxyura leucocephala*)

Pictures and more information are available here.

This species is considered globally and nationally Endangered (BirdLife International 2018b; Government of Georgia 2014b). Small numbers of this species occur in the Kolkheti IBA in winter (in the low 10s: Zura Gurgenidze, Sabuko, pers. comm. 2018).

White-headed Duck is primarily globally threatened by hybridization with the closely-related North American Ruddy Duck (*Oxyura jamaicensis*), which was historically introduced to Europe. Other threats include pollution, degradation and loss of its wetland habitat, and direct hunting.

This species occurs on lakes and freshwater wetlands, so is unlikely to directly overlap the Project site. Nearby, it is likely to be found in the coastal wetlands of Kolkheti National Park both to the north and south of the Project area, and potentially in unprotected wetlands to the north-west of the Project area (west of the Rioni, in an area being considered for extension of the Kolkheti IBA: Natia Javakhishvili, Sabuko, pers. comm. 2018). It has been repeatedly recorded at Paliastomi Lake, in the southern portion of Kolkheti National Park (Abuladze 2015). It winters in the area, so is likely to be present from October-March, and occasionally until April (Abuladze 2015).

Hibiscus ponticus

This species' threat status has not been nationally or globally evaluated, but Matchutadze *et al.* (2015) list it as Critically Endangered on account of a continuing decline in its habitat. It is a Georgian endemic and presumed restricted-range species – confined to swamps near sea level in Abkhazia, Samegrelo and Adjara (Missouri Botanic Gardens 2018), including Kolkheti Ramsar Site (Anonymous 1996).

This species could be found in any of the low-lying wet areas within the Project site, and more widely nearby. While present throughout the year, it is only likely to be readily identifiable when it flowers.

Colchis Water-Chestnut (*Trapa colchica*)

This floating restricted-range plant species is globally Critically Endangered, and is only known from the Kolkheti lowlands (Batsatsashvili & Machutadze 2014). It is known from the vicinity of the Project, as the national EIA has recommended moving individuals before construction.

This species could be found in the limited number of still or slow-flowing water bodies within the Project site. However, given their level of degradation, it is more likely to be found in the many less disturbed water bodies nearby – i.e., in the wetlands of Kolkheti National Park both to the north and south of the Project area, and in unprotected wetlands to the north-west of the Project area (west of the Rioni, in an area being considered for extension of the Kolkheti IBA: Natia Javakhishvili, Sabuko, pers. comm. 2018). While present throughout the year, it is only likely to be readily identifiable when it flowers.

Kolkheti National Park and the Wetlands of Central Kolkheti Ramsar Site

There are two protected sites in close proximity to the Project site: Kolkheti National Park and the Wetlands of Central Kolkheti Ramsar Site. These two areas are geographically the same, were designated in the same year (1998) and have the same IUCN Management Category (II). This area is also being proposed as an Area of Special Conservation Interest (or "Emerald Site") by the national government under the Bern Convention (NACRES 2014; Archil Guchmanidze, MoEPA pers. comm. 2018). A proposal for extension of the National Park south to cover the Rioni River is currently being considered by parliament.

A large "Colchis Wetlands and Forests" World Heritage Site, overlapping the Project area, was proposed by the government in 2007 (UNESCO undated). This is now being revised for resubmission as a more select set of areas, which will still include Kolkheti National Park and thus parts of the Project area (Garstecki 2017; Archil Guchmanidze, MoEPA pers. comm. 2018).

Kolkheti Important Bird Area/Key Biodiversity Area

The internationally recognized Kolkheti Important Bird Area (also de facto a Key Biodiversity Area) also occurs in close proximity to the Project site. The current boundaries are very similar to those of Kolkheti National Park, but are currently being reassessed and may extend to unprotected wetlands to the north-west of the Project area (west of the Rioni, in an area being considered for extension of the Kolkheti IBA: Natia Javakhishvili, Sabuko, pers. comm. 2018). Despite likely changes to the IBA boundaries and status, it seems likely that the IBA will continue to be designated – at least for White-headed Duck (Section 2.3.1).

4 Potential impacts on Critical and Natural Habitat

Following the impact assessment methodology used in the ADB EIA, pre-mitigation impacts for Critical Habitat-qualifying biodiversity (Table 1) are assessed in Table 2 and discussed in Sections 4.1-4.2. Impacts on Natural Habitat are discussed in Sections 4.3-4.4, impacts of Project alternatives are discussed in Section 4.5, and cumulative impacts are discussed in Section 4.6.

Table 2. Impact assessment for Critical Habitat-qualifying biodiversity in the Project area (refer to Annex 3, Section 3.c.i for Impact Significance Rating Methodology)

Environmental Component	Factor	Project Phase P-Preparation, C-Construction, WC-Worksheet Closure, O-Operation	Impact	Sensitivity of Receptors	Level of Public Concern	Severity or degree of change to the receptor	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
Kolkheti National Park, Ramsar Site and Important Bird Area	Vegetation coverage	P	IP 9: Loss of vegetation coverage in specific areas of the project.	H	H	L	MAJ	MT	SMALL	M	UNLIKE	**L**
		P	IP 11: Introduction of invasive alien species.	H	M	H	MOD	LT	INTER	H	POSS	**H**
Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus*	Mortality	P, C	IP, IC 10: Mortality of individuals.	H	M	L	MOD	MT	SMALL	M	POSS	**M**
White-headed Duck (*Oxyura leucocephala*)	Habitat	P	IP 11: Introduction of invasive alien species.	M	M	H	MOD	LT	INTER	H	POSS	**H**
		P	IP 12: Modification and fragmentation of habitat due to loss of vegetation coverage.	M	M	L	MOD	LT	SMALL	M	UNLIKE	**L**
	Distribution	P, C	IP 13, IC 11: Displacement of species due to noise, presence of machinery and equipment and presence of staff.	M	M	L	MOD	ST	SMALL	L	POSS	**L**
		O	IO 7: Displacement of species due to noise from normal traffic or maintenance activities.	M	M	L	MOD	LT	SMALL	M	UNLIKE	**L**
	Mortality	P	IP 13: Mortality of individuals due to equipment operation.	M	M	L	MOD	ST	SMALL	L	UNLIKE	**L**
Stellate, Russian and Beluga Sturgeon	Habitat	P	IP 11: Introduction of invasive alien species.	H	H	H	MAJ	LT	INTER	H	POSS	**H**

Environmental Component	Factor	Project Phase P-Preparation, C-Construction, WC-Worksheet Closure, O-Operation	Impact	Sensitivity of Receptors	Level of Public Concern	Severity or degree of change to the receptor	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
(*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*)		C	IC 12: Modification of habitat, including of spawning grounds for wild sturgeon species.	H	H	H	MAJ	LT	INTER	H	POSS	**H**
		O	IO 8: Degradation of aquatic habitat from accidentally spilled fuel/oil or surface runoff from bridge.	H	H	M	MAJ	MT	SMALL	H	POSS	**M**
	Distribution	C	IC 13: Displacement of species due to noise, presence of machinery, and equipment and of staff.	H	H	H	MAJ	ST	SMALL	M	DEFINITE	**H**
	Mortality	C	IC 14: Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.	H	H	M	MAJ	ST	SMALL	M	POSS	**M**
		O	IO 9: Mortality of sturgeon from illegal fishing activities using the bridge structures.	H	H	M	MAJ	LT	SMALL	H	POSS	**H**
Grusinian Scraper (*Capoeta ekmekciae*)	Habitat	P	IP 11: Introduction of invasive alien species.	M	M	M	MOD	LT	INTER	H	POSS	**H**
		C	IC 12: Modification of habitat, including of spawning grounds for wild sturgeon species.	M	M	L	MOD	MT	SMALL	M	POSS	**M**
		O	IO 8: Degradation of aquatic habitat from accidentally spilled fuel/oil or surface runoff from bridge.	M	M	L	MOD	ST	SMALL	L	POSS	**L**
	Distribution	C	IC 13: Displacement of species due to noise, presence of machinery, and equipment and of staff.	M	M	L	MOD	ST	SMALL	M	POSS	**M**

Environmental Component	Factor	Project Phase P-Preparation, C-Construction, WC-Worksheet Closure, O-Operation	Impact	Sensitivity of Receptors	Level of Public Concern	Severity or degree of change to the receptor	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance
	Mortality	C	IC 14: Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.	M	M	L	MOD	ST	SMALL	M	UNLIKE	**L**

4.1 - Impacts on freshwater Critical Habitat

4.1.1 - Habitats

The Project aquatic DMU represents Critical Habitat for three sturgeon species and one other fish, the Grusinian Scraper (Table 1). The magnitude of risks to all of the sturgeon species is major, given their rarity, threatened status, conservation importance, and level of public concern about these species, while the magnitude of risks to the Grusinian Scraper is moderate (Table 2; Section 4.1.2).

The most significant impact on this freshwater habitat is from direct modification during construction work in the river at or near the Project footprint, or indirectly through modification of other parts of the Rioni River if sand or gravel are sourced from one of the sites licensed upriver. Such modification could have long-term impacts and, if sand or gravel are abstracted upstream, occur at an intermediate scale (Table 2). Direct modification by construction work is anticipated to have relatively low additional impacts, given the presence of a neighbouring railway bridge, a disused bridge nearer the mouth of the Rioni, and the water regulation bridge in Poti (which currently has significant impacts on water flow). By comparison, the piers of this Project's bridge will comprise two of c. 11 m width and one of c. 30 m width (Levan Kupatashvili, Roads Department, pers. comm. 2018), within a river of >250 m minimum width. During the wet season, the river expands up to c. 400 m width and would encompass two other c. 11 m width piers that would be based on the river bank during the dry season. During construction, sheet piling coffer dams would close off a larger area (two of c. 25 m width and one of c. 50 m width) that would be dewatered for construction, but such disturbance would be temporary – lasting approximately three months for the central pier and the same duration for its neighbouring piers together (Levan Kupatashvili, Roads Department, pers. comm. 2018). Nonetheless, there is significant potential for temporary impacts on aquatic macroinvertebrates, the main food for sturgeon (Radu Suciu, pers. comm. 2019). Impacts on such food sources for priority species are here considered habitat-level impacts.

The potential for indirect modification of the Rioni River is, however, of much greater concern. Licensed sand and gravel quarry sites in the Rioni River downstream of the Vartsikhe hydropower plants are currently having devastating impacts on the limited remaining spawning grounds of these sturgeon species in the river (Maka Bitsadze and Fleure Scheele, WWF and FFI, pers. comm. 2018). Without mitigation, choice of licensed sand or gravel quarry site is usually left to contractors, and could include areas in the Rioni River. For example, license 1004022 is in the mouth of the Rioni, and licenses 1002940 and 1003956 are just over 4 km upstream of the Project area. Other nearby licenses in the Rioni River include at least 1003925 and 1004267. As such, ***the modification of in-river habitat during construction – particularly indirectly through sourcing of sand or gravel – is considered a potential impact of High significance***.

Another indirect project impact on freshwater Critical Habitat is the introduction of invasive alien species (IAS). The Global Invasive Species Database has records for 86 terrestrial or freshwater IAS in Georgia, of which 59 are plants (of which some represent water-edge or semi-aquatic species). There is potential for construction machinery, equipment or materials to introduce IAS to the Project site. This is a particular risk for invasive plants, of which seeds or fragments of plant material can easily adhere to transported items. Introduction of invasive plants would primarily represent a habitat-level impact. Risks from IAS vary, according to the individual species and the conditions for their establishment at a particular site. Overall, however, IAS present a very high risk to biodiversity globally. On a precautionary basis, ***the potential impact of introduction of invasive alien species is thus considered of High significance***.

A smaller potential operational impact is degradation of the Rioni River from pollution owing to accidentally spilled fuel/oil or surface runoff from the bridge. Such an impact would, if unmitigated, continue into the long-term, but would be expected to only infrequently be

significant – it is thus assessed as medium-term in nature (Table 2). Though occurring at a small spatial scale, the overall consequence of a spill could be high. With such impacts considered possible, ***degradation of the Rioni River from accidentally spilled fuel/oil or surface runoff from the bridge during the operations phase is considered overall to be a potential impact of Medium significance***.

4.1.2 - Species

The Project aquatic DMU represents Critical Habitat for three sturgeon species and one other fish, the Grusinian Scraper (Table 1). The magnitude of risks to all of the sturgeon species is major, given their rarity, threatened status, conservation importance, and level of public concern about these species, while the magnitude of risks to the Grusinian Scraper is moderate (Table 2; Section 4.1.2). With very limited recent information on the status of each sturgeon species in the Rioni River, it is difficult to robustly assess differences in impacts among the three species. Russian (including "Colchic") Sturgeon is the most likely to be impacted, given its putative population size in the river, but any impacts may be of greater consequence for Beluga Sturgeon, since the Rioni represents one of only two spawning rivers for this species (Section 3.2). For only Stellate Sturgeon, on which impacts are less likely (owing to its low numbers in this area) and of lower consequence (since the Rioni is not believed to be a major spawning river for this species), could potential impacts be considered likely to have a lower overall significance than those for other sturgeon species. Nonetheless, more broadly, all potential Project impacts on the three sturgeon species are of relatively very similar significance compared to those on other species. Impacts on the Grusinian Scraper are considered separately in Table 2, owing to its broader distribution and different ecology and vulnerability.

Without mitigation, it is likely that there would be short-term, localized disturbance impacts during construction, owing to in-river disturbance from noise, pile-driving, and presence of machinery, equipment and people. The greatest disturbance impacts are likely to come from pile-driving. Although sturgeon suffer lower mortality from noise impacts than some other fish owing to their open (physostomous) swim bladders, pile-driving has been demonstrated to result in injuries in sturgeon such as haematomas on the swim bladder, kidney and intestine (Halvorsen *et al.* 2012). Haematomas on sturgeon gonads can be caused even at relatively low noise levels, and could potentially impact reproductive capacity (Halvorsen *et al.* 2012). Even lower-level sound pressures from pile-driving have been demonstrated to elicit significant behavioural responses in fish species (including sturgeon), so that they suffer elevated stress levels, reduced foraging efficiency and/or avoid areas with such disturbance (Mueller-Blenkle *et al.* 2010; Krebs *et al.* 2016; Mickle & Higgs 2017). Sturgeon are not present in the river in significant numbers throughout the year (Section 3.2) so, depending on the season, such impacts could have a high, medium or low consequence. Even assessing such impacts as moderate, it is clear that ***the potential impact of in-river disturbance during construction is of High significance for sturgeon species***.

In-river construction might possibly also cause direct mortality through accidental collision or crushing of individual fish by machinery or equipment, or by poaching of fish by construction workers. Propeller-driven boats pose a particular mortality threat to sturgeon (Goldfarb 2016). Direct mortality impacts would be short-term and localized and, depending again on the season, could have a high, medium or low consequence. Overall, ***the potential impact of direct mortality during construction is of Medium significance for sturgeon species***.

A longer-term potential impact of the Project would be to elevate poaching levels of sturgeon. Where bridges exist, methods of catching sturgeon in the region include stringing nets or snag lines between bridge piers, with hanging nooses or unbaited hooks to catch the sturgeon. This method has previously been used on the neighbouring railway bridge (Gocha Kurdgelia and Konstantin Topuria, Mayor and First Deputy Mayor of Poti, pers. comm. 2018), and so would also be possible on the Project bridge after construction. While occurring at a small spatial

scale, such activity could be persistent and thus have high consequences. ***The potential impact on sturgeon species of mortality from illegal fishing using the bridge is thus assessed as of High significance***.

4.2 - Impacts on terrestrial Critical Habitat

4.2.1 - Habitats

The Project terrestrial DMU represents Critical Habitat for two plant species, one bird, and one site (Kolkheti National Park, Ramsar Site and Important Bird Area). The magnitude of risks to this Critical Habitat is moderate-major, given their rarity, threatened status, conservation importance, and level of public concern about these species and this site (Table 2). There will be some small-scale loss and degradation of vegetation in and near the Project location. Such direct habitat impacts on the site or bird species are, however, unlikely since these are not found within or directly adjacent to the Project footprint, and no sand or gravel quarry sites have been licensed within the protected area. At the closest, the National Park is approximately 150 m from the Project footprint, but is at all times separated from the Project by an existing railway track and right of way, and a high voltage powerline. Direct impacts on the park are thus unlikely. Indirect impacts of noise were identified as a concern by the park authorities (Vladimir Khurtsilava, Kolkheti National Park, pers. comm. 2018), but only limited noise impacts are likely to reach the park and are unlikely to reach sensitive receptors such as wintering waterbirds (which occur further away in the park: Gela Ingorokva, Kolkheti National Park, pers. comm. 2018). The overall significance of potential impacts on terrestrial Critical Habitat is thus assessed as Low (Table 2). It is noted, however, that a proposal for extension of the National Park south to cover the Rioni River is currently being considered by parliament. Boundaries of that extension are unclear, with one source suggesting it may extend as far east as the railway bridge neighbouring the Project (Maka Bitsadze, WWF, *in litt.* 2018). Before Project construction is put out to tender, the Roads Department will obtain the official proposal under consideration by parliament to confirm that the upgraded secondary road will not overlap the proposed protected area extension. If necessary, the planned upgrade will be shortened to avoid impacts on the proposed protected area.

Another indirect project impact on freshwater Critical Habitat is the introduction of invasive alien species (IAS). The Global Invasive Species Database (http://www.iucngisd.org/gisd) has records for 86 terrestrial or freshwater IAS in Georgia, of which 59 are plants (of which some represent water-edge or semi-aquatic species). There is potential for construction machinery, equipment or materials to introduce IAS to the Project site. As discussed in Section 4.1.1, IAS present a very high risk to biodiversity globally. On a precautionary basis, ***the potential impact of introduction of invasive alien species is thus considered of High significance***.

Direct impacts on the two plant species are addressed in Section 4.2.2, since these will be affected more by mortality than by loss of habitat.

4.2.2 - Species

The Project terrestrial DMU represents Critical Habitat for two plant and one bird species (Table 1). The bird species, White-headed Duck, is only likely to be found in areas at some distance from the Project, where suitable habitat occurs (Section 3.2). At the closest, such open still water habitat may be found c. 1 km to the south-west of the project. It is thus possible that this species might be disturbed if there is particularly loud construction activity during the time that it winters in the area, but any such impacts would occur at a small spatial scale and have a low consequence. It is unlikely that inherently quieter operational traffic or maintenance would disturb this species. It is also unlikely that the Project could cause any direct mortality of the species. As such, all potential impacts on White-headed Duck are considered of Low significance.

The two plant species may potentially be impacted by direct mortality during site preparation or construction, through direct land take. Of the two, *Hibiscus ponticus* has not yet been confirmed from the Project footprint, but the national EIA states that Colchis Water-Chestnut is known from the Project site or immediate vicinity. Given the brief nature of baseline surveys, both species could feasibly occur and so direct mortality of individuals is possible. Likewise, as sand and gravel quarry sites have not yet been chosen, these may also cause direct impacts on these plants. Nonetheless, all such impacts would only occur at a small spatial scale, and would not be expected to last into the long-term. As such, ***the potential impact of direct mortality on* Hibiscus ponticus *and Colchis Water-Chestnut is considered Medium***.

4.3 - Impacts on terrestrial Natural Habitat

Impacts on Natural Habitat are anticipated to be negligible. The terrestrial Project footprint totals just 5.25 ha (ADB EIA Section F.2.5 - Ecology and **Biodiversity**), and much of this falls upon already Modified Habitat. There is potential for some significant temporary disturbance impacts during construction (ADB EIA Section F.2.5 - Ecology and **Biodiversity**), and indirect impacts on Natural Habitat paralleling those discussed for Critical Habitat in Section 4.2. These are discussed further in the ADB EIA (Section **F.2.5 - Ecology and Biodiversity**).

4.4 - Impacts of alternative alignments or designs

Various layout alternatives were considered, and are discussed in more depth in the ADB EIA (Chapter **D. Alternatives Analysis**). The “No Action” alternative, and that of upgrading the existing bridge, would have considerably lower impacts on Critical and Natural Habitat than the currently proposed Project option. These two alternatives were, however, considered socially or practically infeasible. Various alignment alternatives for the currently proposed Project option were also considered, but were constrained by the proximity of residences in the village of Patara Poti, commercial buildings, or existing utility and transportation infrastructure – or would have had direct footprint impacts upon environmentally-sensitive areas such as Kolkheti National Park. The alternatives and their constraints are discussed in more depth in the ADB EIA (Chapter **D. Alternatives Analysis**).

Design alternatives were also considered. Recognising the potential for impacts on sensitive aquatic Critical Habitat, the original design of the bridge was modified in order to reduce the number of piers in the main river channel, thus minimising the footprint in the river in line with the mitigation hierarchy (ADB EIA Section Chapter **D. Alternatives Analysis**). The smaller the footprint of the bridge, the lower the impacts upon normal hydrological flows. Further, recognizing the potential for pollution of the river from accidentally spilled fuel/oil or surface runoff from the bridge, the Project design incorporated retention chambers to capture surface runoff from the bridge (ADB EIA Section **D.7 - Alternative Runoff and Spill Management Solutions**). Both such modifications have reduced impacts on Critical Habitat by this Project.

In summary, no other viable alternatives exist within the region for development of the Project on Modified or Natural habitats that are not Critical, and footprint within Critical Habitat has been reduced as far as practically possible – such that the Project will not, after mitigation, have measurable adverse impacts on Critical Habitat or lead to a net reduction in the population of any Critically Endangered or Endangered species (Section 5.2).

4.5 - Cumulative impacts

The Rioni River and its biodiversity are already suffering impacts from issues such as pollution, gravel and sand extraction, and unsustainable fishing practices. Surrounding areas have been

extensively cleared for agriculture and are increasingly being impacted by urban or large-scale development. The ADB EIA assesses a number of other large-scale developments in the region of the Project. These include roads, and the additional development they may induce. Other projects may specifically impact sturgeon (including development of the Anaklia deep sea port 30 km to the north of Poti) or the Rioni River (including the Samtredia-Grigoleti highway, Namakhvani hydropower cascade c. 150 km upstream, a large-scale flood prevention project, and improvement of the Poti wastewater system and Kutaisi water supply system). Many of these are part-financed by international lending institutions, so there is considerable potential for a coordinated approach to mitigating impacts on the river.

Full assessment of these cumulative impacts is not possible without more detailed examination of these other past and future developments, but it is clear that biodiversity in the Project area is already under considerable pressure. As such, any additional impact from this Project risks contributing to severe overall cumulative impacts. This Project thus has an enhanced responsibility to carefully mitigate and compensate for impacts on biodiversity.

5 Mitigation and conservation measures for impacts on Critical and Natural Habitat

5.1 - Mitigation and management measures

A number of general or standard mitigation/enhancement measures are outlined for this Project in the national EIA. Table 3 summarises general (/standard) mitigation/enhancement measures relevant to potential Project impacts on Critical Habitat-qualifying biodiversity (Section 4). The wording of these general mitigation measures is here drawn from the national EIA, but the wording of these measures is further adapted in the ADB EIA. Table 3 also includes a small number of additional specific mitigation measures necessary to reduce residual impacts on Critical Habitat-qualifying biodiversity to levels in line with the ADB Safeguard Policy Statement (ADB 2009), based on a precautionary approach. These additional specific mitigation measures are elaborated in Sections 5.1.1-5.1.7. None have been developed for the Grusinian Scraper, but those for sturgeon will all also have benefits for this fish species. For the most part, the specific mitigation measures are not anticipated to result in any significant Project time delays or costs are only anticipated to incur total up-front costs of about $21,000 USD, and annual monitoring, maintenance and repair costs of 24 person days plus $50 USD/year. Residual impacts after general and specific mitigation are discussed in Section 5.2.

Table 3. Mitigation and management measures for Critical Habitat-qualifying biodiversity , drawn from the ADB EIA with [clarifications in brackets].

Environmental Component	Aspect	Project phase	Impact	Mitigation action	Responsibility	
					Development/ implementation	Control
Kolkheti National Park, Ramsar Site and Important Bird Area	Vegetation coverage	P	IP 9: Loss of vegetation coverage in specific areas of the project.	Ensure that the rehabilitation of the secondary road [from Patara Poti to the oil terminal] does not extend into the proposed extension of the National Park.	Contractor	RD Construction Supervisor (refered to as the 'Engineer" in the ADB EIA)
				Boundaries of ROW and operation area will be strictly kept to - to avoid impact on the adjacent vegetation; Strict keeping to traffic routes during the construction will be ensured to avoid impact on vegetation.	Contractor	RD Construction Supervisor
		P	IP 11: Introduction of invasive alien species.	Care will be taken to avoid introduction of new invasive species to, and spread of existing invasive species within, the Project area through: - washing of vehicles, equipment and supplies before entry to the Project area; - monitoring for invasive species; and - control/eradication of invasive species where found.	Contractor	RD Construction Supervisor
Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus*	Mortality	P, C	IP, IC 10: Mortality of individuals.	Boundaries of ROW and operation area will be strictly kept to - to avoid impact on the adjacent vegetation; Strict keeping to traffic routes during the construction will be ensured to avoid impact on vegetation.	Contractor	RD Construction Supervisor
				Vegetation will be preserved where feasible, in particular in the areas near the river bank to avoid erosion/sedimentation.	Contractor	RD Construction Supervisor
				In case taxation [walkover surveys pre-construction] reveals any protected plant species in the area, the latter will be removed from the environment [and translocated] in accordance with sub-paragraph (v), Article 24, first paragraph of the law of Georgia on 'Red List and Red Book'. Relocation of any specimens found during the surveys where practical will be provided with the help of biodiversity experts to ensure proper handling... A plan and schedule must be developed by the Contractor prior to implementation of this task.	Contractor	RD Construction Supervisor
				Training of the staff in environmental and safety issues, including protection of vegetation outside the boundaries of the project corridor.	Contractor	RD Construction Supervisor
				Disturbed vegetation must be replanted immediately after the construction/disturbance stops.	Contractor	RD Construction Supervisor

Environmental Component	Aspect	Project phase	Impact	Mitigation action	Responsibility	
					Development/ implementation	Control
White-headed Duck (*Oxyura leucocephala*)	Habitat	P	IP 11: Introduction of invasive alien species.	Care will be taken to avoid introduction of new invasive species to, and spread of existing invasive species within, the Project area through: - washing of vehicles, equipment and supplies before entry to the Project area; - monitoring for invasive species; and - control/eradication of invasive species where found.	Contractor	RD Construction Supervisor
		P	IP 12: Modification and fragmentation of habitat due to loss of vegetation coverage.	Boundaries of ROW and operation area will be strictly kept to - to avoid impact on the adjacent vegetation; Strict keeping to traffic routes during the construction will be ensured to avoid impact on vegetation.	Contractor	RD Construction Supervisor
	Distribution	P, C	IP 13, IC 11: Displacement of species due to noise, presence of machinery and equipment and presence of staff.	All vehicles, equipment and machinery used for construction will be regularly maintained and inspected/certificated to ensure that the noise levels conform to the standards prescribed.	Contractor	RD Construction Supervisor
		O	IO 7: Displacement of species due to noise from ongoing traffic or the presence of vehicles and equipment during maintenance activities.	Considered a negligible impact for this species.	n/a	
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Habitat	P	IP 11: Introduction of invasive alien species.	Care will be taken to avoid introduction of new invasive species to, and spread of existing invasive species within, the Project area through: - washing of vehicles, equipment and supplies before entry to the Project area; - monitoring for invasive species; and - control/eradication of invasive species where found.	Contractor	RD Construction Supervisor
		C	IC 12: Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species.	Borrowing from the stream [at the project site] will be prohibited.	Contractor	RD Construction Supervisor
				Movement of machines inside rivers, streams, or on their banks will be prevented except when it is unavoidable due to the construction of a structure.	Contractor	RD Construction Supervisor

Environmental Component	Aspect	Project phase	Impact	Mitigation action	Responsibility	
					Development/ implementation	Control
				No washing of vehicles etc. in the river will be allowed.	Contractor	RD Construction Supervisor
				Coffer dams, silt fences, sediment barriers or other devices to prevent migration of silt during construction within the river will be provided.	Contractor	RD Construction Supervisor
				Dewatering and cleaning of cofferdams to prevent siltation by pumping from cofferdams to a settling basin or a containment unit will be performed.	Contractor	RD Construction Supervisor
				Construction materials and chemicals will be appropriately secured during flood season to avoid accidental release to the natural environment.	Contractor	RD Construction Supervisor
				Materials and waste will be stockpiled so as to avoid erosion and washing off into the river. Drainage trenches will be established to divert surface runoff from the site.	Contractor	RD Construction Supervisor
				In disturbed soil areas, compacted straw (straw bales), silt fence, fibber rolls, gravel bags, or other approved sediment control must be ensured. At a minimum, all bare soil (whether it's an abutment slope or a stockpile) must be protected before it rains.	Contractor	RD Construction Supervisor
				Ensure no waste materials are dumped in the river, including re-enforced concrete debris.	Contractor	RD Construction Supervisor
				No concrete waste from concrete mixers will be dumped in the river.	Contractor	RD Construction Supervisor
				Refueling of all plant, vehicles and machinery will not be allowed within 50 m of any watercourse, drain or channel leading to a water course.	Contractor	RD Construction Supervisor
				Slopes of embankment will be protected from erosion by vegetation and slope drainage.	Contractor	RD Construction Supervisor
				Dropping structures into rivers/streams will be avoided [construction will instead take place from the river bank or pontoons].	Contractor	RD Construction Supervisor

Environmental Component	Aspect	Project phase	Impact	Mitigation action	Responsibility	
					Development/ implementation	Control
				Temporary fuel tanks will be located at least 50 m away from any watercourse, drain, or channel leading to a water course. The tank will be placed in covered areas with berms or dikes installed to intercept spills, if any. Any spill will be immediately localized and cleaned up with absorbent materials. The bund will be able to accommodate 110% of the volume of the tank.	Contractor	RD Construction Supervisor
				Refuelling of all plant, vehicles and machinery will not be allowed within 50 m of any watercourse, drain or channel leading to a water course.	Contractor	RD Construction Supervisor
				Oil, chemical and solid waste will be stored, and handled and disposed of by appropriately licensed waste management contractors.	Contractor	RD Construction Supervisor
				Training of the staff in environmental and safety issues, including protection of vegetation outside the boundaries of the project corridor.	Contractor	RD Construction Supervisor
				Sourcing of construction materials (e.g., sand, gravel) will avoid use of any licensed or unlicensed sites in the Rioni River or on its banks.	Contractor	RD Construction Supervisor
		O	IO 8: Degradation of aquatic habitat from accidentally spilled fuel/oil or surface runoff from bridge.	Runoff water from the bridge structures will be handled by the built drainage structures and runoff and spill containment chambers. The Terms of Reference for the Road Maintenance Contractor for the operations phase will include regular monitoring of retention structures, and safe disposal of contents after any spills.	Road Maintenance Contractor	RD
	Distribution	C	IC 13: Displacement of species due to noise, presence of machinery, and equipment and of staff.	All vehicles, equipment and machinery used for construction will be regularly maintained and inspected/certificated to ensure that the noise levels conform to the standards prescribed.	Contractor	RD Construction Supervisor
				Coffer dams, silt fences, sediment barriers or other devices to prevent migration of silt during construction within the river will be provided. [Coffer dams will also significantly reduce pile-driving noise.]	Contractor	RD Construction Supervisor
				Ensure compliance with construction specifications which envisage the arrangement of cofferdams to protect water quality during construction minimize the impacts to aquatic fauna during pile driving in the Rioni River. Noise from pile-driving will be kept below current international interim good practice guidelines.	Contractor	RD Construction Supervisor
				Movement of machines inside rivers, streams, or on their banks will be prevented except when it is unavoidable due to the construction of a structure.	Contractor	RD Construction Supervisor

Environmental Component	Aspect	Project phase	Impact	Mitigation action	Responsibility	
					Development/ implementation	Control
				No washing of vehicles etc. in the river will be allowed.	Contractor	RD Construction Supervisor
				All in-river activities will be avoided during March-September inclusive [during the spawning season]. Where possible, in-river activities will also be avoided in October and November.	Contractor	RD Construction Supervisor
				The central bridge pier and adjoining two piers will be constructed (referring specifically to construction using coffer dams in the river) at two different times.	Contractor	RD Construction Supervisor
				Implement a build-up of activity which slowly increases construction activities within the Rioni River to allow aquatic fauna to exhibit avoidance responses.	Contractor	RD Construction Supervisor
				The contractor will model planned pile-driving and assess alignment with international interim good practice guidelines before starting to pile. Where planned pile-driving appears likely to exceed such thresholds, alternative pile-driving methods or mitigation will be selected	Contractor	RD Construction Supervisor
	Mortality	C	IC 14: Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.	Fishing and using of illegal fishing gear [by construction workers] anywhere along the river will be prohibited.	Contractor	RD Construction Supervisor
				Movement of machines inside rivers, streams, or on their banks will be prevented except when it is unavoidable due to the construction of a structure.	Contractor	RD Construction Supervisor
				Training of the staff in environmental and safety issues, including protection of vegetation outside the boundaries of the project corridor.	Contractor	RD Construction Supervisor
				Use of propeller-driven boats will be minimised during construction.	Contractor	RD Construction Supervisor
		O	IO 9: Mortality of sturgeon from illegal fishing activities using the bridge structures.	Warning signs and CCTV cameras will be installed on both sides of the bridge to deter and detect illegal fishing activities.	Contractor	RD Construction Supervisor
				Monitoring of the bridge piers by CCTV will be ensured throughout the operation period to prevent poaching of sturgeon by using fishing gear on bridge structures.	Road Maintenance Contractor	RD

5.1.1 - Sourcing of construction materials (e.g., sand, gravel) will avoid use of any licensed or unlicensed sites in the Rioni River or on its banks.

Sourcing of construction materials such as sand or gravel from elsewhere in the Rioni River could have much more significant negative impacts on sturgeon than any direct impacts of the Project itself (Section 4.1.1). Given this, construction contractors will be prohibited from sourcing any materials from any sites in the Rioni River or on its banks. This includes licensed and unlicensed sites, including at least (but not only) licensed sites 1002940, 1003925, 1003956, 1004022 and 1004267: the operation of these sites has potential for significant adverse impacts on sturgeon.

This mitigation measure is not anticipated to cause any significant additional cost or time delay for the Project, since many alternative sand/gravel quarry sites exist nearby. Data from the Ministry of Economy (Mako Zavrashvili, National Agency of Mines, *in litt.* 2018) suggest that 96 quarry sites exist within 40 km of the Project, of which only five appear to be in the Rioni River or on its banks.

5.1.2 - All in-river activities will be avoided during March-September, inclusive. Where possible, in-river activities will also be avoided in October and November.

Impacts of in-river disturbance during construction have the potential to be of High significance for sturgeon species (Section 4.1.2). A number of general mitigation measures aim to reduce disturbance (Table 3), and in-river construction sequencing and noise from pile-driving are subject to specific mitigation measures (Sections 5.1.3-5.1.4). However, the only way to reduce overall in-river disturbance to Low levels during construction is to avoid construction during the period when most sturgeon are present in the river, i.e. March-September inclusive (Section 3.2). The national approval from MoEPA for this Project already requires works to be planned outside the March-August period. Where possible, in-river construction will also be avoided in October and November, when juvenile sturgeon may still travel through the Project site or be using it as a nursery area (Section 3.2). Focus is prioritized on avoiding impacts on adult sturgeon, because such impacts are much more likely to cause population-level impacts.

This mitigation measure is not anticipated to cause any significant additional cost for the Project, but may cause time delays. Typically, for a project like this in Georgia, the central pier and two supporting piers will be constructed in two separate phases, each lasting approximately three months (Levan Kupatashvili, Roads Department, pers. comm. 2018). As such, if these phases were directly in sequence, insufficient time exists for in-river pier construction between October and February, inclusive. Whether this mitigation action will cause significant time delays depends upon the start date of Project construction. From March to September, construction on land-based portions of the Project can continue (which has the simultaneous advantage of minimizing disturbance impacts for wintering waterbirds at Kolkheti National Park, Ramsar Site and Important Bird Area). The feasibility of avoiding all in-river activities in October and November will depend upon the precise start date and sequencing of the Project, but the highest risk disturbances (construction of cofferdams and pile-driving) should be avoided in October-November.

5.1.3 - The central bridge pier and adjoining two piers will be constructed at two different times.

Typically, for a project like this in Georgia, the central pier and two supporting piers will be constructed in two separate phases, each lasting approximately three months (Levan Kupatashvili, Roads Department, pers. comm. 2018). Separate timing of in-river construction for the central pier and two supporting piers will be a specific requirement for this project, to avoid too large a proportion of the river being blocked by cofferdams at any one time. Sheet piling coffer dams for all three piers will span approximately 100 m of the river (two of c. 25 m

width and one of c. 50 m width: Levan Kupatashvili, Roads Department, pers. comm. 2018) – a relatively small proportion if split into two periods, but of concern if constructed simultaneously (Radu Suciu, pers. comm. 2019).

5.1.4 - Noise from pile-driving will be kept below current international interim good practice guidelines.

Following current international interim good practice guidelines, this Project will keep pile driving noise to below a combined interim single strike criterion comprising a Sound Exposure Level (SEL) of 187 dB re: 1 μPa^2-sec and a peak Sound Pressure Level of 208 dB re: 1 μPa_{peak} in any single strike, as measured 10 m from the source (Popper *et al.* 2006), and will restrict cumulative SEL to below 183dB (Carlson *et al.* 2007).

This mitigation measure is not anticipated to cause any time delay for the Project and only minimal additional cost. Reviews of sound pressures for underwater pile-driving demonstrate that such restrictions are within normal pile-driving limits (Illinworth & Rodkin 2007; Caltrans 2015). For ease of all in-water construction, this Project is already planning to use cofferdams dewatered down to the mud line. These substantially reduce underwater pile driving sound (Caltrans 2015), and are likely to provide sufficient mitigation to avoid any mortality or serious injury impacts. Nonetheless, disturbance impacts on fish remain likely even at low sound pressures from pile-driving (Mueller-Blenkle *et al.* 2010; Krebs *et al.* 2016). Pre-construction, the contractor will model planned pile-driving and assess alignment with international interim good practice guidelines (above). Such modelling is anticipated to incur a small additional cost for the contractor, in the region of $20,000. In the unlikely event that planned pile-driving appears likely to exceed such thresholds, alternative pile-driving methods or mitigation will be selected, following Caltrans (2015).

5.1.5 - Use of propeller-driven boats will be minimised during construction.

The most likely method of moving equipment and materials during in-river construction will be use of pontoons (Levan Kupatashvili, Roads Department, pers. comm. 2018). Propeller-driven boats are thought to have been a source of significant mortality to sturgeon on a bridge project in the US (Section 4.12). As such, and given no need for their use during most of construction, they will only be used in this Project during set-up and removal of pontoons, or in response to any safety issues. This mitigation measure is not anticipated to cause any significant additional cost or time delay for the Project.

5.1.6 - Warning signs and CCTV cameras will be installed on both sides of the bridge to deter and detect illegal fishing activities.

Impacts of illegal fishing, using the bridge during operations, have the potential to be of High significance for sturgeon species (Section 4.1.2). The Roads Department understands this risk and proposes installation of Closed Circuit Television (CCTV) cameras on both sides of the bridge to detect illegal fishing activities that are using the bridge (Gia Sopadze, Roads Department, pers. comm. 2018). Such installation will be undertaken by the Construction Contractor, with ongoing maintenance by the Road Maintenance Contractor (Section 5.1.7). Installed cameras should be suitably sited and protected to minimise impacts from weather and vandalism. They should also be easy to remotely monitor (i.e., internet-enabled) or facilitate regular downloading of footage, to enable at least weekly monitoring of footage during the spawning season (Section 5.1.7). Simple signs will also be installed on both sides of the bridge to warn people against illegal fishing.

This mitigation measure is not anticipated to cause any significant time delay for the Project. Procurement and installation of the warning signs and CCTV cameras will incur an additional cost, anticipated to be <$13,000 USD.

5.1.7 - Monitoring of the bridge piers by CCTV will be ensured throughout the operation period to prevent poaching of sturgeon by using fishing gear on bridge structures.

The Terms of Reference for the Road Maintenance Contractor hired to maintain the bridge during the operations phase will include regular (at least weekly) monitoring of these CCTV cameras during the overall spawning season (March-September inclusive) and reporting of incidents to the Roads Department and the MoEPA Biodiversity Service under the Department of Biodiversity and Forest Policy. Their nearest office is in Zugdidi, quite distant from the Project, and the Georgian judicial system makes it challenging to prosecute illegal fishing offences (Fleur Scheele, FFI, pers. comm. 2018). As such, this management measure cannot be expected to prevent illegal fishing, but will enable some enforcement action. As such, it is anticipated to reduce any illegal fishing to Low levels over time.

This mitigation measure is not anticipated to cause any significant time delay for the Project. The only additional cost will be for monitoring of CCTV footage and maintenance/repair costs for the cameras over time. Monitoring costs are estimated at 24 person days/year, to be included in the Road Maintenance Contractor contract. Maintenance/repair costs are conservatively estimated here at 5%/year, i.e. $50 USD/year.

5.2 - Residual impacts

Following the impact assessment methodology used in Section **F.1 - Impact Assessment Methodology**, residual impacts for Critical Habitat-qualifying ("priority") biodiversity (Table 1), after the application of Project mitigation (Section 5.1) are assessed in Table 4. In only a few cases are impacts on priority biodiversity expected to remain greater than negligible by the Project operations phase, for plants and sturgeon (Table 4). In neither case are such impacts anywhere near the level that could impair the ability of the nearby Critical Habitat to function. There remains a risk that the Project may facilitate illegal fishing, and thus result in reductions in the population of Critically Endangered sturgeon (see below). These impacts are not predicted likely to impact on these species' ability to persist. Given risks, and the wider context of cumulative impacts on these highly-threatened fishes, the Project is also planning to make a positive contribution to sturgeon conservation that will compensate for these risks of residual impacts (Section 5.3), in order to achieve a net gain for the species and align with ADB safeguard requirements for projects in areas of Critical Habitat (ADB 2009).

Even if translocated before construction, plants will suffer some mortality through stress, accidental damage or inability to survive in the translocation site. There is thus anticipated to be a limited residual impact on the two priority plant species remaining into the operations phase. Some habitat for the species may be lost forever under the Project footprint (to be confirmed during pre-construction walkover surveys), but this is predicted to be minimal (particularly within the context of available habitat nearby). Moreover, these two plants should be able to re-establish in temporarily disturbed areas after the construction period. As such, long-term residual impacts on Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus* are considered negligible (non-measurable).

Restricting in-river construction and disturbance to periods outside of the sturgeon spawning season (Section 5.2) will dramatically reduce the potential for displacement and mortality impacts on the three priority sturgeon species (Table 4). Nonetheless, all three species are believed to still use the river in lower numbers outside of the spawning season (Section 3.2). There is thus still (lower) potential for disturbance and mortality impacts on sturgeon during construction. These have the potential to negatively affect spawning or juvenile dispersal. The breeding populations of these species are now so limited that any such effects could have impacts on the sturgeon populations that last into the operational phase, though likely not at such a scale that they would last into the long-term (Table 4). Such medium-term impacts are,

nonetheless, of concern for species in such a perilous overall condition as these sturgeon – even limited temporary impacts may reduce the overall viability of these species. Of greater concern, however, is the potential for the bridge to be used for illegal fishing during the operations phase. Mitigation can help to reduce, but not eliminate, this risk (Section 5.1; Table 4). Overall, ***on a precautionary basis, significant, Low-level, residual impacts on Stellate, Russian and Beluga Sturgeon may thus be anticipated from this Project***. The specific mitigation measures developed for sturgeon are anticipated to all but eliminate Project impacts on the Grusinian Scraper, so that only negligible (non-measurable) residual impacts are expected.

Owing to the brief nature of baseline surveys, the distribution of all Critical Habitat-qualifying species in the Project area is very poorly known. It is thus not currently possible to quantify potential impacts. Walkover surveys prior to construction, in order to identify and relocate plants (Table 3) will be able to refine understanding of the actual scale of potential impacts on plants. Only long-term intensive monitoring can help to quantify the scale of any impacts on sturgeon species (Section 5.3).

Residual impacts on Natural Habitat are anticipated to be negligible. The terrestrial Project footprint totals just 5.25 ha (ADB EIA Section **F.2.5 - Ecology and Biodiversity**), and much of this falls upon already Modified Habitat. As stated in the national EIA, the Project is already planning to restore trees when impacted by the Project. Indirect impacts, other than those discussed for Critical Habitat, are also likely to be negligible if mitigation is undertaken as planned (EIA Section **F.2 - Impacts and Mitigation Measures**). Overall, the Project is compliant with the ADB Safeguard Policy Statement (2009) because, after mitigation, (i) there are no measurable adverse impacts, or likelihood of such, on the critical habitat which could impair its high biodiversity value or the ability to function, (ii) the project is not anticipated to lead to a reduction in the population of any recognized endangered or critically endangered species or a loss in area of the habitat concerned such that the persistence of a viable and representative host ecosystem be compromised.

Table 4. Residual impacts after mitigation for Critical Habitat-qualifying biodiversity

Environmental Component	Aspect	Project phase	Impact	Significance of impact without mitigation	Residual impact after implementation of mitigation measures			Key Residual Impacts
					Preparation, Construction, and Worksite Closure Phases	Operation Phase		
						Day 1	Year 10	
Kolkheti National Park, Ramsar Site and Important Bird Area	Vegetation coverage	P	IP 9: Loss of vegetation coverage in specific areas of the project.	**L**	Negligible	Negligible	Negligible	n/a
		P	IP 11: Introduction of invasive alien species.	**H**	Negligible	Negligible	Negligible	n/a
Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus*	Mortality	P, C	IP, IC 10: Mortality of individuals.	**M**	Low	Low	Negligible	Individual protected and priority plants will be relocated before construction impacts, though translocations of plants are rarely fully successful. The actual area in the river to be lost from bridge piers or retaining walls and the areas impacted by construction will be minimal compared to the habitat available in the vicinity of the Project. It is expected that the plants will recover in the vicinity of the Project following construction.
White-headed Duck (*Oxyura leucocephala*)	Habitat	P	IP 11: Introduction of invasive alien species.	**H**	Negligible	Negligible	Negligible	n/a
		P	IP 12: Modification and fragmentation of habitat due to loss of vegetation coverage.	**L**	Negligible	Negligible	Negligible	n/a
	Distribution	P, C	IP 13, IC 11: Displacement of species due to noise, presence of machinery and equipment and presence of staff.	**L**	Negligible	Negligible	Negligible	n/a

Environmental Component	Aspect	Project phase	Impact	Significance of impact without mitigation	Residual impact after implementation of mitigation measures			Key Residual Impacts
					Preparation, Construction, and Worksite Closure Phases	Operation Phase		
						Day 1	Year 10	
		O	IO 7: Displacement of species due to noise from ongoing traffic or the presence of vehicles and equipment during maintenance activities.	L	n/a (operation phase impact)	Negligible	Negligible	n/a
	Mortality	P	IP 13: Mortality of individuals due to equipment operation.	L	Negligible	Negligible	Negligible	n/a
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*)	Habitat	P	IP 11: Introduction of invasive alien species.	H	Negligible	Negligible	Negligible	n/a
		C	IC 12: Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species.	H	Low	Negligible	Negligible	n/a
		O	IO 8: Degradation of aquatic habitat from accidentally spilled fuel/oil or surface runoff from bridge.	M	n/a (operation phase impact)	Negligible	Negligible	n/a
	Distribution	C	IC 13: Displacement of species due to noise, presence of machinery, and equipment and of staff.	H	Low	Low	Negligible	Disturbance during construction has the potential to disrupt spawning or juvenile dispersal, which would have impacts lasting into the operational phase.
	Mortality	C	IC 14: Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.	M	Low	Low	Negligible	Mortality or injury of fish during construction has the potential to affect spawning, which would have impacts lasting into the operational phase.
		O	IO 9: Mortality of sturgeon from illegal fishing activities using the bridge structures.	H	n/a (operation phase impact)	Low	Low	Risks to sturgeon from fishing practices that utilize the bridge structure will continue through the operation phase, however sustained surveillance and monitoring efforts will ensure residual impacts remain low.
Grusinian Scraper (*Capoeta ekmekciae*)	Habitat	P	IP 11: Introduction of invasive alien species.	H	Negligible	Negligible	Negligible	n/a
		C	IC 12: Modification of habitat, including of spawning grounds for wild sturgeon species.	M	Negligible	Negligible	Negligible	n/a
		O	IO 8: Degradation of aquatic habitat from accidentally spilled fuel/oil or surface runoff from bridge.	L	Negligible	Negligible	Negligible	n/a

Environmental Component	Aspect	Project phase	Impact	Significance of impact without mitigation	Residual impact after implementation of mitigation measures			Key Residual Impacts
					Preparation, Construction, and Worksite Closure Phases	Operation Phase		
						Day 1	Year 10	
	Distribution	C	IC 13: Displacement of species due to noise, presence of machinery, and equipment and of staff.	**M**	Negligible	Negligible	Negligible	n/a
	Mortality	C	IC 14: Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.	**L**	Negligible	Negligible	Negligible	n/a

5.3 – No Net Loss / Net Gain Approach

The ADB Safeguard Policy Statement requires '*measures to avoid, minimize, or mitigate potentially adverse impacts and risks*', as outlined in Section 5.1. Nonetheless, some residual impacts cannot be fully mitigated, and – on a precautionary basis – it is recognized that this Project may have significant, though Low-level, residual impacts on Stellate, Russian and Beluga Sturgeon (Section 5.2). In such cases, ADB requires '*compensatory measures, such as biodiversity offsets, to achieve no net loss or a net gain of the affected biodiversity*'. These compensatory measures should ensure that, overall, the high biodiversity value of the Critical Habitat is maintained, along with populations of Endangered and Critically Endangered species.

Residual impacts on sturgeon have been regularly encountered globally and have led to various compensation measures, including enhancing understanding of the status, distribution and ecology of sturgeon (e.g., Ministry of Transportation and Infrastructure 2018; NYSDEC 2013), and provision of new fish habitat – including spawning habitat (Infrastructure Canada 2014; New Champlain undated).

Drawing on international good practice, the choice of an appropriate compensation measure to reach no net loss or net gain should – in particular – be comparable, additional and lasting (e.g., Gardner *et al.* 2013). "Comparable" means that the compensation measure should produce similar biodiversity gains to residual impacts (in scale, type of biodiversity, etc.), equating – for this Project – to relatively limited gains for three sturgeon species. "Additional" means that gains produced by the compensation measure would not have happened anyway, in the absence of the Project. "Lasting" means that gains should last as long as residual impacts, in the case of this Project into the long-term. More practically, the compensation measure should ideally be practical, i.e. cost-effective and relatively easy to implement – such as through a contract to one entity, rather than through complex multi-institutional partnerships.

This Project's predicted residual impacts are on three species of sturgeon. As such, compensation measures should focus on improving the status of these species. Several studies and stakeholders have provided recommendations for sturgeon conservation in Georgia (e.g., Freyhof *et al.* 2015; Fox *et al.* 2018). These recommendations are discussed in Sections 5.3.1-5.3.10 and assessed in Table 5 against the four key criteria discussed above.

Table 5 uses a weakest link approach, such that a compensation measure judged "low" against any criterion is unlikely to be appropriate for this Project. Many of the potential conservation measures are evaluated to be very important, but too complex or expensive for this Project to realistically support. Three approaches are assessed as potentially suitable compensation measures for this Project's residual impacts: support to a high standard monitoring system (Section 5.3.3), support to improved hydropower management (Section 5.3.7), and support to reducing sand/gravel quarrying in the Rioni (Section 5.3.9). The latter two approaches would be highly innovative in a Georgian context, and potentially ultimately costly or unsuccessful. However, their potential benefits are so high that they are top priorities for investigation.

Box 1. Overall Project approach to achieving no net loss / net gain

The Project will put in place a ***high standard monitoring system*** for sturgeon, estimated to cost $140,000/year (based on consultations with WWF-Caucasus). This will be funded for at least the first two years, one of which will be undertaken before – and one after – construction.

The Project will also provide political support to – and participation in – efforts to reduce cumulative impacts in the Rioni River, through improved hydropower management and reduced sand/gravel quarrying. Such efforts are likely to be led by MoEPA, with support from a non-governmental organization or research institution, to engage relevant companies, regulators and national experts in a ***cumulative impacts working group***. Such a working

group would allow better assessment of feasibility of continued support to improved hydropower management, stopping sand/gravel quarrying, or rehabilitating sections of the spawning grounds damaged by quarrying or other activities. Based on consultation with WWF-Caucasus, it is estimated that costs of such an approach may be in the region of $60,000/year (comprising $22,000 for staff and management, $4,000 for working group meetings, and $29,000 for feasibility assessments and studies to identify measures to mitigate current cumulative impacts on the Rioni's biodiversity). It is likely that a five-year engagement would enable implementation of initial practical measures (speculatively estimated to cost $200,000 during this five-year period). The total costs of a Rioni River cumulative impacts working group are thus estimated at $500,000 over five years. The Project will support efforts to seek financing for the working group.

Table 5. Assessment of potential sturgeon compensation measures for this Project, based upon a weakest link approach, with potentially suitable measures highlighted in red

Compensation measure	Comparability	Additionality	Longevity	Practicality
Improve law enforcement	high	high	moderate	low
Raise public awareness	low	high	moderate	high
High standard monitoring	moderate	high	moderate	moderate
Increase protection of the Rioni River	high	moderate	high	low
Remove dams on the Rioni	high	high	high	low
Shorten the Vartsikhe derivation canal	high	high	high	low
Improve hydropower management	high	high	high	moderate
Develop bypass options to spawning areas above dams	high	high	high	low
Reduce sand/gravel quarrying in the Rioni	high	high	high	moderate
Establish a hatchery	high	high	high	low

5.3.1 - Improve law enforcement

One of the most significant impacts on sturgeon in Georgia is illegal fishing, both by commercial fishermen at sea – even within the marine boundaries of Kolkheti National Park (Khavtasi *et al.* 2010) – and capture by local people in the Rioni River (particularly at the river mouth and in the spawning areas). Native sturgeon species are protected by law in Georgia, but are still openly caught and sold (e.g., Fox *et al.* 2018). The MoEPA Biodiversity Service under the Department of Biodiversity and Forest Policy is responsible for enforcing this law. One obstacle to law enforcement has been identification of individual species, including legally-bred Siberian Sturgeon *Acipenser baerii* (Maka Bitsadze, WWF, pers. comm. 2018). This obstacle has largely been overcome through development of identification guides by WWF, though government staff still lack confidence in identification and there are challenges with hybrid fish. Hybrids among native species may occur as populations become depleted or

they may occur with escaped fish from farms. During this study, a credible report was also received of capture of 35 wild sturgeon for the Gugeti Siberian Sturgeon hatchery seven or eight years previously – these fish may have been unintentionally or intentionally hybridized with Siberian Sturgeon (hybridization of fish in aquaculture was a common Soviet practice: Radu Suciu, pers. comm. 2019). Further obstacles to law enforcement are the distance of enforcement officers from poaching hotspots (e.g., the nearest office to the Project is c. 65 km away in Zugdidi), the high burden of proof upon law enforcement agencies when prosecuting cases (Fleur Scheele, FFI, pers. comm. 2018), and the low penalties imposed by the courts (Gvasalia 2017). Freyhof *et al.* (2015) highlighted the need for efforts to support law enforcement. Such support, if considered as a compensation action by this Project, would likely best comprise funding to a skilled independent technical advisor (e.g., institute or non-governmental organization) to work closely with MoEPA and other relevant government departments.

Improved law enforcement would certainly be additional and provide benefits to sturgeon populations (comparable), but may require some level of ongoing support over time (not very lasting). More problematically, the highest priority current improvement needs for law enforcement are not funding (Fleur Scheele, FFI, pers. comm. 2018), but instead appear to be a restructuring of staffing to allow closer geographic focus on illegal fishing hotspots, and simplification of enforcement at the prosecution/judicial level. Both of these issues would require extensive discussion with MoEPA and the Ministry of Justice, and higher-level strategic government decision-making. It would likely be very challenging to coordinate support to a technical advisor and various ministries for such a compensation action. While extremely important for sturgeon conservation, ***support to law enforcement is thus considered infeasible for this Project***.

5.3.2 - Raise public awareness

The national and international importance of Georgia's sturgeon populations is not well recognized by the public in the country (Freyhof *et al.* 2015). Public awareness-raising efforts have thus been recommended (Freyhof *et al.* 2015), in order to raise understanding of threats and build support for sturgeon conservation. One compensation action for this Project could thus be support to a public awareness-raising campaign, perhaps led by a non-governmental organization.

This compensation action is certainly additional and practical, though it would require some level of support into the long-term so cannot be considered truly lasting. In the long-term, raised public awareness could be anticipated to reduce threats on sturgeon, and thus reduce declines in their populations. At present, however, the financial rewards from illegal fishing of sturgeon are so high, and the risks and consequences of being caught so low (Section 5.3.1), that awareness-raising alone is not likely sufficient to change behavior of illegal fishers. The causal links are thus sufficiently weak and long-term that this compensation action is not considered likely to produce gains in sturgeon populations that are comparable to residual Project impacts. In summary, ***raising public awareness is a key supporting activity for all other sturgeon conservation actions, and so should be undertaken for its broad conservation benefits, but is not sufficiently comparable to alone present a suitable compensation action for this Project***.

5.3.3 - High standard monitoring

A challenge to sturgeon conservation in Georgia at present is the extremely limited information on their status, distribution and ecology. This hampers assessment of impacts of planned development (e.g., this Project, upstream hydropower projects) and the potential for improved operational mitigation of current development (e.g., the Vartsikhe hydropower plants). For these reasons, Freyhof *et al.* (2015) called for high standard monitoring to be introduced, with

surveys following international good practice. Such recommendations are reflected globally (Rosenthal & Pourkazemi 2005). There have been some status surveys in the marine waters of Georgia (Guchmanidze 2009, 2017), but surveys in the Rioni River were only initiated in 2018, through net-based surveys by students at Ilia State University (Fleur Scheele, FFI, pers. comm. 2018) and side-scan sonar surveys (Fox *et al.* 2018). Both of these recent surveys were essentially pilot efforts and have not yet yielded many data on sturgeon. Ideally, monitoring of sturgeon in the Rioni would enable at minimum an understanding of abundance of individual species (and age/size classes within those species) over time and temporal distribution in the river (i.e., reflecting migratory movements up/downstream for spawning). The former would be best measured via automatic fish counters, while the latter would require tagging of individual fish (e.g., with passive integrated transponders) and/or direct capture. Information on the individual species involved or age/size classes may require direct capture sampling. The costs, benefits and limitations of various approaches are discussed in Section 6.1.

Monitoring of fish by this Project is inherently necessary to understand Project impacts (Section 6), but the Project would not normally be able to justify expenditure on a high standard monitoring programme. However, additional support to such international standard monitoring could be considered a compensation action by this Project. This level of monitoring would be additional to other monitoring the Project would put in place. It would only be somewhat comparable, since it would provide important information necessary for conservation of sturgeon, but would not directly provide any gains in sturgeon populations. The results it would be anticipated to produce would be valuable into the long-term, though the monitoring programme itself would require some level of continued support to persist into the long-term. The costs of this standard of monitoring are likely to be in the region of $140,000/year for at least the first five years of the Project (per discussions with WWF-Caucasus). There are thus some challenges to implementing this compensation action, but there are certainly no “red flags” – unlike most other potential compensation actions (Table 5). As such, ***support to establish a high standard sturgeon monitoring programme is a suitable compensation action for this Project***.

5.3.4 - Increase protection of the Rioni River

While sturgeon fishing is banned in the Rioni River (Section 5.3.1), and there are other seasonal fishing limitations (Irine Lomashvili, MoEPA, pers. comm. 2018), other activities are still permitted to impact the river – such as sand and gravel quarrying (Section 4.1.1). Inclusion of sections of the Rioni River within formal protected areas would ultimately, though not immediately, lead to reduction of such threats. For example, licensed quarry sites would usually be allowed to function until the end of their term (Maka Bitsadze, WWF, pers. comm. 2018). For this reason, it has been recommended that various sections of the Rioni River be fully protected (Fox *et al.* 2018; Freyhof *et al.* 2015). Proposals for extension of Kolkheti National Park to include the adjacent river, and for establishment of a new Sanctuary covering the sturgeon spawning areas in the river near Samtredia, are already being considered by parliament (Maka Bitsadze, WWF, pers. comm. 2018). Nonetheless, even if these proposals are successful, the central stretch of the Rioni River will remain outside of protected areas. Support to protection of that section could be a compensation measure for this Project.

Increased protection of the Rioni River would certainly be beneficial for sturgeon populations, and thus produce comparable gains to residual impacts from this Project. It would also be a long-lasting measure. It may not, however, be considered very additional given ongoing efforts to protect the Rioni River piece-by-piece. Moreover, it is not likely to be a practical short-term goal, given protected area proposals are currently being considered by parliament – it is likely that political appetite will be limited for rapidly revisiting the extent of protection for the Rioni River. Given this, ***support to increased protection of the Rioni River is considered an unrealistic compensation measure for this Project***.

5.3.5 - Remove dams on the Rioni

The presence of the Vartsikhe cascade of hydropower dams on the Rioni River likely provides the biggest challenge to long-term survival of sturgeon populations (alongside illegal fishing). These dams have largely dewatered or cut off 84% (48 km) of natural sturgeon spawning grounds in the river, dramatically reducing the reproductive viability of the species (Freyhof *et al.* 2015). Further, they are managed in a way that is likely to adversely impact sturgeon reproduction on the limited remaining spawning grounds downstream (Section 5.3.7; Fox *et al.* 2018). For these reasons, Freyhof *et al.* (2015) recommended removal of the dams.

Support to removal of dams on the Rioni River could be considered a compensation measure for this Project, as such action would undoubtedly provide major (comparable) and long-lasting gains to sturgeon species, and be additional to current conservation efforts. It does not seem likely, however, that such action would be politically feasible, without considerable effort to demonstrating alternative energy options at a broad scale. ***Support to removal of dams on the Rioni River is thus considered an unrealistic compensation measure for this Project***.

5.3.6 - Shorten the Vartsikhe derivation canal

The Vartsikhe hydropower cascade derivation canal extends for 4.5 km after the last hydropower plant. Freyhof *et al.* (2015) recommended diverting this canal more quickly back to the Rioni River, restoring flow to an additional 6 km of the river which are currently 90% dewatered and unsuitable for sturgeon spawning. Such action would increase the available river suitable for sturgeon spawning by two thirds.

Support to shortening the Vartsikhe derivation canal could be considered a compensation measure for this Project, as such action would undoubtedly provide significant (comparable) and long-lasting gains to sturgeon species, and be additional to current conservation efforts. It would, however, involve complicated negotiations with the hydropower company, multiple landowners, and a number of government departments – as well as considerable cost (Maka Bitsadze, WWF, pers. comm. 2018). As such, ***support to shortening the Vartsikhe derivation canal is considered an unrealistic compensation measure for this Project***.

5.3.7 - Improve hydropower management

Sturgeon require clean coarse substrate to spawn, since eggs become very adhesive after spawning and stick to this substrate. High sediment loads in the river during spawning are likely to obscure such substrate or become attached to recently fertilized, adhesive eggs – leading to abnormal development and/or increased mortality (Fox *et al.* 2018). Since removal of hydropower dams and shortening of the Vartsikhe derivation canal appear infeasible, Fox *et al.* (2018) recommended that regional biologists collaborate with hydropower plant representatives to change the timing of releases of large volumes of water and sediment. At present, such actions appear to be carried out without regard for sturgeon.

Supporting improved hydropower management could be considered a compensation measure for this Project, if a suitable lead organization could be found to which to provide funding (e.g., a national or international non-governmental organization or research institution). Such action would likely provide significant (comparable) and long-lasting gains to sturgeon species, and be additional to current conservation efforts. It could, however, involve complicated negotiations with the hydropower companies, and potentially some costs to their operations. Overall, while it is not currently possible to predict success of this approach, ***support to improved hydropower management would be a suitable compensation measure for this Project***. It would be most cost-efficient to combine engagement of hydropower and sand/gravel companies (Section 5.3.9). A combined programme over the first five years of the Project is estimated to cost $500,000 (Box 1).

5.3.8 - Develop bypass options to spawning areas above dams

As an alternative to attempting to amend the practices or function of the Vartsikhe hydropower cascade (Sections 5.3.6-5.3.7), Fox *et al.* (2018) recommended that regional biologists collaborate with hydropower plant representatives to consider options that could allow sturgeon to bypass the dams and use about 20 km of historical spawning areas further upstream.

Successful dam bypasses for sturgeon would provide clear (comparable) benefits to sturgeon and long-lasting gains, and be additional to current conservation efforts. However, there have been few facilities yet developed that are suitable for upstream passage of sturgeon past hydropower dams, and these also need to be accompanied by in-river guidance to ensure safe downstream passage around hydropower turbines (Jager *et al.* 2016; Bosse 2018). Such a compensation measure would thus involve complicated negotiations with the hydropower companies, and – given that all four dams would have to be bypassed in order for this action to be useful – it is also likely to involve considerable expense. As such, ***development of bypass options for the Vartsikhe hydropower cascade is considered an unrealistic compensation measure for this Project***.

5.3.9 - Stop sand/gravel quarrying in the Rioni

Sand/gravel quarrying from licensed sites in the Rioni River, particularly within the limited remaining spawning grounds of sturgeon, is having a devastating impact upon these species' survival (Section 4.1.1). Given this, multiple stakeholders have recommended that no quarrying be permitted in the Rioni River, downstream of the Vartsikhe hydropower cascade in the remaining habitat of sturgeon species in Georgia. While new licenses are subject to environmental impact assessment, and thus MoEPA can object to their issuance, there does not appear to be any clear legal avenue for cancelling existing leases – even when a protected area is established over the top of them (Maka Bitsadze, WWF, pers. comm. 2018). There may, however, be an opportunity to purchase and retire the rights for such leases, in effect cancelling them by compensating their current owners (Maka Bitsadze, WWF, pers. comm. 2018). Such opportunities should have costs and benefits weighed against any other opportunities to rehabilitate areas of the river damaged by past activities such as quarrying. Support to stopping sand/gravel quarrying could be considered a compensation measure for this Project, if a suitable lead organization could be found to which to provide funding (e.g., a national or international non-governmental organization or research institution). Such an approach could produce substantial (comparable), additional, long-lasting gains. While it is not yet possible to predict success of this approach, ***support to stopping sand/gravel quarrying in the Rioni River would be a suitable compensation measure for this Project***. It would be most cost-efficient to combine engagement of sand/gravel companies and hydropower (Section 5.3.7). A combined programme over the first five years of the Project is estimated to cost $500,000 (Box 1).

5.3.10 - Establish a hatchery

Globally, sturgeon hatcheries are considered an important component of conservation efforts (Rosenthal & Pourkazemi 2005). During this study, information was received about a potential plan for a sturgeon hatchery at or near Kolkheti National Park, but this could not be confirmed by other sources including the National Park authorities. Only one sturgeon hatchery currently exists in Georgia, a commercial operation in Gugeti focused on production of Siberian Sturgeon (and possibly hybrid sturgeon). There may be some possibility to adapt the Gugeti hatchery to also support conservation efforts for wild sturgeon. However, fish hatcheries require a high standard of understanding of the behavioural needs, nutrition and physiology of the species concerned – including good understanding of wild status, genetics and behavior

if reintroduction of stocks is planned (Rosenthal & Pourkazemi 2005). At present, this level of understanding is not in place in Georgia for the remaining wild species, and so any hatchery effort would require considerable investment and collaboration with overseas experts (e.g., Romanian sturgeon hatchery experts), if it were not to risk causing more harm to remaining wild populations than any benefits it provided (e.g., through release of diseased, genetically less suitable or hybrid fish to the river that may interbreed or compete with remaining wild populations). Given these complications, ***establishment of a hatchery is not considered a feasible compensation action for this Project***.

6 Biodiversity monitoring

The Project will undertake a general programme of monitoring during site preparation, construction and worksite closure (ADB EIA Chapter **I. Environmental Management Plan and Institutional Requirements**). Within that programme, specific monitoring will be undertaken for Critical Habitat-qualifying biodiversity to:

- Confirm presence of effective mitigation (Table 3);
- Confirm predicted negligible impacts after mitigation by the operations phase for most priority biodiversity (Table 4);
- Verify recovery of Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus* before or during the operations phase (Section 5.2); and
- Assess, and quantify if possible, Project impacts on sturgeon species into the long-term, in order to inform compensation measures (Section 5.3).

Monitoring for Critical Habitat-qualifying biodiversity is outlined in Table 5. Further discussion is given to monitoring of sturgeon in Section 6.1, since this comprises not only the most long-term monitoring need for the Project (above), but support to a high-standard programme of sturgeon monitoring is a suitable Project action to compensate for potential residual impacts on sturgeon species (Section 5.3.3).

Table 5. Key areas of monitoring necessary to assess changes in the state of important species, changes in threats, and progress of project mitigation actions

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
Kolkheti National Park, Ramsar Site and Important Bird Area; White-headed Duck (*Oxyura leucocephala*); Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Habitat	P, C	IP 11: Introduction of invasive alien species.	Care will be taken to avoid introduction of new invasive species to, and spread of existing invasive species within, the Project area through: - washing of vehicles, equipment and supplies before entry to the Project area; - monitoring for invasive species; and - control/eradication of invasive species where found.	Washing of vehicles, equipment and supplies before entry to Project area	Transit site outside Project Area of Influence	Inspections	Unannounced inspections at least quarterly during preparation, construction and worksite closure phases	RD, Construction Supervision (refered to as the 'Engineer" in the ADB EIA)
					Abundance/spread of invasive alien species in Project area	Project Area of Influence	Surveys by specialist sub-contractor	Annually, in summer during preparation, construction and worksite closure phases	Construction Contractor ecological sub-contractor
					Control of new/spreading areas of invasive alien species in Project area	Project Area of Influence	Records of invasive species control; inspections	Quarterly, during preparation, construction and worksite closure phases	Construction Supervision, Construction Contractor ecological sub-contractor
Kolkheti National Park, Ramsar Site and Important Bird Area	Vegetation coverage	P	IP 9: Loss of vegetation coverage in specific areas of the project.	Ensure that the rehabilitation of the secondary road [from Patara Poti to the oil terminal] does not extend into the proposed extension of the National Park.	Rehabilitation of secondary road within NP extension	Worksite	Comparison of maps of proposed NP extension with those of secondary road rehabilitation	Before finalisation of project workplans	RD
Kolkheti National Park, Ramsar Site and Important Bird Area	Vegetation coverage	P	IP 9: Loss of vegetation coverage in specific areas of the project.	Boundaries of ROW and operation area will be strictly kept to - to avoid impact on the adjacent vegetation; Strict keeping to traffic routes during the construction will be ensured to avoid impact on vegetation.	Vegetation disturbance by Project vehicles and contractors; mortality of priority bird and plants	Project Area of Influence	Review of Project incident logbook; visual inspection	Unannounced inspections at least quarterly, during preparation, construction and worksite closure phases	RD, Construction Supervision
Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus*	Mortality	P, C	IP, IC 10: Mortality of individuals.						

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
White-headed Duck (*Oxyura leucocephala*)	Habitat	P	IP 12: Modification and fragmentation of habitat due to loss of vegetation coverage.						
	Mortality	P	IP 13: Mortality of individuals due to equipment operation.						
Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus*	Mortality	P, C	IP, IC 10: Mortality of individuals.	Vegetation will be preserved where feasible, in particular in the areas near the river bank to avoid erosion/sedimentation.	Mortality of individuals	Project Area of Influence	Review of Project incident logbook; visual inspection	Unannounced inspections during preparation, construction and worksite closure phases	RD, Construction Supervision
				In case taxation [walkover surveys pre-construction] reveals any protected plant species in the area, the latter will be removed from the environment [and translocated] in accordance with sub-paragraph (v), Article 24, first paragraph of the law of Georgia on 'Red List and Red Book'. Relocation of any specimens found during the surveys where practical will be provided with the help of biodiversity experts to ensure proper handling... A plan and schedule must be developed by the Contractor prior to implementation of this task.	Number of plants requiring translocation	Within the Project area, where ground/water disturbance may take place	Surveys by specialist sub-contractor	During walkover surveys, pre-construction	Construction Contractor ecological sub-contractor

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
White-headed Duck (*Oxyura leucocephala*); Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Distribution	P, C	IP 13, IC 11: Displacement of species due to noise, presence of machinery and equipment and presence of staff.	All vehicles, equipment and machinery used for construction will be regularly maintained and inspected/certificated to ensure that the noise levels conform to the standards prescribed.	Noise levels of Project vehicles, equipment and machinery against prescribed standards	Worksite	Review of certificates; inspections	Unannounced inspections quarterly during preparation and construction phases	RD, Construction Supervision
Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus*	Mortality	P, C	IP, IC 10: Mortality of individuals.	Training of the staff in environmental and safety issues, including protection of vegetation outside the boundaries of the project corridor.	Staff adherence to best practice	Worksite	Review of training records; review of Project incident logbook; inspections	Unannounced inspections quarterly during preparation and construction phases	RD, Construction Supervision
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Habitat	C	IC 12: Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species.						
	Mortality	C	IC 14: Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.						
Colchis Water-Chestnut (*Trapa colchica*) and *Hibiscus ponticus*	Mortality	P, C	IP, IC 10: Mortality of individuals.	Disturbed vegetation must be replanted immediately after the construction/disturbance stops.	Physical restoration of the sites to their original state	At all Project-disturbed areas	Inspections	Before the end of the worksite closure phase	RD, Construction Supervision

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
					Successful progress of re-vegetation, and need for any additional re-vegetation	At all Project re-vegetation sites	Surveys by specialist sub-contractor	Annually, in summer, from the last year of the worksite closure phase until the fifth year of the operations phase, inclusive	MoEPA, Construction Contractor ecological sub-contractor
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Habitat	C	IC 12: Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species.	Slopes of embankment will be protected from erosion by vegetation and slope drainage. Dewatering and cleaning of cofferdams to prevent siltation by pumping from cofferdams to a settling basin or a containment unit will be performed. Construction materials and chemicals will be appropriately secured during flood season to avoid accidental release to the natural environment. Materials and waste will be stockpiled so as to avoid erosion and washing off into the river. Drainage trenches will be established to divert surface runoff from the site. Ensure no waste materials are dumped in the river, including re-enforced concrete debris. In disturbed soil areas, compacted straw (straw bales), silt fence, fibber rolls, gravel bags, or other approved sediment control must be ensured. At a minimum, all bare soil (whether it's an abutment slope or a stockpile) must be protected before it rains. No concrete waste from concrete mixers will be dumped in the river. Temporary fuel tanks will be	Adherence to approved Project plans for soil and erosion, storage of fuels and chemicals, sewage management, and fuelling and maintenance	Project Area of Influence	Inspections	Unannounced inspections at least monthly during preparation, construction and worksite closure phases	RD, Construction Supervision
					Aquatic macroinvertebrate diversity and abundance	Close downstream of the Project site	Surveys by specialist sub-contractor, using driftnets	Quarterly, during preparation, construction and worksite closure phases, and first two years of operations phase	MoEPA, Construction Contractor ecological sub-contractor

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
				located at least 50 m away from any watercourse, drain, or channel leading to a water course. The tank will be placed in covered areas with berms or dikes installed to intercept spills, if any. Any spill will be immediately localized and cleaned up with absorbent materials. The bund will be able to accommodate 110% of the volume of the tank. Refueling of all plant, vehicles and machinery will not be allowed within 50 m of any watercourse, drain or channel leading to a water course. Oil, chemical and solid waste will be stored, and handled and disposed of by appropriately licensed waste management contractors.					
				Borrowing from the stream [at the project site] will be prohibited. Dropping structures into rivers/streams will be avoided [construction will instead take place from the river bank or pontoons]. Discharge of sediment-laden construction water (e.g., from areas containing dredged soil) directly into surface watercourses will be forbidden. Sediment laden construction water will be discharged into settling lagoons or tanks prior to final discharge.	Absence of borrowing from; movement of machines or dropping structures in; and discharge of sediment-laden water to the Rioni River at the project site	Project Area of Influence	Visual inspection	Unannounced inspections monthly, during preparation, construction and worksite closure phases	RD, Construction Supervision

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Habitat	C	IC 12: Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species.	Movement of machines inside rivers, streams, or on their banks will be prevented except when it is unavoidable due to the construction of a structure. No washing of vehicles etc. in the river will be allowed.	Absence of movement of machines in the Rioni River	Project Area of Influence	Visual inspection	Unannounced inspections monthly, during preparation, construction and worksite closure phases	RD, Construction Supervision
	Distribution	C	IC 13: Displacement of species due to noise, presence of machinery, and equipment and of staff.						
	Mortality	C	IC 14: Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.						
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Habitat	C	IC 12: Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species.	Sourcing of construction materials (e.g., sand, gravel) will avoid use of any licensed or unlicensed sites in the Rioni River or on its banks.	Sourcing of materials	n/a	Review of records for sourcing of materials; inspections	Unannounced inspections quarterly, during preparation, construction and worksite closure phases	RD, Construction Supervision

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Distribution	C	IC 13: Displacement of species due to noise, presence of machinery, and equipment and of staff.	Coffer dams, silt fences, sediment barriers or other devices to prevent migration of silt during construction within the river will be provided. [Coffer dams will also significantly reduce pile-driving noise.]	Use of silt migration barriers	Worksite	Visual inspection	Unannounced inspections, twice-yearly in March-September during the preparation and construction phases	RD, Construction Supervision
				Ensure compliance with construction specifications which envisage the arrangement of cofferdams to protect water quality during construction minimize the impacts to aquatic fauna during pile driving in the Rioni River. Noise from pile-driving will be kept below current international interim good practice guidelines.	Use of sheet pile cofferdams for in-river construction	Worksite	Visual inspection	Unannounced inspections, twice-yearly in March-September during the preparation and construction phases	RD, Construction Supervision
				The contractor will model planned pile-driving and assess alignment with international interim good practice guidelines before starting to pile. Where planned pile-driving appears likely to exceed such thresholds, alternative pile-driving methods or mitigation will be selected	Noise levels from pile-driving against good practice guidelines	Worksite	Inspections	Unannounced inspections quarterly during preparation and construction phases	RD, Construction Supervision
				Implement a build-up of activity which slowly increases construction activities within the Rioni River to allow aquatic fauna to exhibit avoidance responses.	Appropriate construction build-up	Worksite	Inspections	Unannounced inspections quarterly during preparation and construction phases	RD, Construction Supervision
				All in-river activities will be avoided during March-September inclusive, to avoid disturbance to sturgeon during their overall spawning season. Where possible, in-river activities will also be avoided in October and November.	Absence of in-river activities	Worksite	Visual inspection	At least monthly from March-September inclusive, during the preparation, construction and worksite closure phases	RD, Construction Supervision

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
				The central bridge pier and adjoining two piers will be constructed (referring specifically to construction using coffer dams in the river) at two different times.	Appropriate constructon sequencing	Worksite	Visual inspection	At least monthly from March-September inclusive, during the preparation, construction and worksite closure phases	RD, Construction Supervision
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Mortality	C	IC 14: Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.	Fishing and using of illegal fishing gear [by construction workers] anywhere along the river will be prohibited.	Absence of fishing	Worksite	Visual inspection	Unannounced inspections, quarterly during the preparation, construction and worksite closure phases	RD, Construction Supervision
				Use of propeller-driven boats will be minimised during construction.	Absence of propeller-driven boats except during set-up and removal of pontoons	Worksite	Visual inspection	Unannounced inspections, quarterly during the preparation, construction and worksite closure phases	RD, Construction Supervision
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A. gueldenstaedtii* and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)	Habitat	O	IO 8: Degradation of aquatic habitat from accidentally spilled fuel/oil or surface runoff from bridge.	Runoff water from the bridge structures will be handled by the built drainage structures and runoff and spill containment chambers. The Terms of Reference for the Road Maintenance Contractor for the operations phase will include regular monitoring of retention structures, and safe disposal of contents after any spills.	Drainage/retention infrastructure in good technical condition and cleaned regularly	Project site	Inspection	Recurrent [as needed for operational life of the Project]	RD, Maintenance Contractor
Stellate, Russian and Beluga Sturgeon (*Acipenser stellatus*, *A.*	Mortality	O	IO 9: Mortality of sturgeon from illegal fishing activities using	Warning signs and CCTV cameras will be installed on both sides of the bridge to deter and detect illegal fishing activities.	Installation of warning signs and CCTV cameras	Project site	Inspection	Before the end of the worksite closure phase	RD, Construction Supervision

Environmental Component	Aspect	Project phase	Issue/impact	Mitigation action	What parameter is to be monitored?	Where is the parameter to be monitored?	How is the parameter to be monitored?	When is the parameter to be monitored (frequency)?	Institutional responsibility
gueldenstaedtii and *Huso huso*); Grusinian Scraper (*Capoeta ekmekciae*)			the bridge structures.	Monitoring of the bridge piers by CCTV will be ensured throughout the operation period to prevent poaching of sturgeon by using fishing gear on bridge structures.	Illegal fishing using the bridge	Project site	Inspection of CCTV camera footage	At least weekly from March-September inclusive, for the operational life of the Project	RD, Maintenance Contractor
					Sturgeon abundance in the river	Project site	Surveys by specialist contractor	Annually, from before the preparation phase until the end of the defect liability period.*	RD, ecological contractor

***Note**: To understand the potential for longer-term impacts, it would be necessary for sturgeon abundance monitoring to continue into the operational phase of the project, annually until the third year of operation after defect liability and then twice more at five-yearly intervals. It is recommended that the RD identify parties best placed to undertake such surveys and to report to ADB and other relevant stakeholders on the findings.

6.1 - Monitoring sturgeon

There are three main things that this Project may wish to understand with regard to sturgeon:

- Project-induced impacts on sturgeon, through illegal fishing;
- Abundance of sturgeon species and age/size classes over time (to understand potential impacts of the Project); and
- Temporal distribution of sturgeon in the Rioni, as a contribution to sturgeon conservation.

The Project is already planning to install and maintain CCTV cameras to monitor illegal fishing from the bridge (Sections 5.1.6-5.1.7). Abundance over time would be best, and most absolutely, measured via automatic fish counters, while understanding temporal distribution would require tagging of individual fish or extensive capture efforts.

Automatic fish counters come in four main types: resistivity counters that identify fish by their different electrical resistivity to water; optical beam counters that involve fish breaking infrared beams; direct video counters; and hydroacoustic (sonar) counters. Resistivity, optical beam and direct video counters are impractical for the Project area, as they require a very narrow and/or shallow channel (Braun *et al.* 2016). Narrowing the natural river channel to facilitate such counters could have unintended consequences by facilitating illegal fishing near the remaining passageway(s) and/or hindering sturgeon migration against a stronger flow through a narrower channel. For the same reasons, it is not recommended to install fish counters on structures (such as the flood gate bridge) currently in the river that, at least at times, artificially narrow the channel. A multibeam sonar counter could function, at low frequency, across 40 m width (Braun *et al.* 2016). The width of coverage of river by a splitbeam sonar counter would depend on the river profile; ideally being gently sloping and triangular in nature, and potentially covering a larger area than a multibeam counter (Braun *et al.* 2016). To cover the whole (250-400 m) width of river with static sonar counters would require installation of multiple counters which, at $25,000-90,000 USD/counter, could become very expensive. Further, annual installation, operation, data download and review costs for sonar counters have been estimated at $60,000-100,000 USD (Braun *et al.* 2016). Dependent on frequencies used, side-scan sonar systems have the potential to survey the whole river channel (Fox *et al.* 2018) but – at least at present – do still require expensive equipment and international expertise.

Tagging of individual fish is the only option for understanding of temporal distribution of sturgeon in the river. Acoustic telemetry has been proposed and tested as an effective way to achieve such tagging in the Rioni River (Fox *et al.* 2018)

Automated technologies could provide good data on abundance, and potentially movement, but would be unlikely to provide good information on the individual species involved or age/size classes. Such information could only really be gathered by direct capture survey methods, for example by using hand nets as in 2018 surveys by Ilia State University. Further, direct capture methods are better for surveying juvenile sturgeon than are automated technologies. Although direct capture methods are time-intensive, they provide data not available through other methods, are low cost (with no risks of expensive equipment malfunction over time), and are highly sustainable with existing in-country capacity. Given the need for long-term Project monitoring of sturgeon, it will be very advantageous to have a system of monitoring that does not – after initial years of training and capacity-building – require significant overseas expertise or support. The Project could contribute a long-term benefit to sturgeon by, through support to a programme of monitoring, establishing a group of sturgeon experts at Ilia State University.

For the first five years of the Project, during construction and into the start of the operations phase, a mixed-method approach is proposed. This will combine use of hi-tech automated technologies (at least including side-scan sonar) with simpler direct capture methods. Such mixed-method monitoring during a five-year pilot phase will enable comparison and cross-

referencing of methods, in order to develop an appropriate long-term Project approach to monitoring. The programme of monitoring should start as soon as possible (even in the Project preparation phase if possible) in order to collect a dataset as representative of the pre-Project baseline as possible.

As discussed in Section 5.3.3, it is estimated that a high standard mixed-method monitoring programme (incorporating both hi-tech methods and simpler direct capture) would cost c. $140,000/year for at least the first five years of the Project. After five years, it is anticipated that such monitoring only need take place on a five-yearly basis, reducing average annual costs to c. $70,000/year.

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Appendix A. Critical and Natural Habitat Assessment

The ADB Safeguard Policy Statement (ADB 2009) requires assessment of whether the project is planned in an area that may qualify as Critical Habitat or Natural Habitat. This assessment followed more detailed guidance in International Finance Corporation Performance Standard 6 and its accompanying guidance note (IFC 2012a, 2012b).

A.1 - Discrete management units

Critical Habitat and Natural Habitat assessment ideally takes place across sensible ecological or political units that are sufficiently large to encompass all direct and indirect impacts from the project. These areas of assessment, referred to as 'discrete management units' (DMUs), are thus often much broader than the direct project footprint. DMUs may be separate or combined, depending on the ecology of the biodiversity concerned.

As outlined in Section A.2, most of the species of concern in this area are freshwater fish and waterbirds. Freshwater impacts on such species are only likely to occur in the vicinity of the project or just downstream (certainly not upstream of the existing tidal gates), and unlikely to extend into nearshore marine areas. According to the national EIA, terrestrial impacts may occur up to 40 km from the Project, through sand and gravel quarrying. Without further clarity on sand and gravel extraction sites, which may occur on land or in rivers, it is challenging to define appropriate DMUs. As such, two DMUs were defined. First, an aquatic DMU was defined that extends from the west end of the Rioni River estuary upstream to 40 km beyond the Project site. Second, an arbitrary terrestrial DMU was defined as a buffer of 40 km around the Project. In both cases, the arbitrary 40 km buffer was chosen to encompass all potential impact sites from sand and gravel quarrying. These two discrete management units are outlined on Figure 1 (and Figures 3 and 5). The aquatic DMU was used to assess fish and freshwater invertebrates, while the terrestrial DMU was used to assess terrestrial vertebrates and plants (acknowledging that, while one of those plants grows in water and some of the birds are waterbirds, they are more likely to be found in lake and wetland areas of the terrestrial DMU than the main stem of the Rioni River itself).

Identification of these 'discrete management units' does not mean that the project has management obligations across them. The aim of this Critical and Natural Habitat Assessment is to identify whether the broad units qualify as Critical Habitat and, if so, for which biodiversity features. This information helps to prioritise impact assessment and to focus mitigation efforts.

A.2 - Assessment of biodiversity which may qualify the area as Critical Habitat

Each of the following sections considers candidate Critical Habitat-qualifying biodiversity identified within the national EIA as actually or potentially present. In each case, reasons are identified for each biodiversity feature likely meeting or not meeting Critical Habitat. Two categories of biodiversity that might qualify the area as Critical Habitat were only considered briefly here, and should be assessed further by social experts – specifically areas that provide key ecosystem services and areas with biodiversity that has significant social, cultural or economic importance to local communities.

A.2.1 Critically Endangered and Endangered species

Species and relevant subspecies are included if they were found during surveys, or there is indication of their presence near the Project site from literature. Threat status is taken from the global IUCN Red List (IUCN 2018) and national legislation (Government of Georgia 2014b).

Atlantic (European) Sturgeon (*Acipenser sturio*)

This species is considered globally Critically Endangered (Gessner *et al.* 2010d), and nationally Critically Endangered (Government of Georgia 2014b). It used to be the most widely-distributed sturgeon in Georgia, but has declined catastrophically. Guchmanidze (2009) estimated the national population to have been 4,300-4,400 in the 1970s, but just 400 by the early 1990s, and did not record any during 2006-2008 bottom trawl surveys in Georgian Black Sea waters. Similar surveys in 2016-2017 produced one possible individual, to be confirmed via genetic analysis (Guchmanidze 2017). Populations of this species are believed to have been heavily impacted by bycatch during commercial fishing of anchovy, one of its main prey species (Guchmanidze 2009), but it was previously deliberately caught annually in significant numbers (500-600) during spawning in the Rioni (Kolman 2011). The last record of the species from the Rioni was of one in 1999 near the river mouth, while six juveniles were recorded in the Black Sea near the river mouth in 2007 (Guchmanidze 2009). While this latter record provides some cause for hope, most authorities do not consider the species to maintain a population in the Rioni River (Council of Europe 2018). Given the near absence of records during extensive coastal surveys, and no reports of the species in the Rioni River for many years, it does not seem likely that the species any longer regularly occurs in the area. As such, this species does not qualify the Project area as Critical Habitat.

Stellate (Starry) Sturgeon (*Acipenser stellatus*)

This species is considered globally Critically Endangered (Qiwei 2010), and nationally Endangered (Government of Georgia 2014b). Guchmanidze (2009) examined 37 individuals between 2006-2008, during bottom trawl surveys in Georgian Black Sea waters (13% of sturgeon caught). Of these, just over 5% were spawners, and it was estimated that 18-22 individuals may spawn in the Rioni River each year. Stellate Sturgeon maintained a similar proportion of sturgeon caught (14%) during similar surveys in 2016-2017 (Guchmanidze 2017). Ongoing reproduction from the Rioni was confirmed in 2018 by the capture of one juvenile in the river (Council of Europe 2018; Fleur Scheele, FFI, pers. comm. 2018). During this study, a freshly-caught adult was seen and photographed at a fish market in Grigoleti (just south of the Project area). The market stall owner said that it had been caught that morning in the Rioni River, but incorrectly called it a Colchic Sturgeon, so information on its location of capture may be unreliable. As this species has historically spawned in the Rioni River, at least sporadically continues to do so, and maintains low populations in coastal Georgian waters, a precautionary approach is to assume that the river still regularly supports at least one individual of this globally Critically Endangered species (during the spawning season). The Rioni is not, however, believed to be a major spawning river (Qiwei 2010). On that basis, ***it is likely that Stellate Sturgeon qualifies the Rioni River as Tier 2 Critical Habitat***. Further surveys in the river would help to refine this precautionary assumption.

Ship (Fringebarbel) Sturgeon (*Acipenser nudiventris*)

This species is considered globally Critically Endangered (Gessner *et al.* 2010c), and nationally Endangered (Government of Georgia 2014b). During bottom trawl surveys in Georgian Black Sea waters, only two individuals were caught between 2006-2008 and one individual between 2016-2017 (Guchmanidze 2009, 2017). A recent Pan-European Action Plan notes that there are still rare reports of the species in the Rioni River, but that the status is unclear (Council of Europe 2018). Given the extremely small number of records during extensive coastal surveys, and no reliable reports of the species in the Rioni River for many years, it does not seem likely that the species any longer regularly occurs in the area. As such, this species does not qualify the Project area as Critical Habitat.

Russian Sturgeon (*Acipenser gueldenstaedtii*)

This assessment includes Colchic Sturgeon (*A. g. colchicus*), although it is also assessed separately in the next account, given the traditional status it has been accorded in Georgia.

This species is considered globally Critically Endangered (Gessner *et al.* 2010b), and nationally Endangered (Government of Georgia 2014b). In Georgia, Colchic Sturgeon is legally considered a subspecies of *A. persicus*, which is also listed as nationally Endangered (Government of Georgia 2014b). Guchmanidze (2009) examined seven Russian Sturgeon and 151 Colchic Sturgeon between 2006-2008, during bottom trawl surveys in Georgian Black Sea waters (together almost 56% of sturgeon caught). Of these, almost 6% were spawners, and it was estimated that 64-80 Colchic Sturgeon and several Russian Sturgeon may spawn in the Rioni River each year. The proportion of Russian/Colchic sturgeon caught during similar surveys in 2016-2017 increased considerably, to about 81% (Guchmanidze 2017). This proportional increase does not appear to be simply a function of declines in other species, since the overall sturgeon population estimate of Guchmanidze (2017) was 36% higher than that of Guchmanidze (2009). While reproduction of "Colchic Sturgeon" is now restricted to the Rioni River, Russian Sturgeon more broadly also still breeds around the Caspian Sea. If Colchic Sturgeon was considered separate from Russian Sturgeon, it might be considered that there was insufficient evidence of the latter species' continued presence in the Rioni River to qualify it as Critical Habitat. Here the two taxa are considered together. Despite little recent information from the Rioni River, they have historically spawned there, and ongoing reproduction was confirmed from the Rioni River in 2018 by the capture of one juvenile Russian/Colchic Sturgeon in the river (Radu Suciu, pers. comm. 2019). Further, they appear to be maintaining or increasing populations in coastal Georgian waters (Archil Guchmanidze, MoEPA pers. comm. 2018). It is thus reasonable to assume that the river still regularly supports this globally Critically Endangered species (during the spawning season). It is now known to naturally spawn on only four rivers (the Rioni, Danube, Volga and Ural), but population numbers are obscured by release of tens of millions of fingerlings in Russia. It is possible, but probably unlikely, that >10% of the global "wild" population relies on the Rioni River for spawning. On that basis, ***it is very likely that Russian ("Colchic") Sturgeon qualifies the Rioni River as Tier 2 Critical Habitat***. Further surveys in the river would help to verify this assumption.

Colchic Sturgeon (*Acipenser* [*gueldenstaedtii*] *colchicus*)

Although this taxon has already been assessed within the previous account, it is also assessed separately here given the traditional status it has been accorded in Georgia.

The subspecies *A. g. colchicus* has at times been considered a subspecies of *A. persicus* or a separate species, but recent genetic studies have found no evidence for distinctiveness of *A. persicus* and *A. gueldenstaedtii* (Birstein *et al.* 2000; Ruban *et al.* 2008) – though both such studies have focused on *A. p. persicus*. Given these studies, this taxon is currently considered a subspecies of *A. gueldenstaedtii* by IUCN (Gessner *et al.* 2010b; Arne Ludwig, IUCN Sturgeon Specialist Group, *in litt.* 2018), though it is still considered as *A. persicus* within Georgian legislation (Government of Georgia 2014b). Whether considered a distinct species, or a subspecies of *A gueldenstaedtii* or *A. persicus*, the *colchicus* taxon would still qualify the Project area as Critical Habitat, as discussed in the previous account.

European Eel (*Anguilla anguilla*)

This species is globally Critically Endangered and occurs in low numbers in the Black Sea (Jacoby & Gollock 2014). It is known from the Rioni River, but it is rare there and not recorded

every year (Archil Guchmanidze and Irine Lomashvili, MoEPA, pers. comm. 2018). During a visit in preparation of this BAP, a local fisherman near Samtredia confirmed that eels were extremely rare and irregular in the Rioni River. Regular presence, even of a single individual, is considered the threshold for a Critically Endangered species to qualify an area as Critical Habitat under PS6 (IFC 2012). Given such an apparently irregular presence in the Rioni River, European Eel does not qualify the Project area as Critical Habitat.

Beluga Sturgeon (*Huso huso*)

This species is considered globally Critically Endangered (Gessner *et al.* 2010a), and nationally Endangered (Government of Georgia 2014b). Guchmanidze (2009) examined 87 individuals between 2006-2008, during bottom trawl surveys in Georgian Black Sea waters. Of these, just over 6% were spawners, and it was estimated that 35-44 individuals may spawn in the Rioni River each year. At that time, this species made up almost a third of sturgeon individuals recorded. Since 2012, however, this species has declined dramatically, such that in 2016-2017 it represented only 4% of sturgeon individuals recorded (Guchmanidze 2017). Populations of this species are believed to have been heavily impacted by bycatch during commercial fishing of anchovy, one of its main prey species (Guchmanidze 2009). A recent Pan-European Action Plan considers the species to still sporadically reproduce in the Rioni River, the only area it breeds outside of the Danube (Council of Europe 2018). During this study, a fisherman near Samtredia reported that no Beluga Sturgeon had been caught in that area (the spawning grounds) in recent years, but that a large one was caught in around 2013. Given the past importance of the Rioni for the species, believed current spawning in the river (Archil Guchmanidze, MoEPA pers. comm. 2018), the recent nature of its population declines, and very limited recent information on its status in the Rioni, a precautionary approach is to assume that the river regularly supports at least one individual of this globally Critically Endangered species (during the spawning season). On that basis, ***it is quite possible that Beluga Sturgeon qualifies the Rioni River as Tier 2 Critical Habitat***. Surveys in the river would help to confirm or disprove this precautionary assumption.

Salmon (*Salmo labrax*)

Globally Least Concern (Freyhof 2011), but nationally Endangered (Government of Georgia 2014b). It is known from a number of rivers in western Georgia (Ninua & Japoshvili 2008), and the Rioni River is not reported to be of particular importance among these. As such, this species is not likely to qualify the Project area as Critical Habitat.

Black Sea Bottlenose Dolphin (*Tursiops truncates* ssp. *ponticus*)

Bottlenose Dolphin is considered globally Least Concern (Hammond *et al.* 2012), but the Black Sea subspecies is considered Endangered (Birkun 2012) and the species is also considered Endangered within Georgia (Government of Georgia 2014b). Bottlenose dolphins mainly live in marine waters close to shore, but do also regularly enter the lower reaches of rivers – potentially including the aquatic DMU for this Project. The present population of this subspecies is estimated to number at least 3,000 (Hammond *et al.* 2012), with few of those in Georgia – possibly only about 100 individuals (Government of Georgia 2014a; Hammond *et al.* 2012). As such, it is very unlikely that regionally important concentrations of this species occur near the Project. It is possible that nationally important concentrations do occur in neighbouring marine waters (e.g., those of Kolkheti National park), but there is currently no evidence of this. Even if this was the case, given limited use of estuaries by bottlenose dolphins, it is considered unlikely that the estuary of the Rioni River (within the aquatic DMU

of this Project) would also hold nationally important concentrations. As such, this subspecies does not qualify the Project area as Critical Habitat.

Dalmatian Pelican (*Pelecanus crispus*)

This species is considered globally Near Threatened (BirdLife International 2018c), but it is considered Endangered within Georgia (Government of Georgia 2014b). It is mentioned in the national EIA and winters in small numbers (a few more than 10: Zura Gurgenidze, Sabuko, pers. comm. 2018) in the Kolkheti Important Bird Area. It mainly winters on inland, freshwater wetlands but could also use the Rioni River estuary. Overall, 300-500 were counted wintering/passing through Georgia, and 10-40 pairs are suspected to breed (Catsadorakis & Portolou 2017). Given these figures, the low numbers of wintering birds in the Project area cannot be considered of regional or national importance. As such, and also given limited likely use of the aquatic DMU, this species does not qualify the Project area as Critical Habitat.

Sociable Lapwing (*Vanellus gregarius*)

This species is considered globally Critically Endangered (BirdLife International 2017d). A review of the species' national status by Abuladze (2016) identified few records in western Georgia (including one record of two individuals south of Poti in 1982). Although regular records are emerging in the more well-watched Batumi area (Abuladze 2016), it is a passage migrant, and there is no particularly suitable habitat for the species in the Project DMUs (beyond that widely available in lowland Georgia). As such, there is no reason to believe the Project DMUs regularly support this species, and this species does not qualify the Project area as Critical Habitat.

Lesser White-fronted Goose (*Anser erythropus*)

This species is considered globally Vulnerable (BirdLife International 2017a), but it is considered Endangered within Georgia (Government of Georgia 2014b). There have been some suggestions that Kolkheti may offer suitable wintering habitat (e.g., Jones *et al.* 2008), but most national records are from lakes in the east of Georgia. There is thus no reason to suspect that the Kolkheti area holds a population of regional or national importance, and this species does not qualify the Project area as Critical Habitat.

Velvet Scoter (*Melanitta fusca*)

This species is considered globally Vulnerable (BirdLife International 2018b), but it is considered Endangered within Georgia (Government of Georgia 2014b). It winters at Kolkheti (BirdLife International 2018a), but is very much a bird of marine waters – only very rarely entering smaller river estuaries such as that of the Rioni. There is thus no reason to suspect that the area holds a population of regional or national importance, and this species does not qualify the Project area as Critical Habitat.

White-headed Duck (*Oxyura leucocephala*)

This species is considered globally and nationally Endangered (BirdLife International 2018b; Government of Georgia 2014b). It occurs on lakes and freshwater wetlands. Small numbers of this species occur in the Kolkheti IBA in winter (in the low 10s: Zura Gurgenidze, Sabuko, pers. comm. 2018). Although such limited numbers are not of regional significance, given much larger numbers recorded in neighbouring countries such as Armenia and Azerbaijan,

these appear to be nationally significant for Georgia (Hughes *et al.* 2006). As such, ***the terrestrial DMU for this Project represents Tier 2 Critical Habitat for White-headed Duck***.

White-tailed Sea Eagle (*Haliaeetus albicilla*)

This species is considered globally Least Concern (BirdLife International 2016c), but it is considered Endangered within Georgia (Government of Georgia 2014b). For Kolkheti IBA, BirdLife International (2018a) reports at least two breeding pairs and small numbers (e.g., 13 birds) in winter. However, a review of the species' status in the Caucasus reports that 1-2 pairs previously bred at Paliastomi Lake (just south of the Project, and within the IBA), but became essentially extinct in western Georgia after the 1950s (Abuladze & Eligulashvili 1996). It thus seems likely that the BirdLife information is out-of-date, and that the species no longer regularly occurs in the area. This species thus does not qualify the Project area as Critical Habitat.

Steppe Eagle (*Aquila nipalensis*)

This species is considered globally Endangered (BirdLife International 2017b). At Kolkheti, up to 127 have been recorded during autumn migration (BirdLife International 2018a). However, the area is not well-watched, so numbers from a regular raptor watch at nearby Batumi may be more representative (albeit likely higher, given a more restricted flyway at this more southerly location: Verhelst *et al.* 2011). At Batumi, an average of 254 birds have been recorded passing through per year during the last ten years (Batumi Raptor Count 2018). Even if all of those were mature individuals, this would represent just 0.4-0.7% of the global population of this species. Further, following global good practice, there is no reason to suspect the Project area itself represents genuine "critical habitat" for this species during migration, since it is not in any particular geographic bottleneck for flying birds along this already-restricted part of the migration flyway and is not used as a resting area during migration (Sercx *et al.* 2018). This species thus does not qualify the Project area as Critical Habitat.

Saker Falcon (*Falco cherrug*)

The Project area is within the non-breeding range of this species, which is considered globally Endangered (BirdLife International 2017c) and nationally Critically Endangered (Government of Georgia 2014b). It has, however, been rarely recorded in this part of Georgia (e.g., Batumi Raptor Count 2018). There is no evidence to suggest that the Project area regularly contains any individuals, let alone nationally-important populations. This species thus does not qualify the Project area as Critical Habitat.

Lesser Kestrel (*Falco naumanni*)

The Project area is within the breeding range of this species, which is considered globally Least Concern (BirdLife International 2016a) but nationally Critically Endangered (Government of Georgia 2014b). The most recent national population estimate is of 80-120 breeding pairs in 2008, with the most important sites being in the Borjomi region (Iñigo & Barov 2010). Small numbers (<100/year) have been recorded on migration just to the south in the Batumi area (Batumi Raptor Count 2018), but there is no evidence of significant populations in the Project area. As such, there is currently no reason to believe that this species qualifies the Project area as Critical Habitat.

Barn Owl (*Tyto alba*)

This species is considered globally Least Concern (BirdLife International 2017b) but nationally Endangered (Government of Georgia 2014b). This species does not aggregate, so there is no reason to suspect that there could be any nationally important population within the Project area compared to any other part of Georgia. This species thus does not qualify the Project area as Critical Habitat.

Common Crane (*Grus grus*)

This species is considered globally Least Concern (BirdLife International 2016b) but nationally Endangered (Government of Georgia 2014b). It is known in small numbers during migration from Kolkheti National Park, and hundreds have been recorded annually on migration at Batumi (Batumi Raptor Count 2018). While the few breeding areas in Georgia (Javakhishvili *et al.* 2013) could be considered nationally important, there is no evidence that the Project area regularly holds numbers that could be considered nationally important. There is thus no reason to believe that this species qualifies the Project area as Critical Habitat.

Hibiscus ponticus

This species' threat status has not been nationally or globally evaluated, but Matchutadze *et al.* (2015) list it as Critically Endangered. It is a Georgian endemic – restricted to swamps near sea level, including Kolkheti Ramsar Site (Anonymous 1996). Nonetheless, there is no evidence to suggest that the Project area is nationally important for this species – it is also known from Abkhazia, Samegrelo and Adjara (Missouri Botanic Gardens 2018). This species thus does not qualify the Project area as Critical Habitat under Criterion 1.

Royal Fern (*Osmunda regalis*)

This species is globally Least Concern and widely distributed (Matchutadze 2014). Its threat status has not been nationally evaluated, but Matchutadze *et al.* (2015) list it as Endangered. The national EIA lists a widespread vegetation type in the Project area that can be expected to contain this species, but there is no evidence to suggest that the area is particularly important for this species – it is also known from suitable habitat across coastal western Georgia (Matchutadze 2014). This species thus does not qualify the Project area as Critical Habitat.

Colchis Water-Chestnut (*Trapa colchica*)

This species is globally Critically Endangered, and is only known from the Kolkheti lowlands (Batsatsashvili & Machutadze 2014), including the vicinity of the Project (according to the national EIA). As such, it is quite possible that the Project's terrestrial DMU contains more than 10% of the global population of this species. On this basis, ***Colchis Water-Chestnut qualifies the Project area as Tier 1 Critical Habitat*** under Criterion 1.

A.2.2 Endemic or restricted-range species

Following the IFC PS6 Guidance Note (IFC 2012b), species were considered restricted-range if their global extent of occurrence was 50,000 km^2 or less (for terrestrial vertebrates and odonates) and 20,000 km^2 or less (for freshwater crabs, fish and molluscs). Species are included if they were found during surveys, or there is indication of their presence from literature. 'Endemism' *per se* was not considered – this can be a useful approach for species

such as plants for which distributions are poorly known, but is less useful for better-known vertebrate species.

It is recognized that other globally or nationally threatened species may occur in the Project area (e.g., Colchic Crayfish *Astacus colchicus*: nationally Vulnerable), and risks to these should be managed by the Project, but the ADB SPS focuses on the most highly-threatened species.

Barbus* (*?*) *rionicus

This fish taxon is sometimes considered a separate species (e.g., Fricke *et al.* 2019), or sometimes as a subspecies of *B. tauricus* (Fricke *et al.* 2019) or *B. escherichii* (Levin *et al.* 2018 in prep.). At present it is not listed as a separate taxon on the IUCN Red List, and it is unclear if it has actually been assessed. However, it is also not listed in any way by the comprehensive database of Froese & Pauly (2018). If this is a separate species, it might possibly be considered restricted-range, since it only occurs from the Choruh basin along the Georgian coast to the Bzyb River (Levin *et al.* 2018 in prep.). Given the extreme lack of clarity over this taxon, it is not considered further in this assessment. Pending further information in the future, the Project may integrate consideration of this taxon into this BAP.

Grusinian Scraper (*Capoeta ekmekciae*)

This species is globally considered Near Threatened, and currently appears to have a range of just under 50,000 km^2 (Freyhof 2014a). As such, it appears to be a restricted-range species. As it is only known from ten independent sublocations (Freyhof 2014a), one of which is in the Rioni River, the Project aquatic DMU is very likely to contain more than 1% of the species' known global range/population. Given this, on a precautionary basis, ***the Grusinian Scraper qualifies the Project area as Tier 2 Critical Habitat***.

Georgian Bitterling (*Rhodeus colchicus*)

Globally considered of Least Concern, but only known from the Black Sea basin south of the Caucasus from the Kherota River in Russia south to the Rioni in Georgia (Freyhof 2014b). As such, despite limited distributional data, it is likely to be a restricted-range species (with a total range of <20,000 km^2). It inhabits streams and small rivers with slowly moving waters and ponds and lakes, usually with dense underwater vegetation (Freyhof 2014b). It is found in tributaries of the Rioni, but avoids the main river itself because of the fast current (Bogutskaya & Komlev 2001). As such, it is not likely to be found in the aquatic DMU for this project, and does not qualify the Project area as Critical Habitat.

Colchic Crayfish (*Astacus* (*astacus*) *colchicus*)

This taxon is sometimes considered a separate species. For example, it is listed as nationally Vulnerable under Georgian law. If a separate species, it might possibly be considered restricted-range, since it is restricted to the Rioni and Coruh rivers (Roth & Kinzelbach 1986). However, on the global Red List it is currently only considered a subspecies (Edsman *et al.* 2010). As such, it is not considered further here.

Hibiscus ponticus

This is a Georgian endemic – restricted to swamps near sea level and known from Abkhazia, Samegrelo and Adjara (Missouri Botanic Gardens 2018), including Kolkheti Ramsar Site (Anonymous 1996). It is thus likely to be a restricted-range species. While there is no evidence

to suggest that the area is particularly important for this species, it is quite possible that the terrestrial Project DMU contains >1% of this species' limited range. On a precautionary basis, ***it is thus quite possible that*** **Hibiscus ponticus** ***qualifies the Project area as Tier 2 Critical Habitat***. Further surveys could help to confirm or disprove this precautionary assumption.

Colchis Water-Chestnut (*Trapa colchica*)

This species is only known from the Kolkheti lowlands (Batsatsashvili & Machutadze 2014), and thus qualifies as a restricted-range species. The national EIA states that it has been recorded in the vicinity of the Project. While growing in water, it is more likely to be found in wetlands and slow-moving waters of the Project's terrestrial DMU, than the main Rioni River itself. Since – given the limited range – it is quite possible that the Project's terrestrial DMU contains more than 10% of the global population of this species, ***Colchis Water-Chestnut qualifies the Project area as Tier 2 Critical Habitat*** under Criterion 2.

A.2.3 Migratory or congregatory species

Migratory and congregatory waterbirds

Kolkheti IBA was originally identified on the basis of IBA Criterion A4iii, indicating the presence of large numbers of congregatory waterbirds of mixed species (BirdLife International 2018a). However, this criterion is no longer used to identify IBAs, and the national BirdLife Partner Sabuko is currently reassessing the status and boundaries of the site (Natia Javakhishvili, Sabuko, pers. comm. 2018). At present, there are no data available to suggest that the site regularly holds >1% of the population of any single waterbird species. As such, the Project area does not qualify as Critical Habitat for migratory or congregatory waterbirds.

Migratory soaring birds

Large numbers of migratory soaring birds – particularly birds of prey – have been observed over Kolkheti IBA (BirdLife International 2018a). Although data are currently poor, it appears that >1% of the global population of Honey Buzzard (*Pernis apivorus*) has occurred over the site in autumn (8,420 birds were observed, representing approximately 5,641 mature individuals from a total of 280,000-420,000, i.e. 1.3-2%: following the methodology of Sercx *et al.* 2018). Further south, at the narrowest point of the flyway near Batumi (where much greater recording effort has been applied), more than 1% of the global population of another nine migratory soaring bird species have been recorded (Verhelst *et al.* 2011). Despite the large numbers of migratory soaring birds likely to be recorded over the Project area, following global good practice there is no reason to suspect the Project area itself represents genuine "critical habitat" for this species during migration, since it is not in any particular geographic bottleneck for flying birds along this already-restricted part of the migration flyway and is not used as a resting area during migration (Sercx *et al.* 2018). Migratory soaring birds thus do not qualify the Project area as Critical Habitat.

Migratory fish

All seven fish species assessed in Section A.2.1 can be considered migratory, and naturally congregate at spawning grounds. Based on data in that section, it is likely that the Rioni River regularly supports >1% of the global population of Stellate Sturgeon and Russian (including "Colchic") Sturgeon. This seems unlikely for Beluga Sturgeon, for which the main populations remain in Russia, albeit heavily assisted by artificial hatcheries (Gessner *et al.* 2010a). As

such, ***Stellate and Russian ("Colchic") Sturgeon qualify the Project area as Tier 2 Critical Habitat under Criterion 3***.

A.2.4 Unique assemblages of species that are associated with key evolutionary processes

While the mountains of the Caucasus are known to be associated with evolutionary processes that have resulted in high levels of endemism (Mittermeier *et al.* 2004), the Georgian Black Sea coast and lower Rioni River is not known to have any significant level of endemism or unique species assemblages. It is known as a relictual area for plants, but with limited endemism.

IFC (2012b) takes a view that unique assemblages of species can often be identified by their association with 'highly threatened and/or unique ecosystems' (GN90-93). Brauneder *et al.* (2018) make a first, global-level assessment of which terrestrial ecosystems might qualify as Critical Habitat under this criterion. Four of the five ecosystems identified do not occur in Georgia. The remaining one, saltmarsh, is not present to any significant extent in the Project area.

Unique assemblages of species associated with key evolutionary processes thus do not qualify the Project area as Critical Habitat.

A.2.5 Areas having biodiversity of significant social, economic, or cultural importance to local communities (including ecosystem services)

The national EIA presents very little information on ecosystem services. It is beyond the scope of this assessment to collect additional information on ecosystem services, and then to assess which may qualify the project area as Critical Habitat.

A.2.6 Legally protected areas and international recognized areas

There are two protected sites in the vicinity of the Project: Kolkheti National Park and the Wetlands of Central Kolkheti Ramsar Site (Figures 3 and 4). These two sites cover the same geographic area, were designated in the same year (1998) and have the same IUCN Management Category (II). For the purposes of this assessment, both are referred to as "Kolkheti National Park". This area is also being proposed as an Area of Special Conservation Interest (or "Emerald Site") by the national government under the Bern Convention (NACRES 2014; Archil Guchmanidze, MoEPA pers. comm. 2018). A proposal for extension of the National Park south to cover the Rioni River is currently being considered by parliament. Boundaries of that extension are unclear, but may extend as far east as the railway bridge neighbouring the Project (an indication is given on Figure 4).

A large "Colchis Wetlands and Forests" World Heritage Site, overlapping the Project area, was proposed by the government in 2007 (UNESCO undated). This is now being revised for resubmission as a more select set of areas, which will still include Kolkheti National Park and thus parts of the Project area (Garstecki 2017; Archil Guchmanidze, MoEPA pers. comm. 2018).

The internationally recognized Kolkheti Important Bird Area (also *de facto* a Key Biodiversity Area) also occurs within the Project area (Figures 3 and 4). Although the IBA boundaries are currently being reassessed (Section 2.3.3), it seems likely that the IBA will continue to be designated – at least for White-headed Duck (Section 2.3.1).

Following IFC (2012b), ***Kolkheti National Park, the Wetlands of Central Kolkheti Ramsar Site, and Kolkheti Important Bird Area all likely qualify the Project area as Critical Habitat***, since they are all '*internationally and/or nationally recognized areas of high biodiversity value*'.

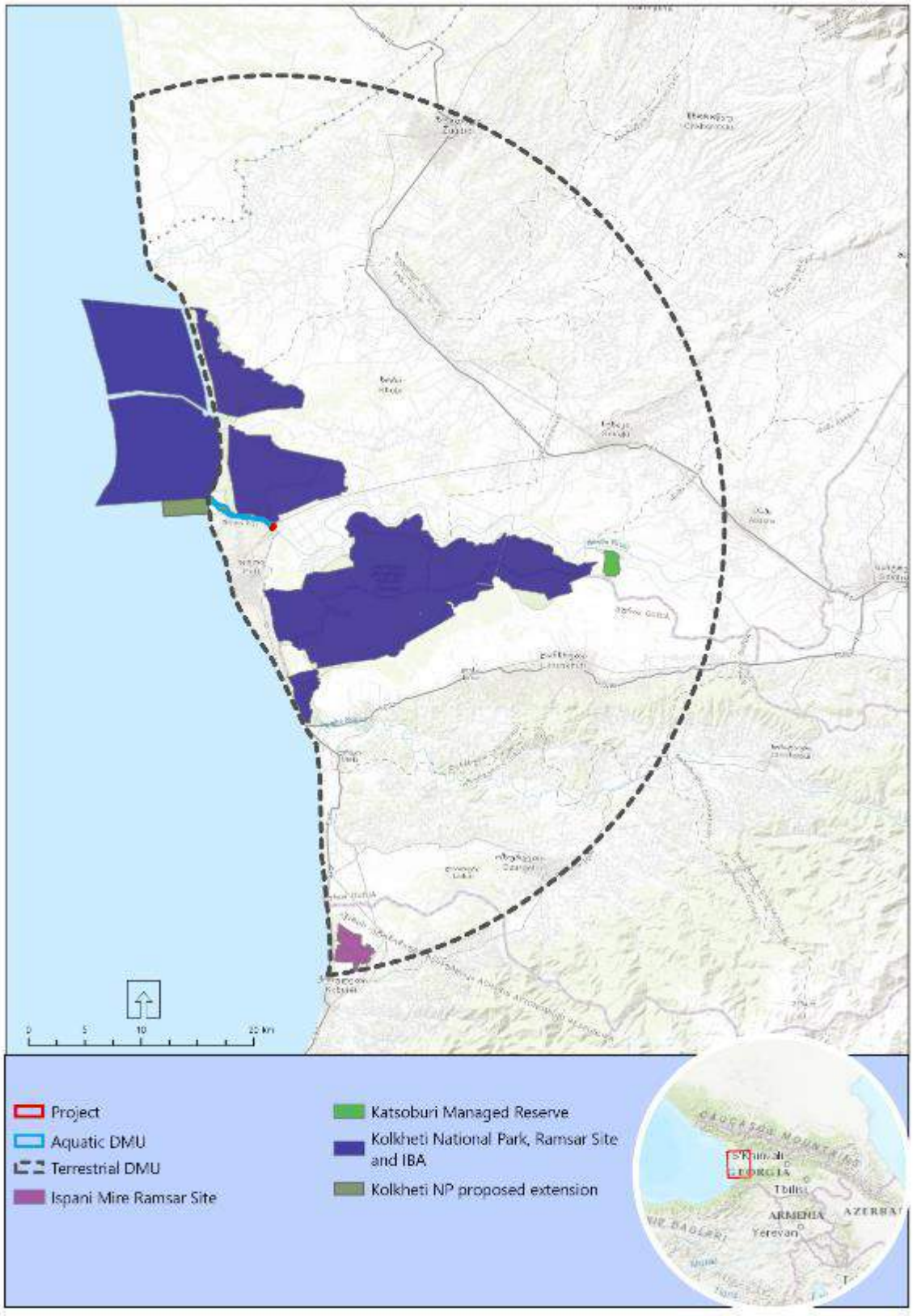


Figure 3. Map of Project context, showing locations of Discrete Management Units, Kolkheti National Park/Ramsar Site/Important Bird Area, an indication of the proposed extension of Kolkheti National Park, and other legally protected and internationally recognized areas

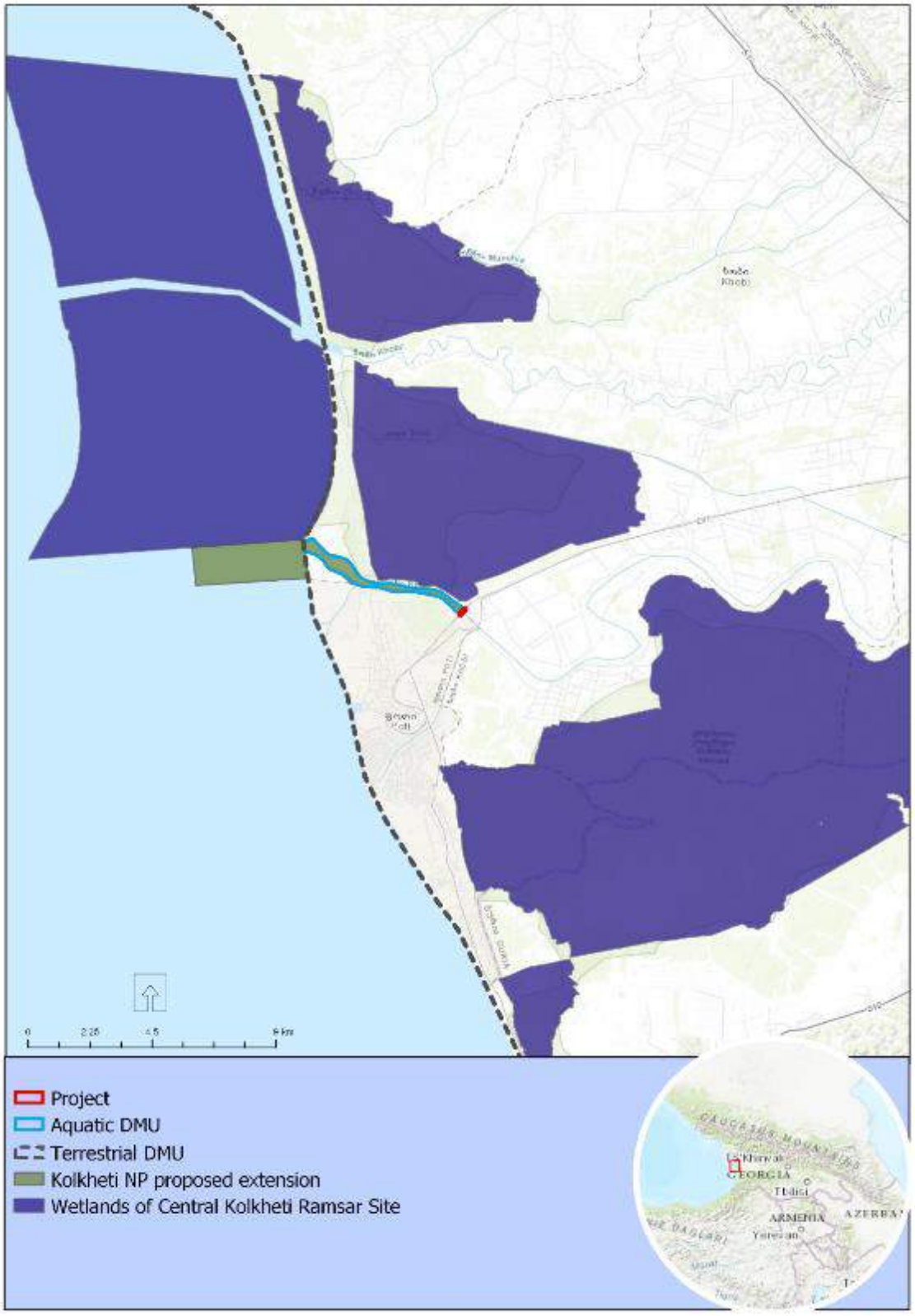


Figure 4. Map of Project area, showing locations of Discrete Management Units, Kolkheti National Park/Ramsar Site/Important Bird Area, an indication of the proposed extension of Kolkheti National Park, and other legally protected and internationally recognized areas

A.2.7 Summary

Both the aquatic and terrestrial DMUs qualify as Critical Habitat, owing to the presence of several Critical Habitat-qualifying species at globally significant levels and the presence of nationally-protected and internationally-recognized areas.

A.3 - Assessment of Natural Habitat

There has been no recent survey of the ecology of the lower reaches of the Rioni River. It has certainly suffered a number of impacts, notably a cascade of dams upstream, sand and gravel abstraction, pollution, over-fishing and urbanization (leading to flood control gates in Poti municipality, bank stabilization upstream, etc.) Nonetheless, available data suggest it retains the majority of its native species and has few established non-native species. As such, it can be assumed that ***the Project aquatic DMU represents Natural Habitat***. Owing to the regular presence of several Critical Habitat-qualifying species (Section A.2.7), the aquatic DMU also represents Critical Habitat.

The Project terrestrial DMU is large and encompasses a range of land uses, including Poti municipality, other settlements, agriculture, scrub, woodland, wetlands and watercourses. Poti itself, other settlements, and agriculture all represent Modified Habitat. Kolkheti National Park/Ramsar Site/IBA holds particularly high quality forest and wetlands. The current condition of other scrub, woodland, wetlands and watercourses is variable, ranging from heavily degraded to very high quality. For example, some low scrubby habitats in the area nonetheless represent Natural Habitat, their height simply stunted by permanently wet soils, while some small stands of trees are primarily comprised of non-native species and represent Modified Habitat. Given this context, ***the Project terrestrial DMU represents a mosaic of Natural and Modified Habitat***. MoEPA was unable to provide national-level land use-land cover maps for this assessment, so it relied on a coarse-scale global land use-land cover layer (ESA 2016) to indicate areas which are primarily Natural and Modified Habitat (Figures 5 and 6). As can be seen, this land use-land cover classification sometimes conflates agricultural land with natural grassland and seasonally-flooded areas. Based on knowledge of the area and satellite imagery, adjustments were made to produce a broad classification of Natural and Modified Habitat (Figures 1 and 2).

Without extensive surveys across this area, it is not possible to identify all sites which may hold globally-significant populations of Critical Habitat-qualifying species, so it is not possible to map terrestrial Critical Habitat at a fine scale. On a precautionary basis, in the absence of much distribution data for biodiversity, all Natural Habitat may also qualify as Critical Habitat.

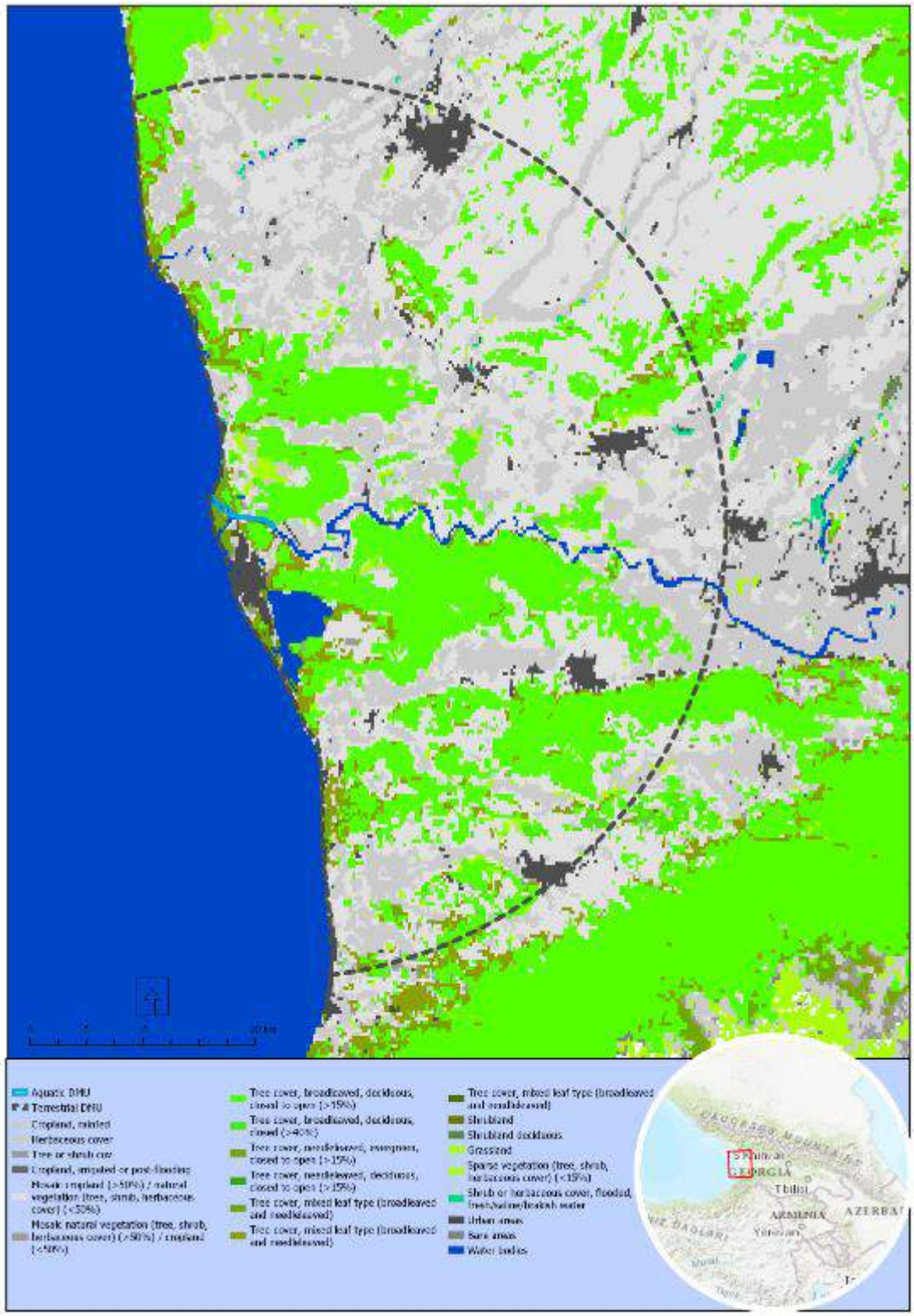


Figure 5. Map of Project context, showing land use classes (ESA 2016) likely to represent Natural Habitat (in shades of green) and Modified Habitat (in shades of grey). On a precautionary basis, in the absence of much distribution data for biodiversity, all Natural Habitat may also qualify as Critical Habitat

Figure 6. Map of Project area, showing land use classes (ESA 2016) likely to represent Natural Habitat (in shades of green) and Modified Habitat (in shades of grey). On a precautionary basis, in the absence of much distribution data for biodiversity, all Natural Habitat may also qualify as Critical Habitat

Annex 2. Stakeholder Engagement Meeting Minutes

2.a - Public Information Meeting - June 30, 2017

Information meeting with population
Bridge construction over the river Rioni
(Excerpt from the minutes of the first information meeting organized by Municipal Development Fund in Poti)

Minutes of the meeting

Town: Poti **June 30, 2017, 02 PM**

1. Information meeting with population and stakeholders regarding bridge construction over river Rioni to access Poti urban –road; rehabilitation of urban –roads to access Poti center and port structure subproject and on environment protection, social and resettlement issues was held by Municipal Development Fund representatives on June 30, 2017 at 02 PM at Poti municipality city hall (Agmashenebli str. #12).

2. On initial stage of the project meeting was aimed at providing general information regarding project and its possible impacts on environment, resettlement, and social conditions during implementation as well as its mitigation measures.

3. Attendants of the meeting: Residents of town Poti, municipality city hall representatives, representatives of MDF (in particular: Head of Environment protection and resettlement unit Giga Gvelesiani, From the same unit resettlement specialist Elguja Kvanchilashvili, ADB local consultants at environment protection and resettlement issues Nino Nadashvili and Davit Arsenashvili), International consultant hired by MDF, bridge engineer Arun Preidan, representatives of Gamma-consulting Ltd Maia Stamateli. Signed list of attendees is provided below.

4. Meeting was opened by Giga Gvelesiani. He greeted attendants of the meeting, gave thanks for coming and explained main reason of the meeting – Providing information to population on initial stage of the project regarding possible impacts during implementation. He briefly described project and presented further spokesperson.

5. **Maia Stamateli** gave speech regarding environment protection issues. She briefly described project and presented main environmental aspects which will be considered during project implementation. She stated that:

6. Currently northern and southern roads are connecting Poti to other regions of Georgia. Road from north passes existing hydro technical structure, which is used as a motor road bridge over Rioni. Dam was built at the end of 50's. Structure was envisaged by the project only for water flow regulation and not for utilization as a motor bridge. Now dam is amortized and despite rehabilitation carried out 10 years ago is in a very poor state. If problems arise from dam's structural state, town Poti and its port will lose mainline connecting them to Tbilisi and south Caucasus regions, which will cause traffic over load on south road.

7. New motor bridge will be constructed within the framework of Tbilisi-Senaki-Poti mainline construction. It will significantly increase carrying capacity of existing road and will provide unhindered connection from north.

8. Implementation of the projects of this type and scale has impacts on physical, biological, and social environment. Main sources of impact on environment during road and bridge construction are transport, construction machinery and working personnel. During and after construction and on road operation stage there is a possibility of noise, air quality worsening, impact on plants and animals, soil and water pollution, construction and domestic waste generation.

9. There is less impact during road and bridge operation. Mostly noise and emission, waste, little change to hydrology due to arrangement of pier of bridge, which may affect on water inhabitants.

10. Possible risks of impact and their assessment is significant for the project, as Rioni represents migration place for protected types of sturgeons. The latter is active sturgeon spawning river in Georgia. Rioni is among two remained active rivers of sturgeon's spawning in Black Sea basin (another is River Danube). Following 4 type of sturgeons spawn there: (Huso huso), Acipencer gueldenstaedtii), (Acipencer stellatus), (Acipencer colchicus). Potentially there are two more species spawning in river Rioni (Acipencer nudiventris) and (Acipencer sturio). It is significant that all sturgeon species prevailing in Georgia are under critical risk of extinction. Georgian sturgeon is included in Red List and require special protection.

11. Currently the only remaining section of spawning starts at upper part of river Rioni, where river Ochoba joins Rioni, approximately 4 km up from Sajavakho-Samtredia Railway Bridge and comes to end adjacent to Vartsihke hydroelectric station into diversion channel. From 57 km area of spawning currently only 9 km (16 %) section is remained, as spawning sections located at head race of the river are annihilated due to dams construction.

12. Preserved territories must also be taken in to account during project impact assessment. However, impact based on preliminary assessment is less expected as project site is far away from territory preserved by Ramsar convention and Colchis National Park and design road section passes along existing road.

13. One more significant issue, which is necessary to be considered during project development is river hydrology and climate change impact. One of the main results of climate change is increase of sea level. This process accelerates coastline erosion process, which may cause salt-water invasion into fresh water reservoirs etc.

14. Detail environmental impact assessment is planned to be carried out in order to determine impact on physical, biological and social environment during construction and operation phases. During survey possible alternatives shall be considered as well as scope of impact shall be evaluated, mitigation measures shall be determined and EMP shall be developed. Works shall be performed with stakeholders' highest involvement.

15. Bridge feasibility study was drawn up by Spanish company Getinsa. Spanish company Eurostudio is working on detail design and environmental and social documentations are prepared by local company "Gamma Consulting".

16. Resettlement aspects have been described by David Arsenashvili, MDF representative.

17. Attendees of the meeting took the floor. The questions and responses are summarized in the table below.

Table 93. Questions and Responses from Public Information Meeting - June 30, 2017

No	Question/Comment	Author	Response
1.	When will the project commence?	Representative of the Municipality	Project design is under elaboration, it will commence after solution of environmental, social, and resettlement issues, based on the approved project design. Following preparation of detailed design and its approval by the donor, the bidding on civil works is expected to be announced in October-November. The design company is working on the environmental documentation and land acquisition and resettlement program. The project will be implemented in line with the current Georgian legislation and donors' requirements.
2	I am the owner of the gas-filling station and I would like to know if the design road will cross my land-plot.	Representative of the business	At this stage, the motor road is not crossing the area indicated by you, though in case if you are affected by the road project following design solution, you will be subjected to the same principles stated in compensation matrix.
3	How many lanes will the bridge pavement have, what is the bridge width?	Representative of the City Hall	The bridge pavement will be 4-lane, two lanes per each opposite direction. Bridge width will approximately equal 14,5 m, length - 410-420 m.
4	What is the expected duration of construction works?		Expected duration of construction works is about 18-20 months.
5	If construction of another new bridge is required on the opposite side of the railway bridge, will this bridge interfere with construction of another bridge?		Construction of another bridge is possible, though if the design bridge is constructed, construction of the new bridge may be hampered due to insufficient space available for maneuvering of the requisite machinery and vehicles, since bridge construction is generally related to mobilization of a number of heavy vehicles and machinery.

საჯარო მუხლეგრა საზოგადოებასთან
Public Consultation Meeting

30.06.2017

შეხვედრაზე დამსწრეთა რეგისტრაციის ფურცელი
List of Attendance

#	გვარი, სახელი / Full Name	ორგანიზაცია / Organization	საკონტაქტო ინფორმაცია / Contact Information	ხელმოწერა / Signature
1			599.87.2225	
2			591417510	
3			591 410386	
4			597877618	
5			599 97 22 49	
6			597-99-28-39	
7			599-89-22-13	
8			591-41-75-43	
9			577-49-99-95	
10			599 87 77-65	
11			591 17 17-47	
12			598-19-57-55	
13			591-971-605	
14			598-37-22-61	

#	გვარი, სახელი / Full Name	ორგანიზაცია / Organization	საკონტაქტო ინფორმაცია / Contact Information	ხელმოწერა / Signature
15			595 91 58 90	
16			558 569690	
17			599 570148	
18			599180709	
19			595 57 60 60	
20			599872282	
21			599 49 46 92	
22			591417520	
23			599873324	
24			5-91-41-72 22	
25			541-41-03-16	
26			591-41-75-49	
27			595 39 55 10	
28			591910606	
29			591133419	
30			599-27-18-12	
31			558118486	
32			595 100477	
33			568 20 23 81	
34				

#	გვარი, სახელი / Full Name	ორგანიზაცია / Organization	საკონტაქტო ინფორმაცია / Contact Information	ხელმოწერა / Signature
1			568 640157	
2			555-17-86-57	
3			591417555	
4				

2.b - Public Information Meeting - January 12, 2018

CONSTRUCTION OF POTI-GRIGOLETI-KOBULETI BYPASS. SECTION OF INTERNATIONAL E-70 SENAKI-POTI (DETOUR)-SARPI (BORDER OF TURKISH REPUBLIC) ROAD

Bridge construction over the river Rioni (Lot 2 Stage 1)

Minutes of the Meeting

Poti
12.01.2018

18. On January 12, 2018 (at 12:00) meeting with stakeholders was held in Poti. The subject of the meeting was presentation of results of environmental impact assessment of the project for construction of a bridge over the Rioni river and access roads.

19. The meeting was attended by representatives of the Ministry of Environment Protection and Agriculture, Roads Department under the Ministry of Regional Development and Infrastructure, local authorities, residents of Poti and NGO representatives (list of attendees is enclosed).

20. The chairmen of the meeting, head of environmental protection unit of the roads department, Mr. Gia Sopadze greeted the audience and presented brief information on the project. He mentioned that the project is one of the components of the program aimed at modernization of the main roads in Georgia initiated by the Government of Georgia with financial support from International Financial Institutions. He mentioned that the program is managed by the Road Department. Main objective of the program is improvement of conditions for traffic and movement of goods through/in Georgia which is important contributor to GDP of the state.

21. Mr.Sopadze mentioned that the project has been split into two lots: Lot 1 Grigoleti-Kobulety bypass and Lot 2 – Poti-Grigoleti. Lot 2 starts on the right bank of the Rioni River, near Patara Poti. The starting section of the road coincides with E-60 highway. The road bypasses Poti from the east and connects to Lot 1 near the Supsa River. He explained that Lot 2 has been split into three stages: Stage 1 – from E-60 up to pk1+500 (the section includes a bridge ovwer the Rioni); stage 2 – from pk 1+500 till the Maltakva River (pk11+00) and stage 3 – from the Maltakva crossing till the starting section of Lot 1 (end of Grigoleti, near the Supsa River). (pk 11+000-20+ pk 741.40). It was mentioned that presented EIA deals with stage 1 of the project only.

22. Results of the EIA were presented by Mr.Jughuli Akhvlediani of Gamma Consulting Ltd. The speaker described the layout of the project, location of site, baseline (environmental and social) situation and sensitive receptors in the area of interest. Patreiculat attention was paid to issues such as proximity of protected areas, sensitivity of ichthyofauna, presence of protects species.

23. Presenter mentioned that with consideration of location, there is no risk of direct impact on protected area. Planning of bridge works with due regard to the sensitive season for fish will enable reducing of the risk of impact on protected species in the river. The EIA report presents information on mitigation measures developed to prevent pollution of the Rioni water which will also held to reduce possible impact.

24. It was mentioned, that land acquisition will be done in compliance with the EIB procedures and national requirements. All affected households will receive relevant compensation.

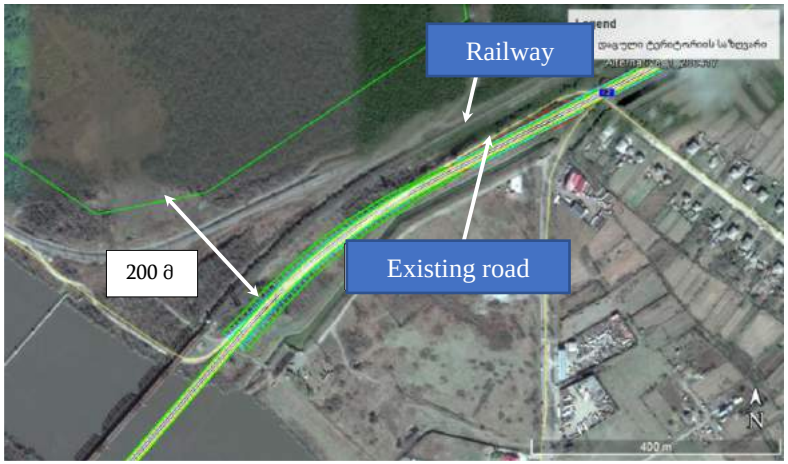
25. Mr.Akhvlediani briefly described mitigation measures set for construction and operation stages of the project and mentioned that under condition that all mitigation measures set in the EIA are implemented and monitoring described in the EMP is carried out, no significant impact on environment is expected to happen. G.Sopadze and J.Akhvlediani answered to the questions posed by the attended. The questions and answers are given in annex to the minutes.

Chairman of the meeting: Gia Sopadze

Secretary: Jughuli Akhvlediani

Second category senior specialist of Environmental Impact Permit Department of the Ministry of Environment Protection and Agriculture Giorgi Mchedlishvili

Table 94. Questions and Responses from Public Information Meeting - January 12, 2018

№	Comment/proposal/ question author	Comment/proposal/question	Answer
1	Ministry of Environment Protection and Agriculture	Section 2.1 (alternatives) of the report presents information on alternatives; however, it is not clear from the text which alternative and why is selected as preferable. The section dedicated to alternatives must include a separate subsection with description of selected alternative with project details.	Section 2.1 presents information an all considered alternatives and main design parameters. Selection of preferable option is done based on assessment of impact on recipients for each considered alternative (see section 6). Comparison of alternatives and selection of advisable one is presented in section 7 of the report.
2	"_____"	Impact on national (Kolkheti National Park) and International protected areas is not presented in the report. The project area is located close to Kolkheti National Park, which, at the same time coincides with Emerald network (ref. Bern convention) candidate site (GE0000006) boundaries and Ramsar site. Therefore, the report must provide assessment of impact on protected areas, species and habitats therein – so called advisability assessment, measures for avoidance of impact and, in case required, compensation measures. The report must describe possible impacts by activity, respective justification; mitigation and impact avoidance measures; the EIA report must include conservation plan based on results of the field survey.	Description of protected area is given in subsection 5.13.1. Assessment of impact – in subsection 6.6. As mentioned in the text, the project area is located in 200m from the boundary of the nearest protected site. However, it shpuld be mentioned that within this stretch the road follows existing one and that the project area is 'separated' from protected zone with railway line. Respectively the impact on protected area is not expected.  The road and the railway are in place for long time already. Construction, better to say – rehabilitation, of the road in this section will not change existing situation here.

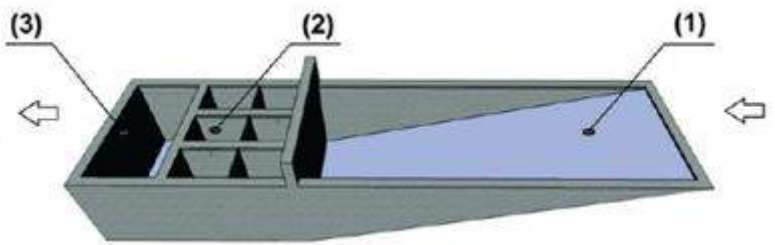
			The report provides a list of measures for mitigation of impact on biodiversity during pre-construction, construction and operation stages of the project. These measures enable reduction of possible impact on abovementioned recipients.
3	"_____"	With consideration of proximity of the design road to the national (Kolkheti National Park), Emerald network candidate and Ramsar sites in case restriction of traffic on existing road is required, the report submitted to the experise must include information on alternative access roads with respective mitigation measures.	Arrangement of alternative access roads is not planned. The project corridor borders with railway line from one side and canal from another (see drawing above – answer to comment 2). Works will be implemented stepwise. Contractor will develop Traffic Management Plan allowing him to implement construction without restriction of the traffic.
4	"_____"	The report for submission to the expertise must include information on detailed survey of species composition and quantity of trees subject to removal (taxation). If necessary, based on the mentioned above additional mitigation measures must be described	Subsection 5.13 presents information on the study area based on field surveys. Quantity of trees subject to removal is given in subsection 6.5. Impact mitigation measures – are listed in subsection 6.5.3. In addition to information already given in the report requirement to monitor invasive species (*Ambrosia artemisiifolia, Artemisia vulgaris, Conyza canadensis, Sonchus Canadensis* and *Amaranthus retroflexus*) has been added. The monitoring must be carried out in growth season. In case registered, sanitary measures should be implemented. Mechanical method must be used (no herbicides) for control.
5	"_____"	To flora and fauna sections of report for submission to the expertise field survey based information on animal species (including birds) in the project impact zone, possible impact on habitats, avoidance of impact and, in case necessary, compensation measures Particular attention should be paid to impact on internationally protected species, migratory birds, wetland areas and habitats.	According to EUNIS the project zone belongs to S26 habitat - Colchic herb-rich tall sedge fens with Carex acuta, Cladium mariscus, Ludwigia palustris in combination with Sphagnum-mires (Sphagnum austinii S. papillosum) with Rhododendron luteum, Osmunda regalis, Rhynchospora caucasica. The project area is River bank forest of the Rioni river; Alluvial forest (Code 91E0) – *Alnus glutinosa* and *Fraxinus excelsior (Alno-Pandion, Alnion incanae, Salicion albae).* As mentioned above the area is located between the railway line and artificial canal, coincides with existing road and is under significant man0cause load. There are no animal migration routes via the area. Sub section 5.13 presents description of the project area based on the field surveys; information on birds, reptilian and fish species – based on available reference data and site surveys (for additional information please see the list of references).

			The project area is located outside the boundaries of protected areas (Kolkheti National Park, SPA, Ramsar site, Emerald network candidate site). However, importance of the Black Sea coastal zone as bird migration corridor is to be mentioned. Impact mitigation measures are given in subsection 6.5.3.
6	"_____"	With consideration of the fact that the Rioni river is spawning place for high conservation value fish species (including sturgeons), the section dedicated to impact on flora and fauna detailed information (based on field surveys) on ichthyofauna in the project impact zone, sturgeons in particular; measures for avoidance of impact and, in case necessary compensation activities.	Information is given in subsection 5.13.2. A chart showing spawning and migration periods by fish species is presented there. The Rioni is important place for protected species, including sturgeon. However, in the direct impact zone of the project no spawning sites or sensitive locations are available. Impact assessment and mitigation measures are listed in subsection 6.5 of the report.
7	"_____"	In monitoring plan, the section related to the frequency of monitoring of impact on fauna says, 'in case available'. This should be corrected (frequency indicated). The plan must include information on reports to be submitted to the Ministry.	Mitigation measures are given in subsection 6.5.3 Statement 'in case available refers to registration of road kills/injuries in case/when observed. Objective of this exercise is assessment of mitigation measures and identification of any additional measures if found to be required. Under the mitigation measures implementation of measures for mitigation of impact on soil and water are also mentioned. In response to the comment monitoring of fish and macroinvertebrates during the first year of operation has been included. This statement was given in the narrative section of the report but missing from the monitoring table. Besides, information on the need of quaternary reporting to the Ministry of Environment Protection and Agriculture has been added.
8	"_____"	In section 3.1. of the report (pre-construction mobilization) stage) is mentioned that works will be implemented by contractor selected through international tender. Prior to construction contractor will define/specify location of the camps, material storage and car stationing areas. Therefore, with regard to the camp areas, the EIA must provide the following information: a. Quantity of worksites/camps, location of the camp, area, category, ownership form, soil characteristics and measures to be implemented	As mentioned in section 3.1 of the report. works will be implemented by contractor selected through international tender. Prior to construction contractor will define/specify location of the camps, material storage and car stationing areas. This means that the company identified through tendering will define location, layout of camps, material and car stationing sites. Therefore, when the company is identified it will present information on: a. Quantity of worksites/camps, location of the camp, area, category, ownership form, soil characteristics and measures to be implemented

		b. Similar information must be provided for machinery stationing and material storage areas c. The size of the area where, in case required, topsoil is to be removed. With consideration of the mentioned above, layout drawings of the area must be provided. Otherwise, assessment of impact of camps, machinery, and material stationing area and next to them will not be possible, besides, responsibility for implementation of recommendations and obligations indicated in the report should rest with developer, not with the company identified via tender. The document must provide not potential and future solutions, but specific project characteristics and solution for specific location.	b. Similar information must be provided for machinery stationing and material storage areas c. The size of the area where, in case required, topsoil is to be removed. At the current stage assessment of impact of abovementioned sites on environment is not feasible. As for recommendations and obligations indicated in the EIA report, construction company as performer of construction works is responsible for their implementation. Compliance under supervision of the Roads Department. This condition is requested in the tender documents. At the current stage of the project only recommendations on selection, arrangement, and operation of the sites with all measures for avoidance/mitigation of impacts can be provided.
9	“_____”	Information of management of inert waste is not provided in the report. Section 6.9.3 (p167) – mitigation measures, contains general information of inert waste. The report must include information on quantity of inert waste, category, and utilization/management operations according to requirements set in the Waste Management Code and related statutory acts. The plan must include information on persons to whom waste will be handed over for collection, transportation and/or treatment – according to permit and/or registration data.	Information on waste streams, including tentative quantity, disposal/recovery code according to the Waste Management Code is given in subsection 6.9.1. It’s also mentioned that in addition to other measures, impact of waste on environment during construction can be reduced by reduction of waste amount, maximum reuse and timely removal from the site. To reduce amount of waste contractor will be responsible to plan material importation with consideration of work schedule to avoid accumulation of surplus material on the site. Accumulation may lead to deterioration of quality and ‘transformation’ of material into waste. Usable (clean) material cannot be considered as waste and can be used for ‘beneficial’ purposes. In response to the comment a list of companies authorized for management of waste has been added to the report.
10	“_____”	With consideration of the fact that during construction stationary spruces of emission may be available (asphalt plant, concrete mixers, other on type and location of which decision of	Since selection of the site for ‘installation’ of the stationary sources of emission will be identified by construction company identified through tendering, Development of the document now without linking to specific environment does not make sense. Respective document will

		construction company is not known yet), the document for submission to the expertise must describe these issues, respective documents, specified in the law – provided.	be prepared ana agreed after construction company is known. The EIA provides recommendations to be considered during selection of the site.
11	"_____"	Impact on geology (this mainly means possibility for activation of hazardous geodynamic processes (if available)) is not considered in the report. This information must be considered in detail and presented as a separate sub-chapter.	Impact on geological environment (that mainly include possibility for activation of hazardous geodynamic processes (if available)) is not considered in the report. These processes would have been considered in case available.
12	"_____"	The report mentions geotechnical surveys carried out in the project area, however results of the surveys are not enclosed to the document. The EIA report must provide information on geotechnical surveys.	In response to the comment two volumes of annexes have been added to the report.
13	"_____"	Because of the scale the maps showing geological hazards (landslide, mudflow) given in baseline section of the report (subsection 5.9) are practically unusable. Besides, it should be mentioned that in the project area (Poti-Grigoleti) landslide and mudflow risks are nonexistent. The EIA report must describe hazards and mitigation measures typical for the area.	Poti-Grigoleti sections the risks of landslides and outflow does not exist in the project area. In the baseline section of the report (subsection 5.9) the maps are included to illustrate this fact only.
14	"_____"	The following information must be verified: Resolution of the drawings attached to the report is low, text not legible. The shape file does not show location of noise barriers and other mitigation infrastructure. Rioni characteristics are calculated based on old hydrological data.	Shape file with indication of location of the noise barriers have been added to the report. In addition, hydrological information provided to design team by Saqtkalproekti the other sources used include: Flood risk assessment and mitigation measure for Rioni River, 2010. Thesis submitted to the International Institute for Geo-Information Science and Earth Observation in partial fulfilment of the requirements for the degree of Master of Science in Geo-information Science and Earth Observation, Specialization: Geo-hazards. Emergency Underwater Rehabilitation of the Poti Main Diversion Weir, Georgia. LJILJANA SPASIC-GRIL, Jacobs, Reading, UK, Improvements in reservoir construction, operation and maintenance. Thomas Telford, London, 2006.

			100-year maximum flow is coherent with old dam and left bank regulator flow. This value was considered in design calculations. Calculations carried out for the project show that the new bridge will not change conditions in the section of the railway bridge.
15	"_____"	The report says (p16) that during construction of the piers sheet piles walls will be used, contains areas dewatered. Construction will be carried out using barges. The report must provide parameters of the sheet pile walls, construction process and technical means required.	Comment is considered. For information see Annexes volume 4
16	"_____"	Developer must take into account and describe in the EIA report operation peculiarities and purpose of existing bridge (hydraulic facility), its current status – ability to cope with increased load, Is it possible that during construction in order to reduce water level in the project section, the flow is directed into the southern branch of the river instead of the north one.	Neither increase of traffic via the mentioned bridge nor direction of the flow in the south branch is planned/expected. On the contrary, the new bridge will reduce the traffic over the old bridge/dam. The function of regulator located on the left bank of the river will not change.
17	"_____"	According to the EIA report (p141) to avoid pollution of water settling chambers are planned. Nothing is said about how water accumulated in the chamber will be managed. Respectively, the report must include the following: • Parameters of waste water from worksites/camps • Location of waste water collection basins, its parameters, information on where the water will be disposed to. In case the waste water will discharge into the surface water body water treatment methods and parameters if treatment facility must be described	Sewage water discharge into the surface water body is not planned. Construction company identified via tender will select location of the camp/stationing area. In case contractor (construction company) decides to discharge effluents into the river the issues will be specified. To avoid increase of turbidity during works in the river crossing area settling basins will be arranged. Water accumulated in the basin (it is assumed that water is not polluted) can be used for dust suppression or for other technical needs. In hot season part of water will evaporate. Sediment accumulated in the basin is ordinary soil that is not hazardous for environment. There are two concrete plants in 5km distance from the project site. In case contractor (construction company) decides to arrange own concrete batching unit the site must be equipped with settling basin. Design of the basin can be as given below:

			 Key: 1 – first (inlet) chamber, 2 – intermediate chamber, 3- last (outlet) chamber Location, parameters and discharge point (in case discharge into the surface water body will be planned) and treatment method will be defined by construction company. The EIA report presents recommendations related to management of water: • Water from the last chamber can be pumped (return back into the cycle. This will allow reduction of used raw water. • Capacity of the basin will depend on capacity of the batching unit (technical parameters) and will be specified by contractor, during calculation the amount of expected rainfall will be taken into account. • Solid material will be removed from the basin when latter is 75% full. Removed material can be reused. • In case discharge of water on the surface is planned, pH level in water must be checked, in case of necessity the pH must be 'corrected', • In case visual observation reveals presence of petroleum product slick on the surface of the basin, the slick must be skimmed, placed in adequately marked container and handed over to contractor authorized for management of this type of waste material. Container, until removal from the site, must be stored away from the traffic routes. The area must be flat, paved and bunded (capacity of inner basin must be equal 110% of container capacity) to avoid spreading of pollution in case of any spill. • Untreated waste water discharge into the surface water body will not happen.

			Unusable bentonite can be removed to the nearest landfill under agreement with landfill operator company.
18	“_____”	If waste water is planned to be discharged into the surface water body, developer must prepare and agree with the Ministry of Environment Protection and Agriculture the limits of pollutants discharged into the surface water body together with effluents.	Discharge into a water body is not planned. However, in case construction company decides to arrange a camp - location of the latter and waste water management/discharge issues will be reconsidered. In case discharge into the surface water turns to be required, developer will develop the agree the maximum permissible limits of pollutants in effluents discharged into the surface water body and agree respective document/limits with the Ministry of Environment Protection and Natural Resources. The EIA report provides recommendation to use accommodation in the nearest residential areas (Patara Poti, Poti) instead of arrangement of a camp. This will support waste water management needs and address impacts on environment caused by arrangement and operation of a camp.
19	“_____”	In EIA report and Table 4 (Sub-section 4.2. environmental regulations and standards) titles of some of the bylaws (e.g., Resolutions of the Government of Georgia #8, dated 2014; #42 and #498, dated 2013) the name of the Ministry and titles of some administrative units are wrong. The issues must be corrected.	The comment has been considered
20	“_____”	According to section 5.14 (natural resource) there is significant reserve of inert material required for construction in the project area. A number of sand and gravel quarries are available, majority operating under the license issued by the Ministry of Environment. In case in the course of the EIA you get in know of any illegally operating quarry, please provide information proving that to Environmental Supervision Department.	A number of quarries operating and those with expired licenses have been registered in the project region. None of the sites with expired licenses are in operation. These sites may potentially be used under a new license issued by relevant authority – the Ministry of Economy and Sustainable Development) on discretion of the mentioned authority.
21	“_____”	According to section 5.14 (natural resources) of the report (p100) – the Black Sea cost experiences deficit of beach-forming material. The main reason of that is construction of hydropower plants. Removal of inert material is another cause of the problem. This reduces amount of solid sediments and worsens the situation.	Presented statement is based on the following sources: • I. Papashvili, G. Lominadze, S. Khorava- The Tendencies of Modern Development of the Rioni-Supsa Interfluve Region of the Sea Shore. Materials of International Conference “Applied Ecology: Problems and Innovations”. Proceedings ICAE. Batumi, Georgia 2015 pp.42-53

		Site for abstraction of inert material must be chosen carefully. According to hydrologists, gravel abstraction from Khobistskali, Tekhuri and Enguri, while sand can be taken from the Rioni in Poti environs is ess damaging to the coastal zone. The EIA report must provide a prove of this statement – reference to studies, method and name of experts.	• George Lominadze, Irakli Papashvili, Sasha Khorava – Development of the River Deltas of the Black Sea East Coast, Abstracts, XIX INQUA Congress, Nagoya, Japan 2015 • G. Lominadze, I.Papashvili, S.Khorava, G.Kavlasvili – Contemporary Changes of Beach Sediment's Balance of Southern Part of Black Sea Coastal Line of Georgia., Abstracts of 8th International Conference of Asian Marine Geology, Jeju,Republic of Korea, 2015. • George J.Lominadze, Irakli G. Papashvili and Sasha G. Khorava - The Black Sea Kolkheti Coastal zone Submarine Canyons Erosive Development in the Epoch of Pleistocene-Holocene., Environment and Ecology in the mediterranean region Chapter 25 , Cambridge scholars Publ.2014 pp. 295-305, • G. Lominadze, I.Papashvili - Enguri Submarine Canyon Erosive Development in the Epoch of Pleistocene-Holocene, 2 nd International Symposium on Kazdaglar(mount Ida) and Edremit,Human-EnvironmentInteractions and Ecologyof Mountain Ecosystem Proceedings and Abstracts, pp.497-504, 2013 • g. lominaZe, i. papaSvili, s. xorava. – kaxaberis vakis zRvis sanapiro zonis Tanamedrove ganviTareba. – ivane javaxiSvilis sax. Tbilisis saxelmwifo universiteti, vaxuSti bagrationis geografiis geografiis instituti. Sromebis krebuli, axali seria #5 [84], Tbilisi, 2013, gv. 39. • Пешков В.М. Галечные пляжи неприливных морей. Краснодар, 2005. – 429 с. • Кикнадзе А.Г. Морфодинамика береговой зоны и оптимизация её использования на примере Черноморского побережья Грузии. Диссертация на соискание учённой степени доктора географических наук.: Тбилиси, 1991. • Джанелидзе Ч.П. Регулирование осадконакопления и рельефообразования в пределах приморской части Колхидской низменности. – Тбилиси: ГрузНИИНТИ - 1989. • Zenkovich V.P., Schwartz M.L. Restoration of the Gorgian SSR Goast // Shore and Beach. 1988, vol. 56, # 1, p. 8-12. • Маткава Д.И., Папашвили И.Г., Руссо Г.Е. Сток береговых наносов в подводные каньона Черноморского побережья Грузии и методы его прекращения. Тбилиси ГрузНИИНТИ, 1987. – 40 с.

			• Папашвили И.Г. Восстановление вдольберегового потока наносов в целях берегозащиты. Тезисы докладов «Географические и экономические проблемы изучения и освоения южных морей СССР» - Ленинград, 1987. • Зенкович В.П. Морская геоморфология. – М: «Мысль» , 1980. • Сакварелидзе В.В. Определение вдольберегового расхода пляжевых наносов// Сообщ. АН ГССР. - 1979, 93. - № 1. – С. 13-21. • Зенкович В.П. Проблема стабилизации морских берегов Грузинской ССР. – Геоморфология, 1977, №1. • Кикнадзе А.Г. Динамические системы и бюджет наносов вдоль берегов Грузии. – В кн. Человек и окружающая среда. Сухуми. Изд-во «Алашара», 1977. • Макацария А.П. Причины и возможные меры устранения размыва берега у г.Поти. – Тр. Географ. Общества Грузии, 1973 т.XII – С. 34-47.
	Questions received at the meeting		
	Darejan Ckhvitaria – member of Poti municipality sakrebulo	How the new alignment look like – will it affect vegetation- will trees be felt?. Removal of vegetation will result in significant impact on environment. Is construction of the new road worth that?	The section of the road under consideration starts near Patara Poti, partly follows existing highway running in 40-50m to the railway line, crosses the river and ends near Nikora factory on the left bank of the river. Field survey carried out for the project does not reveal any protected plant species in the direct impact zone of the project. Number of trees subject to removal is not high. Impact on vegetation, in case all mitigation measures are implemented will not be high.
	„----------„	Is the project somehow related to Poti airport development?	No, the project under consideration is implemented as a part of road modernization program implemented by the Government of Georgia and is not related to airport development.
	„----------„	Will it be possible to replant the trees to a new location instead of cutting?	Replanting of trees including big ones is technically feasible, however this is rather expensive and for low conservation value species - not generally practicable. No protected species have been registered in direct impact zone of the project. In case necessary the plants with <8cm diameter can be replanted, since the young trees better adapt a nre environment.
	Oleg Nachkebia – resident of Poti	Does the new bridge construction process envisage rehabilitation of exist if hydrotechnical facility (existing bridge)	The project does not envisage rehabilitation of existing bridge.

	Napi Todua – resident of Poti	The fact that information on the planed project is communicated to local residents is highly appreciated. Fully support the idea of the project but want to know why there were no such meetings/discussions when construction of fish processing factory started. The factory poisons Poti residents, but nobody cares	The project under consideration is being implemented by Roads Department fish factory is out of the scope of the competence of the latter. Unfortunately, construction of fish processing plant is not subject to EIA process, respectively no public consultation procedure for that project had been carried out.
	Nana Khukhua – JSC Dioskuria	Is construction of the new road agreed with stakeholder such as Kolkheti National Park administration staff?	According to the national legislation/regulations the project cannot be implemented unless agreed with all relevant authorities. As for Kolkheti National Park – the report will be reviewed/subject to ecological examination by the Ministry of Environment Protection and Agriculture. The document will be reviewed by the Agency of Protected Areas. It should be mentioned that the corridor of the road and the bridge does not cross the boundaries of protected area.
	Merab Khorava, resident of Poti	There is a footpath under the railway bridge on the left bank of the river. The path is used by population to access land plots located on the other side of the railway line. Will people be able to use this path after construction of the new road?	The project will not hinder free movement of residents.

Note: Sections and passages referenced in the questions and responses from Public Information Meeting on January 12, 2018 are in connection to the GoG EIA that received national government approval in 2018.

List of attendees

ფოთი -გრიგოლეთი–ქობულეთის შემოვლითი გზის მშენებლობის პროექტი.
საერთაშორისო E-70 სენაკი–ფოთი (შემოვლითი)–სარფის (თურქეთის რესპუბლიკის საზღვარი) საავტომობილო გზა
ფოთი-გრიგოლეთის მონაკვეთი (I ეტაპი) - მდ. რიონზე ხიდის და მისასვლელი გზების მშენებლობის და ექსპლუატაციის პროექტის
გარემოზე ზემოქმედების შეფასების ანგარიშის საჯარო განხილვის სხდომაზე დამსწრე პირთა სია

12 იანვარი 2018 წელი

ქ. ფოთი

N	გვარი, სახელი	საცხოვრებელი ადგილი	სამუშაო ან საცხოვრებელი ადგილი	საკონტაქტო ინფორმაცია
	გიორგი მჭედლიშვილი		[illegible]	595 63 62 62
1	[illegible]		ქ. [illegible]	591945848
2	[illegible]		ქ. [illegible]	577 927878
3	[illegible]			599 580355
4	[illegible]		[illegible]	
5	[illegible]		[illegible]	595. 53 67. 67
6	[illegible]	[illegible]		593.12.7833
7	[illegible]	ქ. ფოთი	[illegible]	593233489
8	[illegible]	ფოთი	ფოთი	558778008
9	[illegible]	ქ. ფოთი	[illegible]	595954554
10	[illegible]	ქ. ფოთი	[illegible]	599 61 06 87
11	[illegible]	ქ. ფოთი	[illegible]	599-49-40-92 nkhukhia@mail.ru

N	გვარი, სახელი	საცხოვრებელი ადგილი	სამუშაო ან საცხოვრებელი ადგილი	საკონტაქტო ინფორმაცია
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14				599877225
15				591417555
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19				598-11-58-58
20				593-87-22-26
21				595-11-33-05
22				555300080
23				551420103
24				591171767
25				557-94-34-94
26				591133419
27				577406617
28				577458190

N	გვარი, სახელი	საცხოვრებელი ადგილი	სამუშაო ან საცხოვრებელი ადგილი	საკონტაქტო ინფორმაცია
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30				591910606
31				577 49 99 95
32				577 73 01 02
33				593 46 98 20
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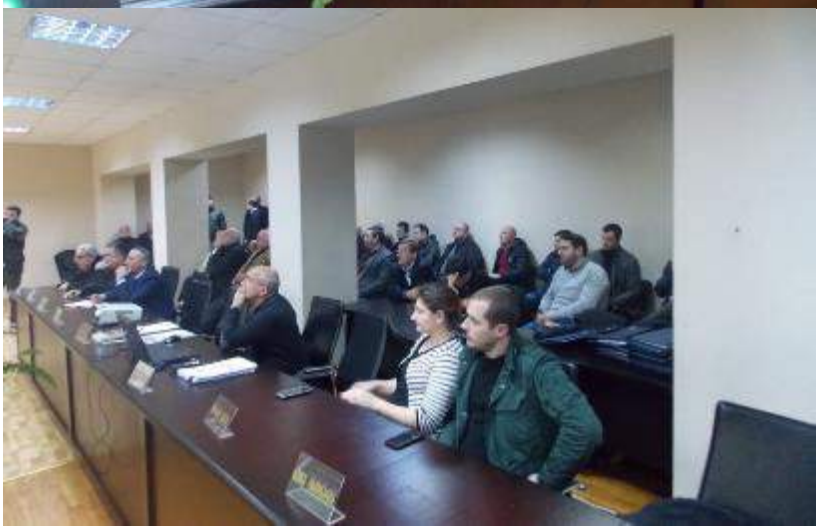


2.c - Targeted Supplemental Consultation for EIA

Stakeholder Engagement – Poti Bridge Project

November 26, 2018 - Roads Department (RD)

26. Meeting Participants –

1) Mr. Levan Kupatashvili - Deputy Chairman of RD
2) Mr. Gia Sopadze - Head of Environmental Division
3) Mr. David Getsadze - Acting Director of Technical Secretariat
4) Ms. Maka Stamateli - Gamma Consulting
5) Ms. Elene Mgaloblishvili - Gamma Consulting
6) Mr. Nino Nadashvili - ADB Safeguards Officer
7) Ms. Keti Dgebuadze - ADB/RETA International-Regional Environmental Safeguards Consultant
8) Mr. John Pilgrim - Biodiversity Specialist, ADB Consultant
9) Mr. Raymond Von Culin - Environment Specialist, ADB Consultant

27. Discussion –

- Project Background
    - The RD provided background information on the project and its status. This included information related to the following: i) extent of road and bridge works to be funded by the ADB; ii) changes in project scope since feasibility stage; iii) elaborated justification of the project; iv) stakeholder engagement held to date as it relates to the ADB funded project; v) evolution of bridge and road design changes; and vi) alignment alternatives considered.
    - Environment permits for the project have been received, with conditions, from the Georgian Authorities for the project.
- Implementation arrangements
    - The RD confirmed that the MDF would no longer act as the implementation unit and that the RD will be responsible for managing implementation of the project.
- Confirmed project design
    - Project construction under the ADB funded project includes a bridge over the Rioni River and approach roads on either side of the bridge.
- Approximately 500m long bridge
- Two approach roads with a combined length of approximately 2km
    - A section of a secondary road (approximately 750m) which runs parallel to the river before turning and connecting to the E-60 will be paved.
    - The RD currently has no plans to install lights on the bridge.
- Timing of project implementation
    - The construction process and civil works activities were discussed to understand how they will be phased, the types of activities planned, and time anticipated for their completion. The most intensive period of work planned within the river is during construction of the bridge's three middle piers (five piers in total are planned). Construction of the outermost piers will require only limited work in the water and the remainder of bridge construction will require no work in the water. Work on three piers in the river will take place using sheet piling to construct dewatered zones, within which work will take place. The RD

estimated that the center pier will take approximately 3 months to complete, while the two piers to either side of the center pier will likely take three months to complete combined.
    - Limiting the construction period within the water to avoid overlap with sturgeon up-river migration and spawning periods was discussed and agreed to in principle.
- Sand/gravel abstractions sites
    - Pilgrim and Von Culin expressed concern about abstraction sites in the Rioni River being used for the project.
    - The RD expressed concern with excluding any sand and gravel extraction sites from being used by contractors if those sites have been licensed by government authorities.
- Staging/laydown areas and workers camp
    - The RD has not identified areas of concern for placement of staging/laydown areas or workers camp (if needed) and will allow contractors to propose locations during the RFP stage and in accordance with Georgian law.
- Spill and runoff containment system
    - The preferred option for spill and runoff management on the bridge is still the retention chamber proposed in the EIA.
    - The RD explained that it should be the responsibility of the Division of Environmental Supervision, in the Ministry of Environment, to manage spills and run-off in the structure in the operations phase.
- Resettlement Action Plan (RAP)
    - The RD asked whether the ADB had any objections to proceeding with the original RAP developed in accordance with Georgian Government standards.

November 26, 2018 – Ministry of Environment Protection and Agriculture (MoEPA)

28. Meeting Participants –

1) Lika Giorgadze - Agency of Protected Areas, Deputy
2) Nato Sultanishvili - Agency of Protected Areas, Head of Planning and Development Division
3) Irine Lomashvili - Planning and Development Division, Fish Specialist
4) Eka Elgerdalashvili - Department of Environmental Assessment Permits
5) Merab Mosidze - GIS Specialist
6) Ms. Keti Dgebuadze - ADB/RETA International-Regional Environmental Safeguards Consultant
7) Mr. John Pilgrim - Biodiversity Specialist, ADB Consultant
8) Mr. Raymond Von Culin - Environment Specialist, ADB Consultant

29. Discussion –

- Kolkheti National Park and Ramsar Site
    - MoEPA confirmed the boundaries of these two sites are currently the same, but that a plan was well advanced to expand the National Park.
    - MoEPA explained that the National Park is one of 36 candidate Emerald sites in Georgia.
- Impacts of the planned bridge

  - MoEPA stated that all their concerns about project impacts had already been included on the environmental permit conditions, included with the approval of the project EIA.
  - MoEPA explained that licensing of quarries is now under the authority of the Ministry of Economy.
  - MoEPA stated no knowledge of other projects likely to impact the river from Samtredia to the mouth of the Rioni River.
- Illegal poaching
  - MoEPA stated that there were significant levels of illegal fishing of sturgeon.
  - MoEPA explained that all fishing is banned in the Rioni River for a certain period each year, variable but usually around May-June, during spawning.
  - MoEPA stated that eels were rarely seen in the Rioni River.
  - MoEPA confirmed that a Georgian Sturgeon Conservation Management Plan, identified as a need in the National Biodiversity Strategy and Action Plan, has not yet been initiated.
- Procedures of sand and gravel extraction site selection, approval, and permitting
  - MoEPA confirmed that the Ministry of Economy is now responsible for permitting of sand and gravel abstraction sites.
  - MoEPA explained that reviews are undertaken by MoEPA for proposed sand and gravel abstraction sites before the Ministry of Economy grants a permit.

November 27, 2018 – Sabuko

30. Meeting Participants –

1) Ms. Natia Javakhishvili - Director
2) Mr. Zura Gurgenidze - Project Manager
3) Ms. Keti Dgebuadze - ADB/RETA International-Regional Environmental Safeguards Consultant
4) Mr. John Pilgrim - Biodiversity Specialist, ADB Consultant
5) Mr. Raymond Von Culin - Environment Specialist, ADB Consultant

31. Discussion –

- Kolkheti Important Bird Area (IBA) boundaries
  - Sabuko explained that all IBA information nationally was currently being updated, and outlined the proposed changes in geographic extent of the Kolkheti IBA. Of relevance to the Project, this includes the area to the south of the Rioni River, to the west of the railway line.
- Importance of the area for birds
  - Sabuko explained that this IBA is important all year round, but that it is listed as globally important because of its concentrations of wintering waterbirds – especially in December/January-February.
- Project impacts
  - Sabuko expressed concern about the potential for noise and disturbance from the Project impacting birds in the IBA.
  - Given the importance of the IBA for wintering birds, Sabuko expressed a preference for noisy and disturbing elements of construction – particularly those on land to the south of the Rioni River in closest proximity to the IBA – to occur in summer.

November 27, 2018 – World Wildlife Fund (WWF)

32. Meeting Participants –

1) Ms. Maka Bitsadze, Conservation Officer
2) Ms. Keti Dgebuadze - ADB/RETA International-Regional Environmental Safeguards Consultant
3) Mr. John Pilgrim - Biodiversity Specialist, ADB Consultant
4) Mr. Raymond Von Culin - Environment Specialist, ADB Consultant

33. Discussion –

- Current status of sturgeon in Georgia
    - WWF shared a recent survey report, focused on piloting side-scan sonar and acoustic telemetry for surveys of sturgeon in the Rioni River. Apart from two incidental records of sturgeon during this pilot, WWF have no recent information on their status.
    - WWF stated the main period of concern for sturgeon in the Rioni River to be March-August, though noted juveniles returned to the sea until mid-October.
    - WWF were not aware of eels in the Rioni River.
- Illegal poaching
    - WWF noted that poaching is a significant problem, occurring throughout the year on the Rioni River, particularly at the river mouth and spawning grounds (near Samtredia), mainly by local people for additional income. Officially, it is illegal to commercially fish in the Rioni.
    - WWF also noted that commercial marine fishermen are supposed to immediately release sturgeon if caught, but at least some of these are sold illegally to markets and restaurants.
    - Following concern by the Division of Environmental Supervision about identification of wild versus Siberian Sturgeon (farmed in Georgia), WWF trained their staff and produced identification guides.
- Other threats to sturgeon
    - WWF expressed major concern about gravel and sand extraction from the Rioni, particularly from within the spawning area of sturgeon near Samtredia, and recommended that the project not abstract materials from the Rioni.
    - WWF also expressed major concern about hydropower operation and development on the Rioni. Flushing from existing hydropower plants causes a major sediment plume in the river. The WWF expressed particular concern that flushing has previously occurred during the spawning season. Additional hydropower plants planned around Namakhvani are of concern owing to changes they will likely produce in hydrology, water temperature, oxygenation, etc.
- Conservation of sturgeon
    - WWF described understanding of sturgeon status in the Rioni River as the most fundamental conservation need, in order to define further work.
    - A further major need was described as enhanced law enforcement, and it was noted that the Government was very keen to address poaching issues.
    - WWF stated that earlier considerations of changing the route of the hydropower derivation canal on the Rioni to increase sturgeon spawning areas were now considered too expensive and complex.
- Protected area boundaries

- WWF explained that a national package of protected area changes has advanced to final parliamentary approval stage, and that this includes 'Phase 1' of their plans to protect the Rioni. Specifically, this package includes (i) expansion of Kolkheti National Park (KNP) to include the Rioni River itself from the river mouth to just west of the railway bridge, including some areas of state land on the north bank of the Rioni, but not connecting directly to KNP owing to private land ownership on the north bank, and (ii) establishment of a new IUCN Category IV protected area (nominally the 'Rioni Sanctuary') south of Samtredia to cover the remaining spawning grounds of sturgeon.
- Establishment of protected areas will not cancel existing gravel/sand extraction licenses but should prevent issuance of any new ones.

November 27, 2018 – Fauna & Flora International (FFI)

34. Meeting Participants –

1) Ms. Fleur Scheele - Programme Manager, Caucasus at FFI
2) Ms. Keti Dgebuadze - ADB/RETA International-Regional Environmental Safeguards Consultant
3) Mr. John Pilgrim - Biodiversity Specialist, ADB Consultant
4) Mr. Raymond Von Culin - Environment Specialist, ADB Consultant

35. Discussion –

- FFI work on sturgeon
  - FFI described their work on sturgeon in Georgia over the last year, which has included funding to Masters students at Ilia State University to research the status of sturgeon in the Rioni River and in fish markets; support to the Division of Environmental Supervision through reports of illegal fishing by a network of community members between Poti and Samtredia; and awareness raising among local villagers.
  - This year, those students found a juvenile in spring (identified as a Stellate Sturgeon, pending genetic confirmation) and a juvenile in October (identification pending).
  - FFI considers that the juvenile found in October is suggestive that a second, autumn, spawning season may exist (in September-October). If correct, FFI suggest that juvenile sturgeon could be in the river until November or even December.
- Illegal poaching
  - FFI stated this to be a significant threat to sturgeon, particularly on the spawning grounds and near the river mouth at Poti. FFI clarified that use of nets to fish on the Rioni is illegal.
- Cumulative impacts
  - FFI considered spawning sturgeon to be quite strong, and able to swim past the slightly increased current as a result of a narrowed channel owing to footings of the planned bridge.
  - FFI cautioned against stopping the entire flow of the river at any point during the project.
  - For sturgeon, FFI consider March-June to be the most sensitive period for in-river construction, followed by July-September.

  - FFI recommended that the project not abstract sand or gravel from the Rioni River, even from licensed sites. Juvenile sturgeon feed on sandy river bottom macroinvertebrates, particularly in the vicinity of gravel islands.
  - FFI expressed concerns about multiple existing impacts on sturgeon, including illegal fishing, quarries in the river, existing hydropower facilities, planned hydropower plants upriver (Namakhvani area), pollution from fish meal factories near Poti, lack of any sewage treatment facilities in Poti, and the current Poti municipal solid waste management facility (stated to be losing significant waste into the river). There is also apparently potential for hybridization.
  - FFI stated no knowledge of any invasive species issues that this Project may exacerbate, that would be likely to impact sturgeon.
- Conservation of sturgeon
  - FFI highlighted better tackling of poaching by the Division of Environmental Supervision as the primary need. At present, staff of this Division need to come from Zugdidi, some way from the main Rioni River poaching sites. Further, they find tackling poaching challenging as there is a high burden of proof required for prosecuting offences.

November 29, 2018 – Poti Municipality

36. Meeting Participants –

1) Mr. Gocha Kurdgelia - Mayor
2) Mr. Konstantin Topuria - First Deputy Mayor
3) Mr. Vladimir Kirvalidze - Material - Technical Maintenance Division Senior Specialist
4) Ms. Keti Dgebuadze - ADB/RETA International-Regional Environmental Safeguards Consultant
5) Mr. John Pilgrim - Biodiversity Specialist, ADB Consultant
6) Mr. Raymond Von Culin - Environment Specialist, ADB Consultant

37. Discussion –

- Background on the existing diversion dam / bridge
  - The water regulating gates across the Rioni River was originally not designed to accommodate road traffic, but this functionality was added later. The diversion dam and road bridge are approximately 70 years old.
  - The gates and bridge were recently renovated to restore functionality.
  - Once the new bridge is constructed, it is planned to limit the existing
  - road bridge to light traffic only.
  - The municipality is favor of the project.
- Sand and Gravel abstraction
  - The municipality only has authority over sand and gravel abstraction sites within Poti Municipality and there are currently only two sites under that territory. The MoEPA performs environmental inspections of these sites.
  - The Municipality's Division of Environmental Supervision checks that municipal sand and gravel abstraction sites have a license and monitors what and how much the operator is extracting.
- Municipal authorities asked questions about the following issues:
  - The timing of civil works for the project as it relates to potential threats to sturgeon spawning periods.

  - What effects the project may have on the river flow and water elevation. The RD representative informed them that no significant changes in water flow or water levels would result from the project.
- Municipal waste
  - An agreement has been made between the RD and the Poti Municipality in which construction and inert waste generated from the Project will be transported by the Municipality to the municipal waste dump. The contractor for the project will need to contract the Municipality to make arrangements for waste management.
  - The municipal waste dump was renovated in 2014 and has a proposed life span of 50 years. According to the Municipality, all the necessary licenses are in place for it to operate and no environmental issues have been raised.
- Spill and runoff containment system
  - The RD will conclude a long-term contract with a supervision company to provide maintenance services for the bridge and road (cleaning, tree cutting, etc.) during the operations phase. The RD plans to integrate maintenance of the spill and runoff containment structures into that company's TOR.
- Construction staging/laydown areas and potential workers camp
  - The Municipality expressed no concerns with the location of the staging/lay down area or workers' camp (if one is needed) with the understanding that it should follow Georgian law.

November 29, 2018 – Kolkheti National Park

38. Meeting Participants –

1) Ms. Khatuna Katsarava - Chief of Administrative Division at Kolkheti National Park
2) Ms. Gela Ingorokva - Natural Resort Specialist.
3) Mr. Gia Sopadze - Head of Environmental Division, Roads Department
4) Mr. Vladimir Khurtsilava - Head of Law Enforcement Division
5) Ms. Keti Dgebuadze - ADB/RETA International-Regional Environmental Safeguards Consultant
6) Mr. John Pilgrim - Biodiversity Specialist, ADB Consultant
7) Mr. Raymond Von Culin - Environment Specialist, ADB Consultant

39. Discussion –

- National Park boundary expansion
  - KNP clarified that the expansion would include the river from about 1.5km west of the railway bridge but would not include the gas pipeline.
  - KNP clarified that no quarries are currently licensed within the NP.
- Project impacts
  - KNP clarified that they understood the need to construct the bridge.
  - KNP expressed concerns about the potential for construction impacts on sturgeon from vibration of pile driving.
  - KNP expressed concerns about use of the municipal waste dump, which they did not view as well managed.
  - KNP expressed concerns about the potential for operational impacts on birds of bridge lighting and traffic noise.
- Illegal poaching

- KNP said there was lots of illegal poaching, particularly during spawning times. They expressed concerns about the new bridge exacerbating poaching of sturgeon because a common method of catching fish in this region is to string lines and hooks between bridge piers – NP staff have seen this on the railway bridge. Mr. Gia Sopadze from the Roads Department proposed a video camera system to monitor for such illegal activity.

December 4, 2018 – Ministry of Environment Protection and Agriculture

40. Meeting Participants –

1) Mr. Archil Guchmanidze - Head of Fisheries and Black Sea Monitoring Service
2) Ms. Keti Dgebuadze - ADB/RETA International-Regional Environmental Safeguards Consultant
3) Mr. John Pilgrim - Biodiversity Specialist, ADB Consultant
4) Mr. Raymond Von Culin - Environment Specialist, ADB Consultant

41. Discussion –

- Sturgeon in the Rioni River
  - MoEPA considered Beluga, Stellate, and Colchic sturgeon to still spawn in the Rioni River.
  - MoEPA explained that work in the river in March-April could be catastrophic, as this is when adult sturgeon migrate upstream to spawn.
  - MoEPA further clarified that May-August would be the next worst time to do in-river work, followed by September-October (when juveniles remain in the river).
- Threats to sturgeon
  - The primary threats were stated to be illegal fishing and barriers (notably hydropower dams).

January 9, 2019 – Radu Suciu

42. Meeting Participants –

1) Mr. Radu Suciu – International sturgeon expert, based in Romania
2) Mr. John Pilgrim - Biodiversity Specialist, ADB Consultant

43. Discussion –

- Ilia State University surveys in 2018
  - Was involved and confirmed one juvenile Stellate and one Russian/Colchic were captured.
  - Explained that the latter juvenile appeared to have been born in September, indicating a second spawning season.
  - Stated that data from that survey suggest the lower reaches of the Rioni River are a nursery area for juvenile sturgeon.
  - Clarified that macroinvertebrates are the main food for young sturgeon, and that benthic macroinvertebrates in the lower Rioni are scarce (owing to the compacted dark sand substrate), but that free-floating macroinvertebrates are unusually abundant.
- Sturgeon ecology
  - Stressed that each river is different, and there is little information from the Rioni.

  - Explained that each species in the Danube has slightly different spawning requirements and locations, but all require cracks in substrate to keep eggs safe from predators.
  - Explained that some sturgeon species in the Danube have multiple spawning seasons during the year, determined by factors such as water temperature and day length (which affects availability of macroinvertebrate food for juveniles), and that some individuals may overwinter in the river.
  - Expressed concern about potential project impacts on macroinvertebrates.
  - Explained that most sturgeon in the Danube do not spawn every year, but perhaps only every three years.
- Monitoring
  - Expressed concern about the methods used for at-sea monitoring, based on lessons from use of similar methods in the Caspian Sea.
  - Stressed the importance of monitoring juveniles, since these are an outcome indicator that demonstrates success of adult migration, spawning and egg growth).
  - Strongly recommended an approach to monitoring that ensures local capacity is built for sustainable monitoring into the long term.

Annex 3. Impact Assessment Results

3.a - Impact Screening Matrix

Table 95. Impact Screening Matrix

Factors / Actions	Abiotic									Biotic									Landscape	Socioeconomic										
	Atmosphere			Land			Surface water		Groundwater	Flora		Fauna								Economic			Services Demand				Health and Safety		Cultural
												Terrestrial			Aquatic														
	Air Quality	Long-Term GHG Emissions	Noise and Vibration	Soil Structure	Soil Quality	Relief	Surface Drainage (run-off patterns)	Surface Water Quality	Groundwater Quality	Vegetation Coverage	Floral Species	Habitat	Distribution	Terrestrial Species	Habitat	Distribution	Aquatic Species	Quality	Land Use and Livelihoods	Jobs	Local and Regional Development	Water	Energy	Waste Management and Disposal	Consumables	Occupational Health and Safety	Community Health and Safety	Cultural Heritage
Site Preparation Phase																													
Land acquisition and compensation																			IP 18		IP 20								
Delimitation of working zones																				IP 19	IP 21				IP 26				
Land clearing / Leveling	IP 1	IP 2	IP 3	IP 4	IP 5		IP 7	IP 8		IP 9	IP 11	IP 12	IP 14	IP 15				IP 17		IP 19	IP 21	IP 22		IP 25	IP 26	IP 27	IP 28	IP 29

Rehabilitation, extension & construction of access roads	IP 1	IP 2	IP 3	IP 4	IP 5	IP 6	IP 7	IP 8		IP 9	IP 11	IP 12	IP 14					IP 17		IP 19	IP 21	IP 22		IP 25	IP 26	IP 27	IP 28	IP 29
Construction / placement of provision facilities	IP 1	IP 2	IP 3	IP 4	IP 5	IP 6	IP 7	IP 8					IP 14					IP 17		IP 19	IP 21	IP 22	IP 23	IP 25	IP 26	IP 27	IP 28	IP 29
Mobilization of equipment, construction materials/ vehicles, staff, consumables	IP 1	IP 2	IP 3							IP 10		IP 13	IP 14		IP 16			IP 17		IP 19	IP 21				IP 26	IP 27	IP 28	
Storage of materials, machinery, equipment					IP 5			IP 8		IP 10		IP 13	IP 14		IP 16			IP 17								IP 27	IP 28	
Relocation of electricity transmission and distribution lines, gas pipes, and telecoms lines	IP 1	IP 2	IP 3															IP 17		IP 19	IP 21		IP 24	IP 25		IP 27		IP 29
Construction Phase																												
Sand and gravel abstraction, potentially from the Rioni River	IC 1	IC 2	IC 3	IC 4	IC 5	IC 6		IC 8			IC 10				IC 12	IC 13												
Excavation, cuts, filling-in, compaction, leveling	IC 1	IC 2	IC 3	IC 4	IC 5	IC 6	IC 7	IC 8					IC 11					IC 15		IC 16	IC 17			IC 21	IC 22			IC 25

Building of structures ***outside*** river	IC 1	IC 2	IC 3	IC 4			IC 7						IC 11					IC 15		IC 16	IC 17	IC 19	IC 20	IC 21	IC 22	IC 23		IC 25
Building of structures ***inside*** river	IC 1	IC 2	IC 3					IC 8			IC 10					IC 13	IC 14	IC 15		IC 16	IC 17		IC 20	IC 21	IC 22	IC 23		
Operation of provisional facilities (concrete plant, crusher, camp, etc.)	IC 1	IC 2	IC 3					IC 8					IC 11					IC 15		IC 16	IC 17	IC 19	IC 20	IC 21	IC 22	IC 23		
Heavy equipment operations	IC 1	IC 2	IC 3				IC 7						IC 11			IC 13		IC 15		IC 16	IC 17	IC 19	IC 20		IC 22	IC 23	IC 24	IC 25
Storage, handling, and disposal of ***construction waste***	IC 1	IC 2	IC 3		IC 5			IC 8	IC 9				IC 11					IC 15		IC 16				IC 21		IC 23		
Storage, handling, and disposal of ***inert waste and spoil***, including dredging materials	IC 1	IC 2	IC 3		IC 5			IC 8					IC 11			IC 13		IC 15		IC 16				IC 21	IC 22	IC 23		
Operation of equipment on water	IC 1	IC 2	IC 3					IC 8			IC 10				IC 12	IC 13	IC 14			IC 16					IC 22	IC 23	IC 24	
Transportation of personnel and material by road	IC 1	IC 2	IC 3										IC 11							IC 16	IC 18					IC 23	IC 24	
Storage and handling of materials and equipment					IC 5		IC 7	IC 8	IC 9							IC 13		IC 15			IC 18			IC 21		IC 23	IC 24	

Maintenance of vehicles and equipment					IC 5			IC 8	IC 9													IC 19	IC 20	IC 21	IC 22			
Influx of construction workers																	IC 14			IC 16			IC 20	IC 21	IC 22			
Worksite Closure Phase (i.e., Project Closure)																												
Dismantling & demolition of provisional facilities	IW 1	IW 2	IW 3		IW 4			IW 5										IW 8		IW 10	IW 11	IW 12	IW 13	IW 14	IW 15	IW 16		
Transportation of equipment, construction materials/ vehicles, staff, consumables	IW 1	IW 2	IW 3																	IW 10						IW 16	IW 17	
Cleaning and rehabilitation activities	IW 1	IW 2	IW 3							IW 6		IW 7						IW 9		IW 10	IW 11	IW 12	IW 13	IW 14	IW 15			
Operation and Maintenance Phase																												
Vehicle use of the new road and bridge	IO 1	IO 2	IO 3		IO 4			IO 5					IO 7				IO 9	IO 10		IO 11	IO 12			IO 13			IO 15	
Accidents resulting in spilled fuel/oil, or contaminated road surface runoff								IO 5	IC 6						IO 8									IO 13		IO 14	IO 15	
Maintenance of road and associated facilities	IO 1	IO 2	IO 3					IO 5	IC 6						IO 8					IO 11					IO 13		IO 14		

Land restoration in provisional roads and temporarily disturbed areas																		IO 10									

Represents a potential **NEGATIVE** impact
Represents a potential **POSITIVE** impact
IP – Preparation Phase Impact
IC – Construction Phase Impact
IW – Worksite Closure Phase Impact
IO – Operation Phase Impact

3.b - Impact Identification Tables

Table 96. Impact Identification Tables

Impacts at the Site Preparation Phase			
Action	**Component**	**Factors**	**Impact Identified**
Land clearing / Leveling	Atmosphere	Air Quality	IP 1: Localized emissions of combustion gas and dust resulting from the use of machinery and equipment and circulation of vehicles.
Rehabilitation, extension & construction of access roads			
Construction / placement of provision facilities			
Mobilization of equipment, construction materials/ vehicles, staff, consumables			
Relocation of electricity transmission and distribution lines, gas pipes, and telecoms lines			
Land clearing / Leveling	Atmosphere	Air Quality	IP 2: Long-term effects of greenhouse gas emissions from the use of machinery and equipment and circulation of vehicles.
Rehabilitation, extension & construction of access roads			

Construction / placement of provision facilities			
Mobilization of equipment, construction materials/ vehicles, staff, consumables			
Relocation of electricity transmission and distribution lines, gas pipes, and telecoms lines			
Land clearing / Leveling	Atmosphere	Noise and Vibration	IP 3. Noise and vibration emissions resulting from the use of machinery and equipment and vehicle circulation.
Rehabilitation, extension & construction of access roads			
Construction / placement of provision facilities			
Mobilization of equipment, construction materials/ vehicles, staff, consumables			
Relocation of electricity transmission and distribution lines, gas pipes, and telecoms lines			
Land clearing / Leveling	Land	Soil Structure	IP 4: Land erosion due to loss of vegetation coverage and changes in its structure.
Rehabilitation, extension & construction of access roads			
Construction / placement of provision facilities			
Land clearing / Leveling	Land	Soil Quality	IP 5: Land pollution due to wrong management of waste, as well as possible dripping of hydrocarbons from machinery and equipment, and wrong storage of oil and fuel.
Rehabilitation, extension & construction of access roads			
Construction / placement of provision facilities			
Storage of materials, machinery, equipment			
Construction / placement of provision facilities	Land	Relief	IP 6: Modification of geological formations.
Rehabilitation, extension & construction of access roads			
Land clearing / Leveling	Surface water	Surface Drainage (run-off patterns)	IP 7: Modification of surface hydrological pattern due to removal of vegetation and construction of provisional works and roads.
Rehabilitation, extension & construction of access roads			

Construction / placement of provision facilities			
Land clearing / Leveling	Surface Water	Water Quality	IP 8: Pollution of nearby water bodies due to poor storage and management of waste and construction materials, which may be introduced through runoff or leaching through the soil.
Rehabilitation, extension & construction of access roads			
Construction / placement of provision facilities			
Storage of materials, machinery, equipment			
Land clearing / Leveling	Flora	Vegetation Coverage	IP 9: Loss of vegetation coverage in specific areas of the project.
Rehabilitation, extension & construction of access roads			
Mobilization of equipment, construction materials/ vehicles, staff, consumables	Flora	Vegetation Coverage	IP 10: Introduction of invasive alien species.
Storage of materials, machinery, equipment			
Land clearing / Leveling	Flora	Species	IP 11: Mortality of individuals.
Rehabilitation, extension & construction of access roads			
Land clearing / Leveling	Terrestrial Fauna	Habitat	IP 12: Modification and fragmentation of habitat due to loss of vegetation coverage.
Rehabilitation, extension & construction of access roads			
Mobilization of equipment, construction materials/ vehicles, staff, consumables	Terrestrial Fauna	Habitat	IP 13: Introduction of invasive alien species.
Storage of materials, machinery, equipment			
Land clearing / Leveling	Terrestrial Fauna	Distribution	IP 14: Displacement of species due to noise, presence of machinery and equipment and presence of staff.
Rehabilitation, extension & construction of access roads			
Construction / placement of provision facilities			
Mobilization of equipment, construction materials/ vehicles, staff, consumables			
Land clearing / Leveling	Terrestrial Fauna	Species	IP 15: Mortality of terrestrial fauna individuals.

Mobilization of equipment, construction materials/ vehicles, staff, consumables	Aquatic Fauna	Habitat	IP 16: Introduction of invasive alien species
Storage of materials, machinery, equipment			
Land clearing / Leveling	Landscape	Quality	IP 17: Modification of original landscape due to loss of vegetation coverage and presence of machinery and equipment.
Rehabilitation, extension & construction of access roads			
Construction / placement of provision facilities			
Mobilization of equipment, construction materials/ vehicles, staff, consumables			
Storage of materials, machinery, equipment			
Relocation of electricity transmission and distribution lines, gas pipes, and telecoms lines			
Land acquisition and compensation	Socioeconomic (Economic)	Change of Land Use and Livelihoods	IP 18: Land acquisition and livelihood loss to affected persons.
Delimitation of working zones	Socioeconomic (Economic)	Jobs	IP 19: Creation of direct and indirect jobs because of hiring staff from the region.
Land clearing / Leveling			
Rehabilitation, extension & construction of access roads			
Construction / placement of provision facilities			
Mobilization of equipment, construction materials/ vehicles, staff, consumables			
Relocation of electricity transmission and distribution lines, gas pipes, and telecoms lines			
Delimitation of working zones	Socioeconomic (Economic)	Local Development	IP 20: Payment to owners for leasing their premises and compensation for change of land use on their premises.
Land clearing / Leveling	Socioeconomic (Economic)	Local and Regional Development	IP 21: Demand of services in neighboring towns (food, accommodation, recreation, vehicles, machinery, and equipment).
Rehabilitation, extension & construction of access roads			

Construction / placement of provision facilities Mobilization of equipment, construction materials/ vehicles, staff, consumables Relocation of electricity transmission and distribution lines, gas pipes, and telecoms lines			
Land clearing / Leveling Rehabilitation, extension & construction of access roads Construction / placement of provision facilities	Socioeconomic (Services)	Water	IP 22: Water demand for construction activities, mainly to avoid spreading dust and particles during drilling, during operation of provisional facilities, during circulation of vehicles on dirt roads, and for general cleaning services.
Construction / placement of provision facilities	Socioeconomic (Services)	Energy	IP 23: Energy demand for provisional facilities, construction/deconstruction activities and lighting.
Relocation of electricity transmission and distribution lines, gas pipes, and telecoms lines			IP 24: The disruption of services, including energy, to surrounding communities due to relocation of utilities.
Land clearing / Leveling Rehabilitation, extension & construction of access roads Construction / placement of provision facilities Relocation of electricity transmission and distribution lines, gas pipes, and telecoms lines	Socioeconomic (Services)	Waste Management and Disposal	IP 25: Both the presence of staff at the site and preparation/construction/dismantling tasks will generate waste which need the use of sanitary landfill or municipal dumps duly authorized.
Delimitation of working zones Land clearing / Leveling Rehabilitation, extension & construction of access roads Construction / placement of provision facilities Relocation of electricity transmission and distribution lines, gas pipes, and telecoms lines	Socioeconomic (Services)	Consumables	IP 26: Demand of consumables or materials to be used for preparation/construction/worksite closure activities and supplied from local or regional sources (food, fuel, sand, gravel, cement, wood, steel, among others).
Land clearing / Leveling Rehabilitation, extension & construction of access roads	Socioeconomic (Health and Safety)	Occupational Health and Safety	IP 27: The exposure of workers to various physical hazards that may result to minor, disabling, catastrophic, or fatal injuries.

Construction / placement of provision facilities			
Mobilization of equipment, construction materials/ vehicles, staff, consumables			
Storage of materials, machinery, equipment			
Relocation of electricity transmission and distribution lines, gas pipes, and telecoms lines			
Land clearing / Leveling	Socioeconomic (Health and Safety)	Community Health and Safety	IP 28: Risks to community health and safety due to increased traffic; the transport, storage, and use and/or disposal of materials (e.g., fuel and chemicals); and access to structural elements or components of the project by members of the community.
Rehabilitation, extension & construction of access roads			
Construction / placement of provision facilities			
Mobilization of equipment, construction materials/ vehicles, staff, consumables			
Storage of materials, machinery, equipment			
Land clearing / Leveling	Socioeconomic (Cultural)	Cultural Heritage	IP 29: Risks to built heritage, objects, and sites that have archaeological, historical, religious, or other cultural value and significance.
Rehabilitation, extension & construction of access roads			
Construction / placement of provision facilities			
Relocation of electricity transmission and distribution lines, gas pipes, and telecoms lines			

Impacts at the Construction Phase			
Action	**Component**	**Factors**	**Impact Identified**
Sand and gravel abstraction from rivers	Atmosphere	Air Quality	IC 1: Localized emissions of combustion gas and dust resulting from the use of machinery and equipment and circulation of vehicles.
Excavation, cuts, filling-in, compaction, leveling			
Building of structures ***outside*** river			
Building of structures ***inside*** river			
Operation of provisional facilities (concrete plant, crusher, camp, etc.)			
Heavy equipment operations			

Storage, handling, and disposal of construction waste			
Storage, handling, and disposal of inert waste and spoil, including dredging materials			
Operation of equipment on water			
Transportation of personnel and material by road			
Sand and gravel abstraction from rivers	Atmosphere	Air Quality	IC 2: Long-term effects of greenhouse gas emissions from the use of machinery and equipment and circulation of vehicles.
Excavation, cuts, filling-in, compaction, leveling			
Building of structures ***outside*** river			
Building of structures ***inside*** river			
Operation of provisional facilities (concrete plant, crusher, camp, etc.)			
Heavy equipment operations			
Storage, handling, and disposal of construction waste			
Storage, handling, and disposal of inert waste and spoil, including dredging materials			
Operation of equipment on water			
Transportation of personnel and material by road			
Sand and gravel abstraction from rivers	Atmosphere	Noise and Vibration	IC 3. Emissions of noise resulting from the use of machinery and equipment.
Excavation, cuts, filling-in, compaction, leveling			
Building of structures ***outside*** river			
Building of structures ***inside*** river			
Operation of provisional facilities (concrete plant, crusher, camp, etc.)			
Heavy equipment operations			
Storage, handling, and disposal of ***construction waste***			
Storage, handling, and disposal of ***inert waste and spoil***, including dredging materials			
Operation of equipment on water			

Transportation of personnel and material by road			
Sand and gravel abstraction from rivers Excavation, cuts, filling-in, compaction, leveling Building of structures ***outside*** river	Land	Soil Structure	IC 4: Land erosion due to loss of vegetation coverage and changes in its structure
Sand and gravel abstraction from rivers Excavation, cuts, filling-in, compaction, leveling Storage, handling, and disposal of ***construction waste*** Storage, handling, and disposal of ***inert waste and spoil***, including dredging materials Storage and handling of materials and equipment Maintenance of vehicles and equipment	Land	Soil Quality	IC 5: Land pollution due to wrong management of waste, as well as possible dripping of hydrocarbons from machinery and equipment, and wrong storage of oil and fuel.
Sand and gravel abstraction from rivers Excavation, cuts, filling-in, compaction, leveling	Land	Relief	IC 6: Modification of geological formations
Excavation, cuts, filling-in, compaction, leveling Building of structures ***outside*** river Heavy equipment operations Storage and handling of materials and equipment	Surface Water	Surface Drainage (run-off patterns)	IC 7: Modification of surface hydrological pattern due to modification of geological formations and construction of elements which may block the original pattern of surface run-off.
Sand and gravel abstraction from rivers Excavation, cuts, filling-in, compaction, leveling Building of structures ***inside*** river Operation of provisional facilities (concrete plant, crusher, camp, etc.) Storage, handling, and disposal of ***construction waste*** Storage, handling, and disposal of ***inert waste and spoil***, including dredging materials	Surface Water	Water Quality	IC 8: Pollution of nearby water bodies due to poor storage and management of waste and construction materials, which may be introduced through runoff or leaching through the soil.

Operation of equipment on water			
Storage and handling of materials and equipment			
Maintenance of vehicles and equipment			
Storage and handling of materials and equipment	Groundwater	Water Quality	IC 9: Pollution of groundwater due to poor storage and management of waste and construction materials, and improper vehicle maintenance.
Storage, handling, and disposal of ***construction waste***			
Maintenance of vehicles and equipment			
Sand and gravel abstraction, potentially from the Rioni River	Flora	Species	IC 10: Mortality of individuals.
Building of structures ***inside*** river			
Operation of equipment on water			
Excavation, cuts, filling-in, compaction, leveling	Terrestrial Fauna	Distribution	IC 11: Displacement of species due to noise, presence of machinery and equipment and of staff.
Building of structures ***outside*** river			
Operation of provisional facilities (concrete plant, crusher, camp, etc.)			
Heavy equipment operations			
Storage, handling, and disposal of ***construction waste***			
Storage, handling, and disposal of ***inert waste and spoil***, including dredging materials			
Transportation of personnel and material by road			
Sand and gravel abstraction from rivers	Aquatic Fauna	Habitat	IC 12: Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species.
Operation of equipment on water			
Sand and gravel abstraction from rivers	Aquatic Fauna	Distribution	IC 13: Displacement of species due to noise, presence of machinery, and equipment and of staff.
Building of structures ***inside*** river			
Heavy equipment operations			
Storage, handling, and disposal of ***inert waste and spoil***, including dredging materials			
Operation of equipment on water			
Storage and handling of materials and equipment			

Building of structures ***inside*** river Operation of equipment on water Influx of construction workers	Aquatic Fauna	Species	IC 14: Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.
Excavation, cuts, filling-in, compaction, leveling Building of structures ***outside*** river Building of structures ***inside*** river Operation of provisional facilities (concrete plant, crusher, camp, etc.) Heavy equipment operations Storage, handling, and disposal of ***construction waste*** Storage, handling, and disposal of ***inert waste and spoil***, including dredging materials Storage and handling of materials and equipment	Landscape	Quality	IC 15: Modification of original landscape due to presence of machinery and equipment.
Excavation, cuts, filling-in, compaction, leveling Building of structures ***outside*** river Building of structures ***inside*** river Operation of provisional facilities (concrete plant, crusher, camp, etc.) Heavy equipment operations Storage, handling, and disposal of ***construction waste*** Storage, handling, and disposal of ***inert waste and spoil***, including dredging materials Influx of construction workers Operation of equipment on water Transportation of personnel and material by road	Socioeconomic (Economic)	Jobs	IC 16. Creation of direct and indirect jobs because of hiring staff from the region.
Excavation, cuts, filling-in, compaction, leveling Building of structures ***outside*** river Building of structures ***inside*** river	Socioeconomic (Economic)	Local and Regional Development	IC 17: Demand of services in neighboring towns (food, accommodation, recreation, vehicles, machinery, and equipment).

Operation of provisional facilities (concrete plant, crusher, camp, etc.)			
Heavy equipment operations			
Transportation of personnel and material by road	Socioeconomic (Economic)	Local and Regional Development	IC 18: Road access restrictions to traffic during to construction phase.
Storage and handling of materials and equipment			
Building of structures ***outside*** river	Socioeconomic (Services)	Water	IC 19: Water demand for construction activities, mainly to avoid spreading dust and particles during drilling, during operation of provisional facilities, during circulation of vehicles on dirt roads, and for general cleaning services.
Operation of provisional facilities (concrete plant, crusher, camp, etc.)			
Heavy equipment operations			
Maintenance of vehicles and equipment			
Building of structures ***outside*** river	Socioeconomic (Services)	Energy	IC 20: Energy demand for provisional facilities, construction/deconstruction activities and lighting.
Building of structures ***inside*** river			
Operation of provisional facilities (concrete plant, crusher, camp, etc.)			
Heavy equipment operations			
Excavation, cuts, filling-in, compaction, leveling	Socioeconomic (Services)	Waste Management and Disposal	IC 21: Both the presence of staff at the site and preparation/construction/dismantling tasks will generate waste which need the use of sanitary landfill or municipal dumps duly authorized.
Building of structures ***outside*** river			
Building of structures ***inside*** river			
Operation of provisional facilities (concrete plant, crusher, camp, etc.)			
Storage, handling, and disposal of ***construction waste***			
Storage, handling, and disposal of ***inert waste and spoil***, including dredging materials			
Influx of construction workers			
Storage and handling of materials and equipment			
Maintenance of vehicles and equipment			
Excavation, cuts, filling-in, compaction, leveling	Socioeconomic (Services)	Consumables	IC 22: Demand of consumables or materials to be used for preparation/construction/worksite closure activities and supplied from local or regional sources (food, fuel, sand, gravel, cement, wood, steel, among others).
Building of structures ***outside*** river			
Building of structures ***inside*** river			

Operation of provisional facilities (concrete plant, crusher, camp, etc.) Heavy equipment operations Storage, handling, and disposal of ***inert waste and spoil***, including dredging materials Influx of construction workers Operation of equipment on water Maintenance of vehicles and equipment			
Building of structures ***outside*** river Building of structures ***inside*** river Operation of provisional facilities (concrete plant, crusher, camp, etc.) Heavy equipment operations Storage, handling, and disposal of ***construction waste*** Storage, handling, and disposal of ***inert waste and spoil***, including dredging materials Operation of equipment on water Transportation of personnel and material by road Storage and handling of materials and equipment	Socioeconomic (Health and Safety)	Occupational Health and Safety	IC 23: The exposure of workers to various physical hazards that may result to minor, disabling, catastrophic, or fatal injuries.
Heavy equipment operations Operation of equipment on water Transportation of personnel and material by road Storage and handling of materials and equipment	Socioeconomic (Health and Safety)	Community Health and Safety	IC 24: Risks to community health and safety due to increased traffic; the transport, storage, and use and/or disposal of materials (e.g., fuel and chemicals); and access to structural elements or components of the project by members of the community.
Excavation, cuts, filling-in, compaction, leveling Building of structures ***outside*** river Heavy equipment operations	Socioeconomic (Cultural)	Cultural Heritage	IC 25: Risks to built heritage, objects, and sites that have archaeological, historical, religious, or other cultural value and significance.

Impacts at the Worksite Closure Phase (i.e., project closure phase)

Action	Component	Factors	Impact Identified
Dismantling & demolition of provisional facilities	Atmosphere	Air Quality	IW 1: Localized emissions of combustion gas and dust resulting from the use of machinery and equipment and circulation of vehicles.
Transportation of equipment, construction materials/ vehicles, staff, consumables			
Cleaning and rehabilitation			
Dismantling & demolition of provisional facilities	Atmosphere	Air Quality	IW 2: Long-term effects of greenhouse gas emissions from the use of machinery and equipment and circulation of vehicles.
Transportation of equipment, construction materials/ vehicles, staff, consumables			
Cleaning and rehabilitation			
Dismantling & demolition of provisional facilities	Atmosphere	Noise and Vibration	IW 3: Noise emissions resulting from the use of machinery and equipment, structure demolition and circulation of vehicles on the project area.
Transportation of equipment, construction materials/ vehicles, staff, consumables			
Cleaning and rehabilitation			
Dismantling & demolition of provisional facilities	Land	Soil Quality	IW 4: Land pollution due to wrong management of waste, as well as possible dripping of hydrocarbons from machinery and equipment, and wrong storage of oil and fuel.
Dismantling & demolition of provisional facilities	Surface Water	Water Quality	IW 5: Pollution of water bodies nearby due to wrong management and disposal of waste during structure dismantling and demolition.
Cleaning and rehabilitation	Flora	Vegetation coverage	IW 6: Planting of vegetation on the site after rehabilitating disturbed areas.
Cleaning and rehabilitation	Terrestrial Fauna	Habitat	IW 7: Restoration of land.
Dismantling & demolition of provisional facilities	Landscape	Quality	IW 8: Modification of original landscape due to loss of vegetation coverage and presence of machinery and equipment.
Cleaning and rehabilitation			IW 9: Improvement of landscape quality of the area due to rehabilitation of disturbed areas.
Dismantling & demolition of provisional facilities	Socioeconomic (Economic)	Jobs	IW 10: Creation of direct and indirect jobs because of hiring staff from the region.

Transportation of equipment, construction materials/ vehicles, staff, consumables Cleaning and rehabilitation			
Dismantling & demolition of provisional facilities Cleaning and rehabilitation	Socioeconomic (Economic)	Local and Regional Development	IW 11: Demand of services in neighboring towns (food, accommodation, recreation, vehicles, machinery, and equipment).
Dismantling & demolition of provisional facilities Cleaning and rehabilitation	Socioeconomic (Services)	Water	IW 12: Water demand for construction activities, mainly to avoid spreading dust and particles during drilling, during operation of provisional facilities, during circulation of vehicles on dirt roads, and for general cleaning services.
Dismantling & demolition of provisional facilities Cleaning and rehabilitation	Socioeconomic (Services)	Energy	IW 13: Energy demand for provisional facilities, construction/deconstruction activities and lighting.
Dismantling & demolition of provisional facilities Cleaning and rehabilitation	Socioeconomic (Services)	Waste Management and Disposal	IW 14: Both the presence of staff at the site and preparation/construction/dismantling tasks will generate waste which need the use of sanitary landfill or municipal dumps duly authorized.
Dismantling & demolition of provisional facilities Cleaning and rehabilitation	Socioeconomic (Services)	Consumables	IW 15: Demand of consumables or materials to be used for preparation/construction/worksite closure activities and supplied from local or regional sources (food, fuel, sand, gravel, cement, wood, steel, among others).
Dismantling & demolition of provisional facilities Transportation of equipment, construction materials/ vehicles, staff, consumables	Socioeconomic (Health and Safety)	Occupational Health and Safety	IW 16: The exposure of workers to various physical hazards that may result to minor, disabling, catastrophic, or fatal injuries.
Cleaning and rehabilitation	Socioeconomic (Health and Safety)	Community Health and Safety	IW 17: Risks to community health and safety due to increased traffic; the transport, storage, and use and/or disposal of materials (e.g., fuel and chemicals); and access to structural elements or components of the project by members of the community.

Impacts at the Operation Phase			
Action	**Component**	**Factors**	**Impact Identified**
Vehicle use of the new road and bridge	Atmosphere	Air Quality	

Maintenance of road and associated facilities			IO 1: Short-term and localized emissions of combustion gas and dust resulting from the use of machinery and equipment and circulation of vehicles.
Vehicle use of the new road and bridge Maintenance of road and associated facilities	Atmosphere	Air Quality	IO 2: Long-term effects of greenhouse gas emissions from the use of machinery and equipment and circulation of vehicles.
Vehicle use of the new road and bridge Maintenance of road and associated facilities	Atmosphere	Noise and Vibration	IO 3: Noise emissions resulting from the use of vehicles on the new road and bridge and from the use of machinery and equipment during maintenance activities
Vehicle use of the new road and bridge	Land	Soil Quality	IO 4: Pollution due to littering.
Vehicle use of the new road and bridge Accidents resulting in spilled fuel/oil, or contaminated road surface runoff Maintenance of road and associated facilities	Surface Water	Water Quality	IO 5: Surface water contamination from accidentally spilled fuel/oil or surface runoff.
Accidents resulting in spilled fuel/oil, or contaminated road surface runoff Maintenance of road and associated facilities	Groundwater	Water Quality	IO 6: Groundwater contamination from accidentally spilled fuel/oil and road surface runoff.
Vehicle use of the new road and bridge	Terrestrial Fauna	Distribution	IO 7: Displacement of species due to noise from the presence of normal traffic maintenance activities.
Accidents resulting in spilled fuel/oil, or contaminated road surface runoff Maintenance of road and associated facilities	Aquatic Fauna	Habitat	IO 8: Degradation of aquatic habitat from accidentally spilled fuel/oil or surface runoff from bridge.
Maintenance of road and associated facilities	Aquatic Fauna	Species	IO 9: Mortality of sturgeon from illegal fishing activities using the bridge structures.
Vehicle use of the new road and bridge Land restoration in provisional roads and temporarily disturbed areas	Landscape	Quality	IO 10: Modification of the original landscape from the presence of new infrastructure.
Maintenance of road and associated facilities	Socioeconomic (Economic)	Jobs	IO 11: Creation of direct and indirect jobs because of hiring staff from the region.
Vehicle use of the new road and bridge	Socioeconomic (Economic)	Local and Regional Development	IO 12: Improved road traffic capacity and connectivity resulting in socioeconomic benefits.

Vehicle use of the new road and bridge Accidents resulting in spilled fuel/oil, or contaminated road surface runoff Maintenance of road and associated facilities	Socioeconomic (Economic)	Waste Management and Disposal	IO 13: Services demand for management of waste generated during maintenance activities.
Vehicle use of the new road and bridge Accidents resulting in spilled fuel/oil, or contaminated road surface runoff	Socioeconomic (Health and Safety)	Occupational Health and Safety	IO 14: The exposure of workers to various physical hazards that may result to minor, disabling, catastrophic, or fatal injuries.
Accidents resulting in spilled fuel/oil, or contaminated road surface runoff Maintenance of road and associated facilities	Socioeconomic (Health and Safety)	Community Health and Safety	IO 15: Road accidents resulting from higher travel speeds and increased traffic.

IP – Preparation Phase Impact
IC – Construction Phase Impact
IW – Worksite Closure Phase Impact
IO – Operation Phase Impact

3.c - Impact Significance Matrix

3.c.i - Impact Significance Rating Methodology

44. The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the approval process; secondly, it serves to show the primary impact characteristics, as defined above, used to evaluate impact significance. The impact significance rating system is presented in Table 97 and described as follows:

- **Part A:** Define impact consequence using the three primary impact characteristics of magnitude, spatial scale, and duration.
- **Part B:** Use the matrix to determine a rating for impact consequence based on the definitions identified in Part A; and
- **Part C:** Use the matrix to determine the impact significance rating, which is a function of the impact consequence rating (from Part B) and the probability of occurrence.

45. Using the matrix, the significance of each described impact is rated.

Table 97: Method for Rating Significance

PART A: DEFINING CONSEQUENCE IN TERMS OF MAGNITUDE, DURATION AND SPATIAL SCALE			
Definition		**Criteria**	
MAGNITUDE		**Negative**	**Positive**
	Major	• Large number of receptors affected • Receptors highly sensitive and/or are of conservation importance • Substantial deterioration, nuisance or harm to receptors expected • Relevant thresholds often exceeded • Significant public concern expressed during stakeholder consultation • Receiving environment has an inherent value to stakeholders	• Large number of receptors affected • Receptors highly amenable to positive change • Receptors likely to experience a big improvement in their situation • Relevant positive thresholds often exceeded
	Moderate	• Some receptors affected • Receptors slightly sensitive and/or of moderate conservation importance • Measurable deterioration, nuisance or harm to receptors • Relevant thresholds occasionally exceeded • Limited public concern expressed during stakeholder consultation • Limited value attached to the environment	• Some receptors affected • Receptors likely to experience some improvement in their situation • Relevant positive thresholds occasionally exceeded
	Minor	• No or limited receptors within the zone of impact • Receptors not sensitive to change • Minor deterioration, nuisance, or harm to receptors • Change not measurable or relevant thresholds never exceeded • Stakeholders have not expressed concerns regarding the receiving environment	• No or limited receptors affected • Receptors not sensitive to change • Minor or no improvement in current situation • Change not measurable • Relevant positive thresholds never exceeded No stakeholder comment expected

TIMEFRAME		**Duration of Continuous Aspects**	**Frequency of Intermittent Aspects**
	Short term / low frequency	• Less than 4 years from onset of impact	• Occurs less than once a year

	Medium term / medium frequency	• More than 4 years from onset of impact up to end of life of project (approximately 30 years)	• Occurs less than 10 times a year but more than once a year
	Long term / high frequency	• Impact is experienced during and beyond the life of the project (greater than 30 years)	• Occurs more than 10 times a year
SPATIAL SCALE		**Biophysical**	**Socio-economic**
	Small	• Within the defined 'area of influence'	• Within the defined 'area of influence'
	Intermediate	• Within the district in which is the facilities are located	• Within the municipality in which the activity occurs
	Extensive	• Beyond the district in which the facilities are located	• Beyond the municipality in which the activity occurs

PART B: DETERMINING CONSEQUENCE RATING

MAGNITUDE	TIMEFRAME	SPATIAL SCALE		
		Small	Intermediate	Extensive
Minor	Short term / low frequency	Low	Low	Medium
	Medium term / medium frequency	Low	Low	Medium
	Long term / high frequency	Medium	Medium	Medium
Moderate	Short term / low frequency	Low	Medium	Medium
	Medium term / medium frequency	Medium	Medium	High
	Long term / high frequency	Medium	High	High
Major	Short term / low frequency	Medium	Medium	High
	Medium term / medium frequency	Medium	Medium	High
	Long term / high frequency	High	High	High

PART C: DETERMINING SIGNIFICANCE RATING

		CONSEQUENCE		
		Low	Medium	High
PROBABILITY (of exposure to impacts)	Definite	Low	Medium	High
	Possible	Low	Medium	High
	Unlikely	Low	Low	Medium

46. Wherever the Project is likely to result in unacceptable impact on the environment, mitigation measures are proposed (over and above the inherent design measures included in the Project description). In addition, good practice measures may be proposed however these are unlikely to change the impact significance. In the case of positive impacts, management measures are suggested to optimize the benefits to be gained. Where mitigation measures are required the impact will be rated again to show the residual impact after implementation of management controls.

47. The following mitigation hierarchy will be utilized in selecting practical mitigation measures for unacceptable impacts as follows (in order of preference):

- Avoid the impact wherever possible by removing the cause(s).
- Reduce the impact as far as possible by limiting the cause(s).
- Ameliorate the impact by protecting the receptor from the cause(s) of the impact.
- Providing compensatory measures to offset the impact, particularly where an impact is of high significance and none of the above are appropriate.

3.c.ii - Project Impact Significance Matrix

48. Based on the impact assessment methodology discussed above, Table 98 presents the significance of impacts identified for the Project.

Table 98: Impact Significance Matrix

Environmental / Social Component	**Factor**	**Project Phase** P-Preparation, C-Construction, WC-Worksite Closure, O-Operation	**Impact** IP - Preparation Phase Impact IC – Construction Phase Impact IW – Worksite Closure Phase Impact IO – Operation Phase Impact	**No. of Receptors Affected**	**Sensitivity of Receptors**	**Level of Public Concern**	**Severity or degree of change to the receptor**	**Magnitude**	**Timeframe**	**Spatial Scale**	**Consequence**	**Probability**	**Significance**
Atmosphere	Air Quality	P, C, WC, O	IP, IC, IW, IO 1: Localized emissions of combustion gas and dust resulting from the use of machinery and equipment and circulation of vehicles.	L	H	L	L	MOD	H/F	SMALL	M	DEF	**M**
		P, C, WC, O	IP, IC, IW, IO 2: Long-term effects of greenhouse gas emissions from the use of machinery and equipment and circulation of vehicles.	H	L	L	L	MIN	H/F	EXT	L	DEF	**L**
	Noise and Vibration	P, C, WC, O	IP, IC, IW, IO 3. Noise and vibration emissions resulting from the use of machinery and equipment and vehicle circulation.	M	H	M	M	MOD	ST	SMALL	M	DEF	**M**
Land	Soil Structure	P, C	IP, IC 4: Land erosion due to loss of vegetation coverage and changes in its structure	L	M	M	M	MOD	MT	SMALL	M	POSS	**M**
	Soil Qulity	P, C, WC	IP, IC 5, IW 4: Land pollution due to wrong management of solid waste, as well as possible dripping of hydrocarbons from machinery and equipment, and wrong storage of oil and fuel.	L	M	M	M	MOD	ST	SMALL	L	POSS	**L**
		O	IO 4: Pollution due to littering.	L	L	L	L	MIN	H/F	SMALL	L	DEF	**L**
	Relief	P	IP 6: Modification of geological formations.	L	M	L	M	MOD	LT	SMALL	M	DEF	**M**

Surface Water	Surface Drainage (run-off patterns)	P	IP 7: Modification of surface hydrological pattern due to removal of vegetation and construction of provisional works and roads.	M	M	L	M	MOD	MT	SMALL	M	POSS	**M**
		C	IC 7: Modification of surface hydrological pattern due to modification of geological formations and construction of elements which may block the original pattern of surface run-off.	M	M	L	L	MOD	LT	SMALL	M	POSS	**M**
	Water Quality	P, C	IP, IC 8: Pollution of nearby water bodies due to poor storage and management of waste and construction materials, which may be introduced through runoff or leaching through the soil.	M	M	L	M	MOD	ST	INTER	M	POSS	**M**
		WC	IW 5: Pollution of water bodies nearby due to wrong management and disposal of waste during structure dismantling and demolition	M	M	L	M	MOD	ST	INTER	M	POSS	**M**
		O	IO 5: Surface water contamination from accidentally spilled fuel/oil and road surface runoff.	M	M	M	M	MOD	LT	INTER	H	POSS	**H**
Groundwater	Water Quality	O	IO 6: Groundwater contamination from accidentally spilled fuel/oil and road surface runoff.	M	M	L	M	MOD	LT	INTER	H	POSS	**H**
		C	IC 9: Pollution of groundwater due to poor storage and management of waste and construction materials, and improper vehicle maintenance.	M	M	M	M	MOD	ST	INTER	M	POSS	**M**
Flora	Vegetation Coverage	P	IP 9: Loss of vegetation coverage in specific areas of the project.	M	L	L	L	MIN	MT	SMALL	L	DEF	**L**
		P	IP 10: Introduction of invasive alien species.	L	M	L	H	MOD	LT	INTER	M	POSS	**H**
		WC	IW 6: Planting of vegetation on the site after rehabilitating disturbed areas.	M	L	L	L	MIN	ST	SMALL	L	DEF	**L+**
	Species	P, C	IP 11, IC 10: Mortality of individuals.	L	H	M	L	MOD	MT	SMALL	M	UNLIKE	**L**

Terrestrial Fauna	Habitat	P	IP 12: Modification and fragmentation of habitat due to loss of vegetation coverage.	L	L	M	L	MIN	LT	SMALL	M	POSS	**M**
		P	IP 13: Introduction of invasive alien species.	L	M	L	H	MOD	LT	INTER	M	POSS	**H**
		WC	IW 7: Restoration of land.	L	L	L	L	MIN	LT	SMALL	M	DEF	**M+**
	Distribution	P, C	IP 14, IC 11: Displacement of species due to noise, presence of machinery and equipment and presence of staff.	M	M	M	L	MOD	ST	SMALL	L	DEF	**L**
		O	IO 7: Displacement of species due to noise from the presence of normal road traffic and maintenance activities.	M	M	M	L	MOD	LT	SMALL	M	POSS	**M**
	Species	P	IP 15: Mortality of terrestrial fauna individuals.	L	H	L	L	MIN	ST	SMALL	L	POSS	**L**
Aquatic Fauna	Habitat	P	IP 16: Introduction of invasive alien species	L	M	L	H	MOD	LT	INTER	M	POSS	**H**
		C	IC 12: Modification and fragmentation of habitat, including loss of spawning grounds for wild sturgeon species.	L	H	H	H	MAJ	LT	INTER	H	POSS	**H**
		O	IO 8: Degradation of aquatic habitat from accidentally spilled fuel/oil or surface runoff from bridge.	L	H	H	M	MAJ	MT	SMALL	M	POSS	**M**
	Distribution	C	IC 13: Displacement of species due to noise, presence of machinery, and equipment and of staff.	L	H	H	H	MAJ	ST	SMALL	M	DEF	**M**
	Species	C	IC 14: Mortality of individuals, from operation of equipment and construction activities, or poaching by construction workers.	L	H	H	L	MAJ	ST	SMALL	M	POSS	**M**

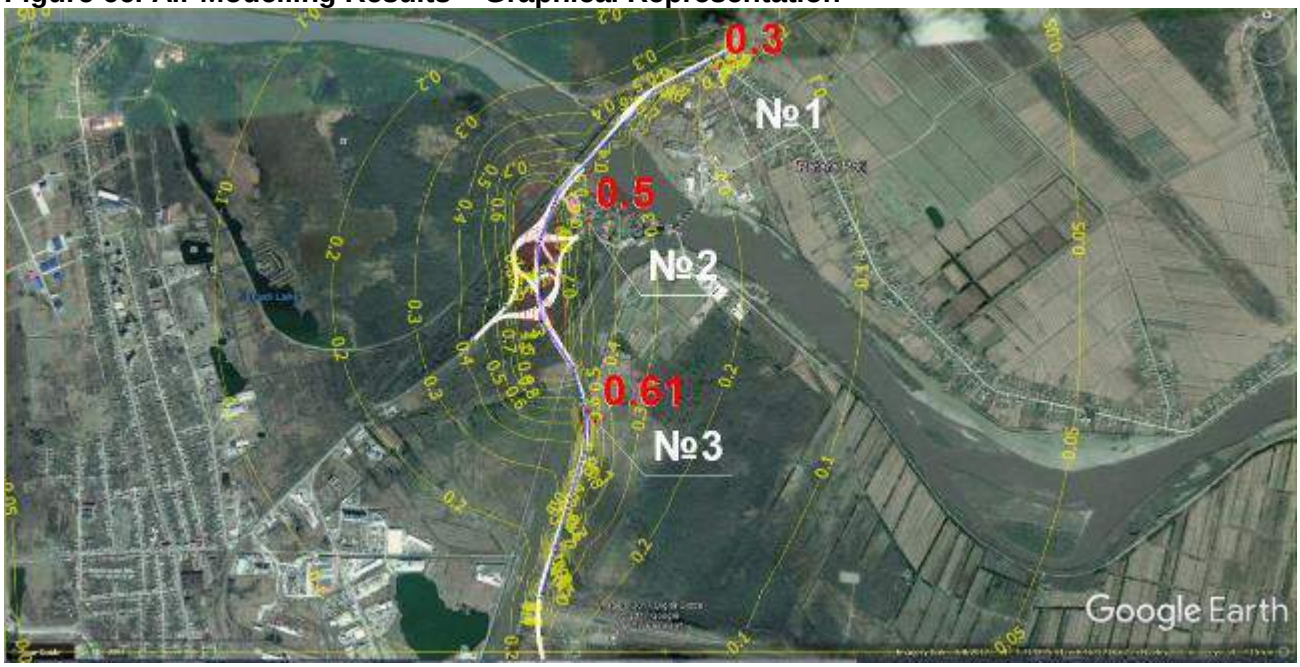
		O	IO 9: Mortality of sturgeon from illegal fishing activities using the bridge structures.	L	H	H	M	MAJ	LT	SMALL	H	POSS	**H**
Landscape	Quality	P, C, WC	IP 17, IC 15, IW 8: Modification of original landscape due to loss of vegetation coverage and presence of machinery and equipment.	M	M	L	M	MOD	MT	SMALL	M	DEF	**M**
		WC	IW 9: Improvement of landscape quality of the area due to rehabilitation of disturbed areas.	M	M	L	M	MOD	ST	SMALL	L	POSS	**L+**
		O	IO 10: Modification of the original landscape from the presence of new infrastructure.	H	M	L	M	MOD	LT	SMALL	M	DEF	**M**
Socioeconomic (Economic)	Land Use and Livelihoods	P	IP 18: Land acquisition and livelihood loss to affected persons.	L	H	M	M	MOD	ST	SMALL	M	DEF	**M**
	Jobs	P, C, WC, O	IP 19, IC 16, IW 10, IO 11: Creation of direct and indirect jobs because of hiring staff from the region.	M	H	L	M	MOD	MT	INTER	M	DEF	**M+**
	Local Development	P	IP 20: Payment to owners for leasing their premises and compensation for change of land use on their premises.	L	H	L	M	MOD	ST	SMALL	L	DEF	**L+**
	Local and Regional Development	P, C, WC	IP 21, IC 17, IW 11: Demand of services in neighboring towns (food, accommodation, recreation, vehicles, machinery, and equipment).	M	H	L	M	MOD	ST	INTER	M	DEF	**M+**
		C	IC 18: Road access restrictions to traffic during to construction phase.	M	M	L	L	MOD	ST	INTER	M	DEF	**M**
		O	IO 12: Improved road traffic capacity and connectivity resulting in socioeconomic benefits.	M	L	L	L	MIN	LT	INTER	M	DEF	**M+**
Socioeconomic (Services)	Water	P, C, WC	IP 22, IC 19, IW 12: Water demand for construction activities, mainly to avoid spreading dust and particles during drilling, during operation of provisional facilities, during circulation of vehicles on dirt roads, and for general cleaning services.	M	L	L	L	MIN	ST	SMALL	L	DEF	**L**
	Energy	P, C, WC	IP 23, IC 20, IW 13: Energy demand for provisional facilities, construction/deconstruction activities and lighting.	L	L	L	L	MIN	ST	SMALL	L	DEF	**L**

		P	IP 24: The disruption of services, including energy, to surrounding communities due to relocation of utilities.	M	M	M	H	MOD	ST	INTER	M	DEF	**M**
	Waste Management and Disposal	P, C, WC	IP 25, IC 21, IW 14: Both the presence of staff at the site and preparation/construction/dismantling tasks will generate waste which need the use of sanitary landfill or municipal dumps duly authorized.	M	L	M	M	MOD	ST	INTER	M	DEF	**M**
		O	IO 13: Services demand for management of waste generated during maintenance activities.	M	L	L	M	MOD	MT	INTER	M	DEF	**M**
	Consumables	P, C, WC	IP 26, IC 22, IW 15: Demand of consumables or materials to be used for preparation/construction/worksite closure activities and supplied from local or regional sources (food, fuel, sand, gravel, cement, wood, steel, among others).	M	L	L	M	MOD	ST	INTER	M	DEF	**M+**
Socioeconomic (Health and Safety)	Occupational Health and Safety	P, C, WC, O	IP 27, IC 23, IW 16, IO 14: The exposure of workers to various physical hazards that may result to minor, disabling, catastrophic, or fatal injuries.	H	H	H	H	MAJ	ST	SMALL	M	POSS	**M**
	Community Health and Safety	P, C, WC	IP 28, IC 24, IW 17: Risks to community health and safety due to increased traffic; the transport, storage, and use and/or disposal of materials (e.g., fuel and chemicals); and access to structural elements or components of the project by members of the community.	M	H	H	H	MAJ	ST	SMALL	M	POSS	**M**
		O	IO 15: Road accidents resulting from higher travel speeds and increased traffic.	H	M	L	M	MOD	LT	SMALL	M	POSS	**M**
Socioeconomic (Cultural)	Cultural Heritage	P, C	IP 29, IC 25: Risks to built heritage, objects, and sites that have archaeological, historical, religious, or other cultural value and significance.	L	H	L	M	MOD	ST	SMALL	L	POSS	**L**

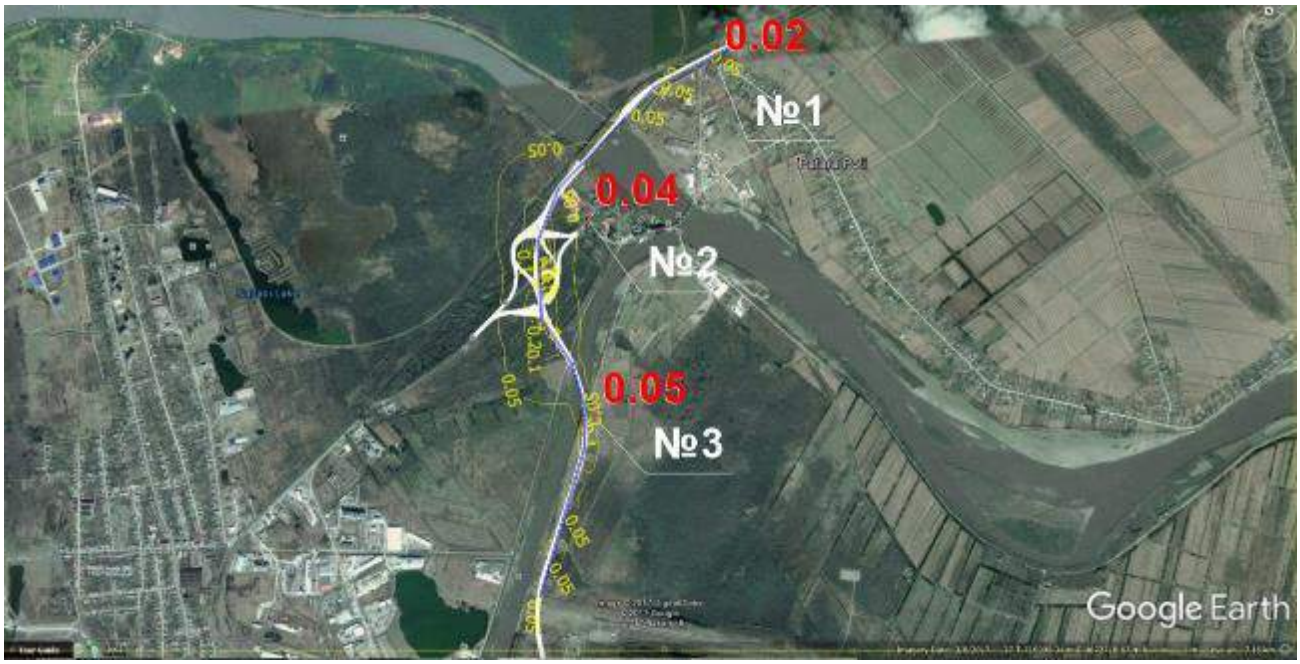
Note: The '+' sign indicates significance of a positive impact.

Annex 4. Air Modelling Results – Graphical Representation (operation stage)

Figure 66. Air Modelling Results – Graphical Representation



NO2 (nitrogen (IV) oxide) (Code 301) max concentrations at the nearest residential area (points 1, 2, and 3)



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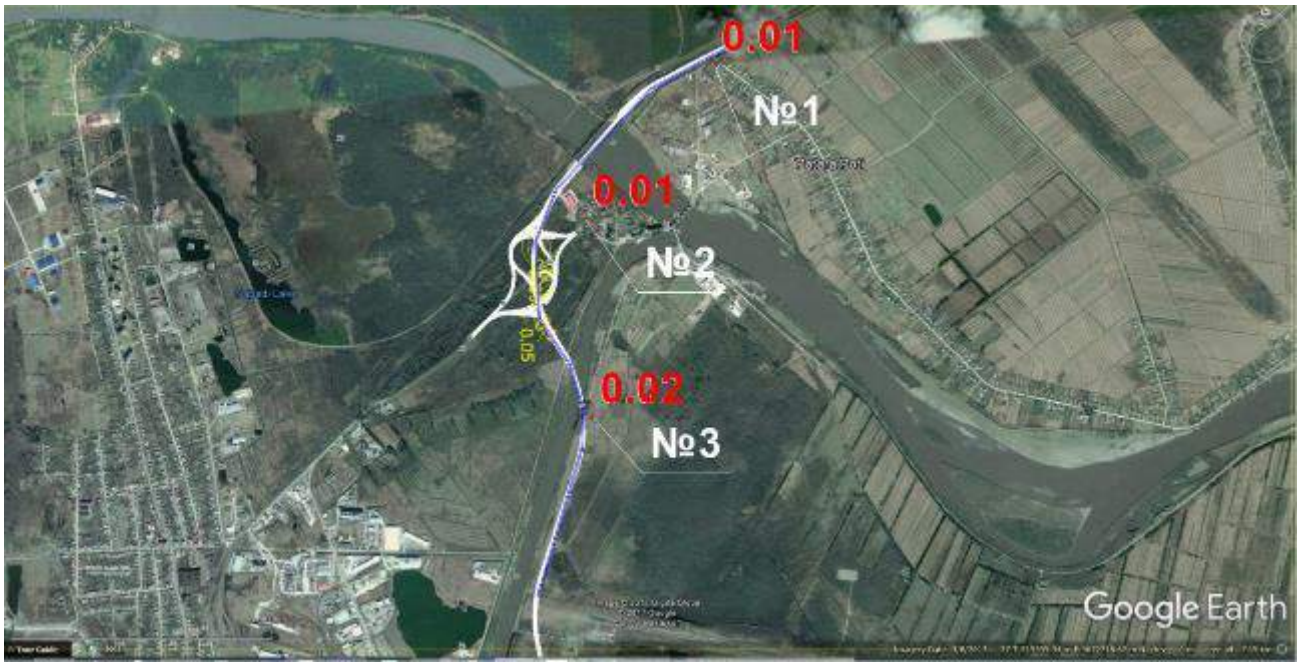
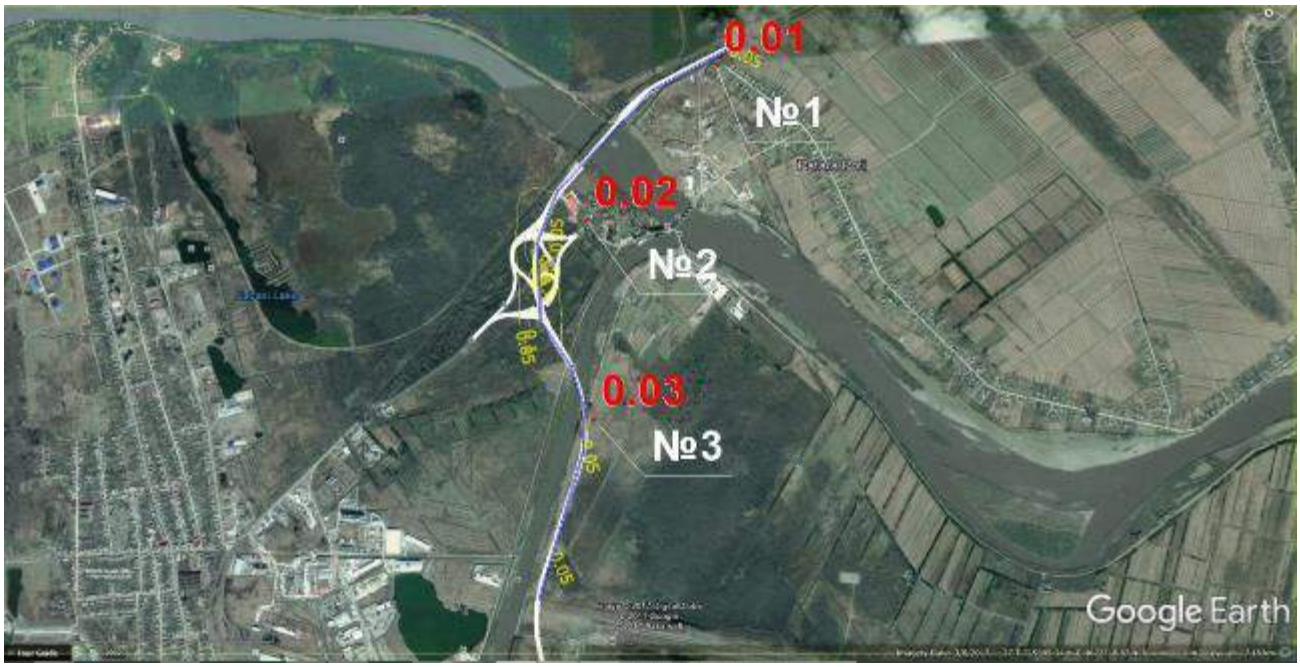


Soot (Code 328) max concentrations at the nearest residential area (points 1, 2, and 3)

Sulphur dioxide (Code 330) max concentrations at the nearest residential area (points 1, 2, and 3)

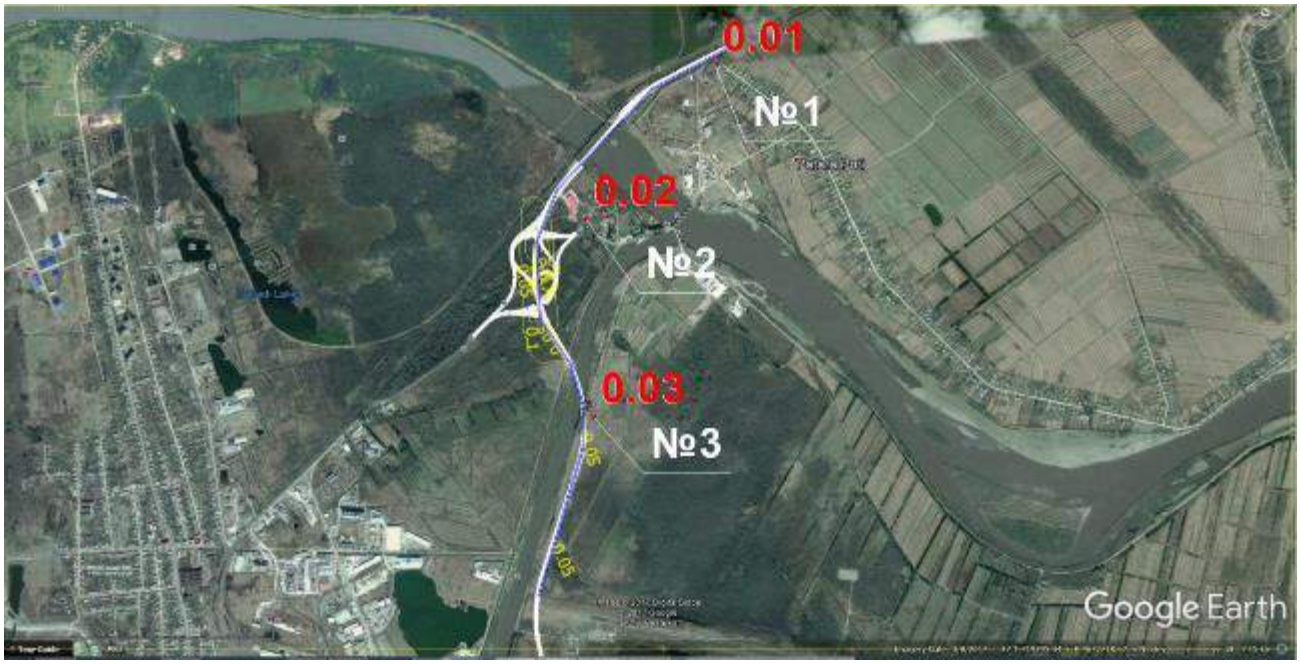


Carbon oxide (Code 337) max concentrations at the nearest residential area (points 1, 2, and 3)

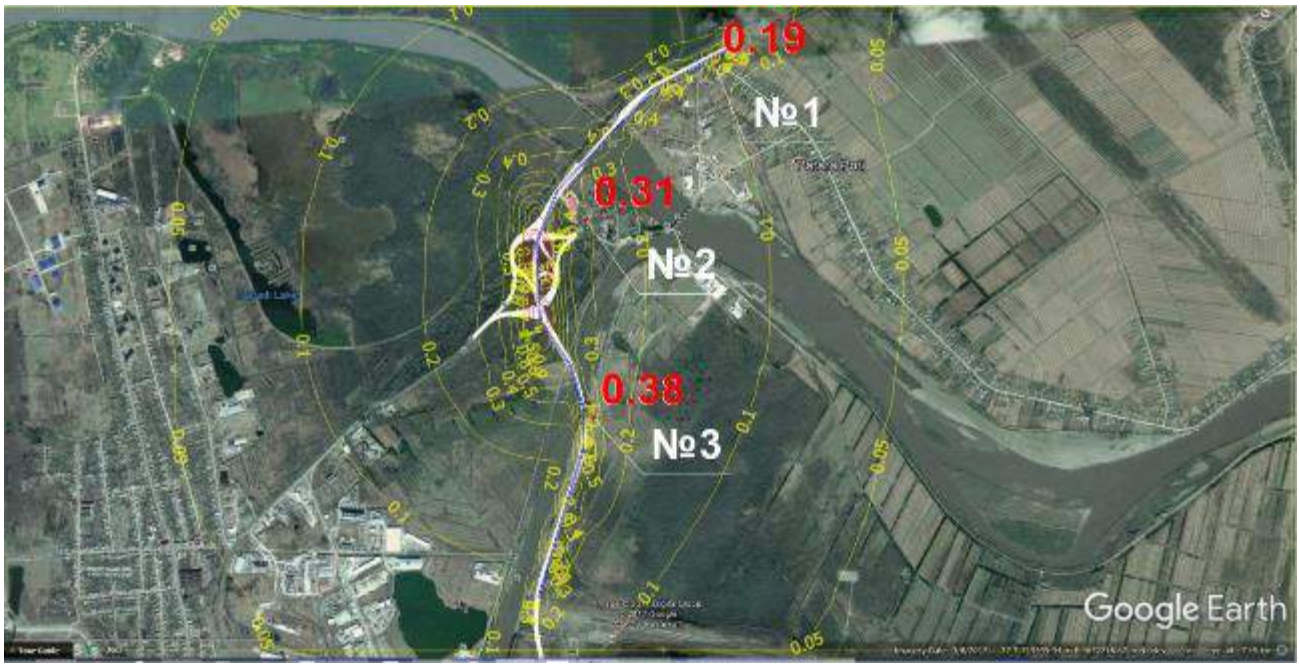
Benzo(a)pyrene (3,4 – benzoapyrene) (Code 703) max concentrations at the nearest residential area (points 1, 2, and 3)

Formaldehyde (Code 1325) max concentrations at the nearest residential area (points 1, 2, and 3)

Petroleum hydrocarbons (fuel fraction (Code 2704)) max concentrations at the nearest residential area (points 1, 2, and 3)

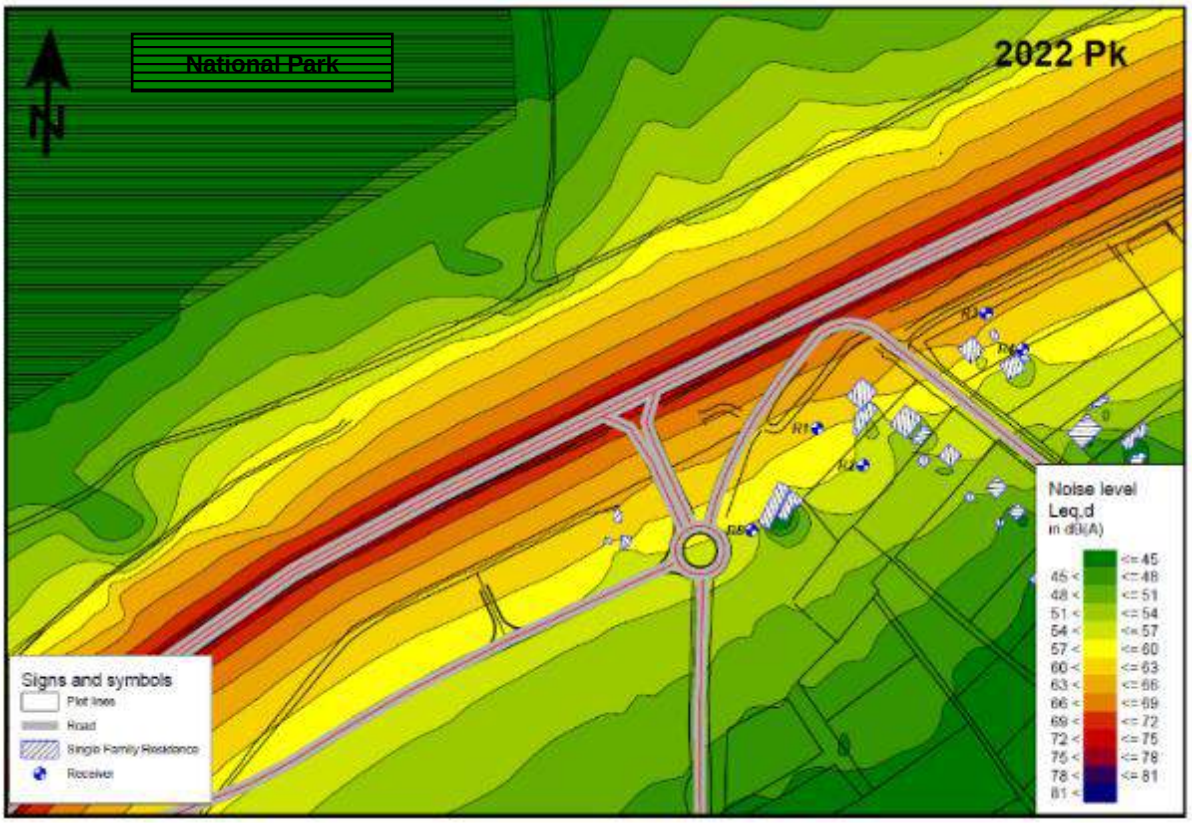


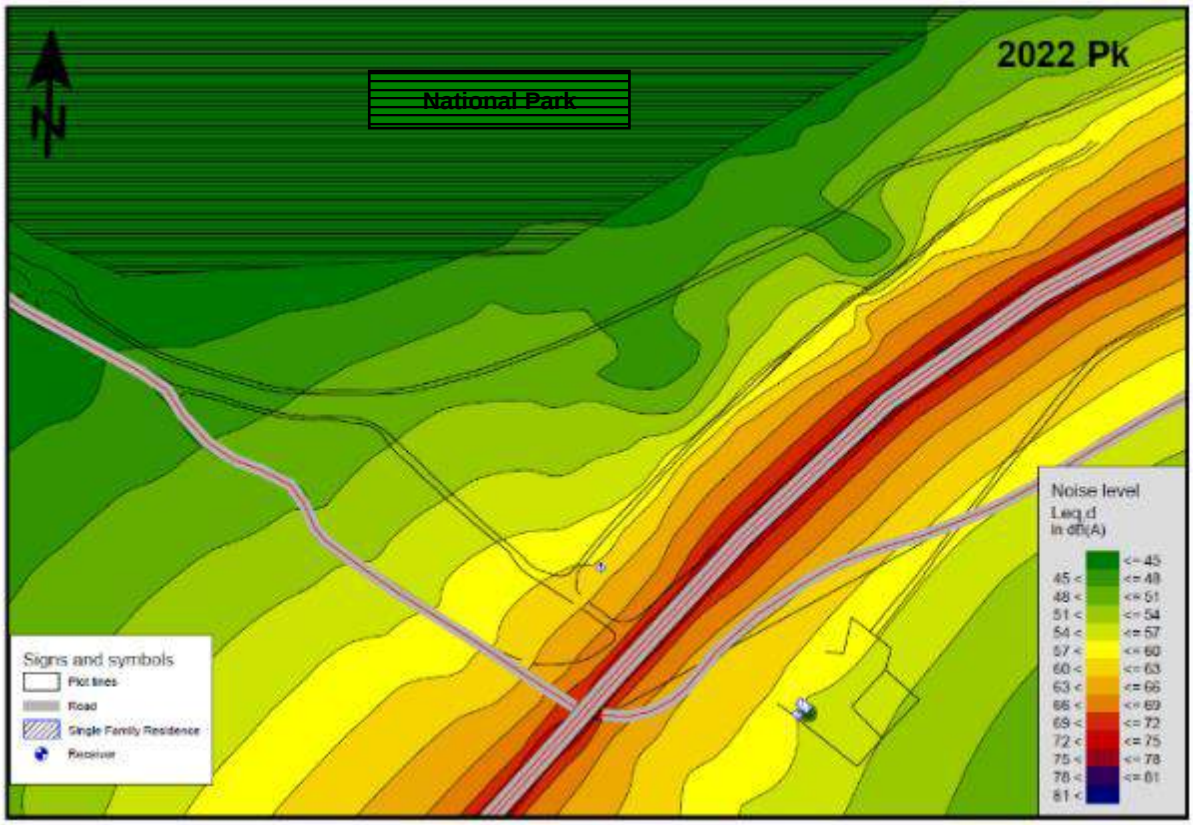
Petroleum hydrocarbons (kerosene fraction (Code 2732)) max concentrations at the nearest residential area (points 1, 2, and 3)

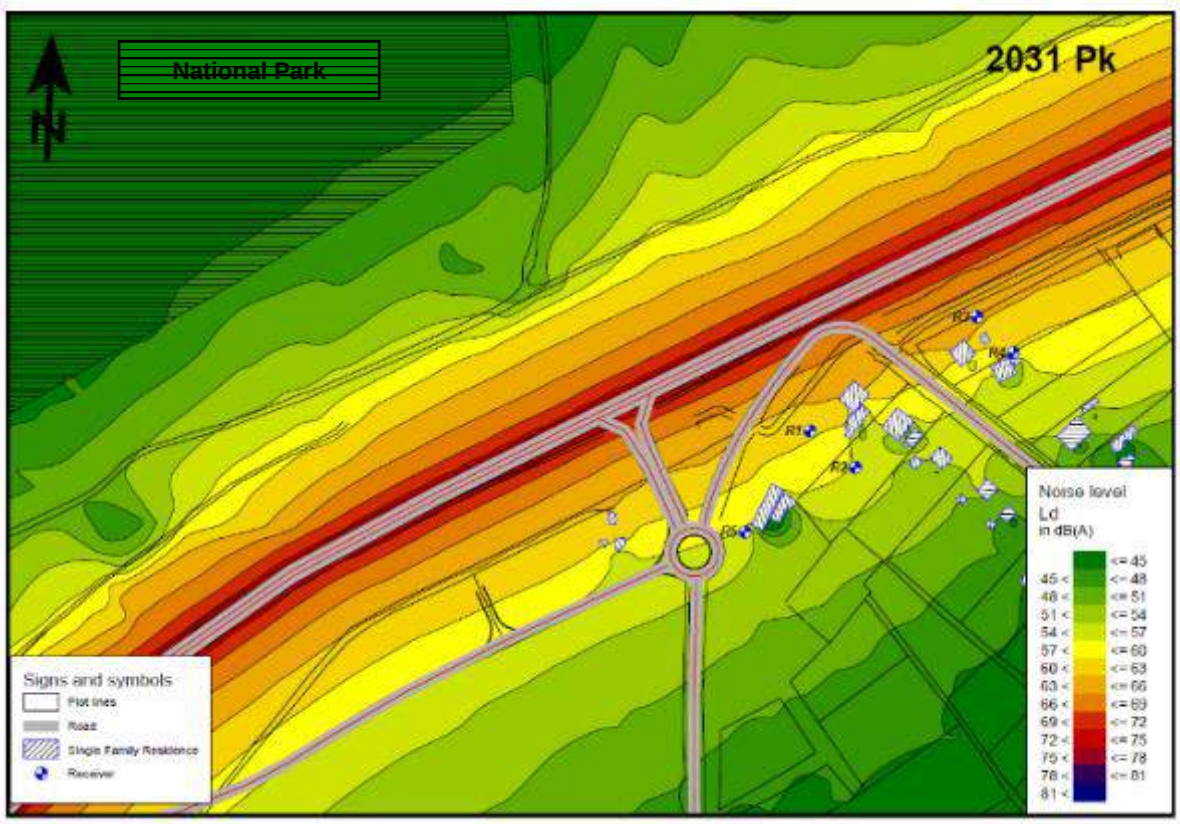


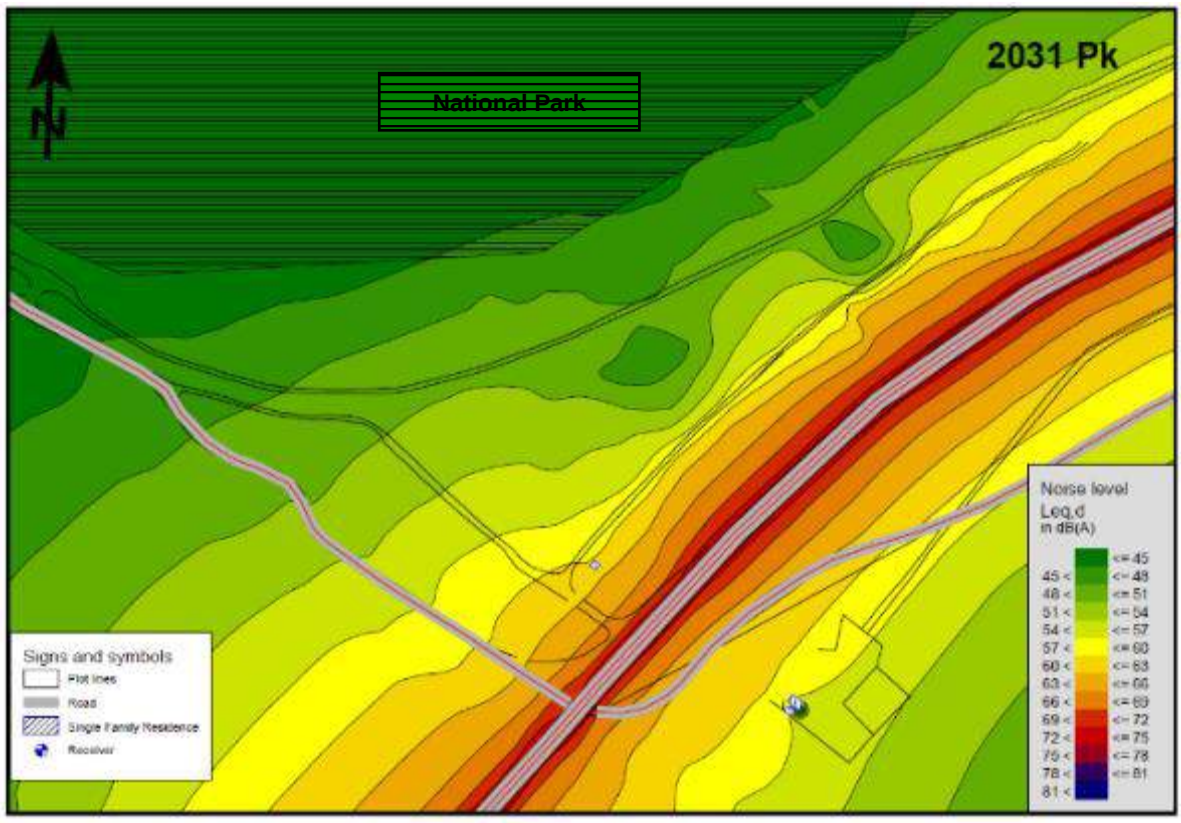
Summary impact group (Code 6204 nitrogen dioxide, sulfur dioxide) max concentrations at the nearest residential area (points 1, 2, and 3)

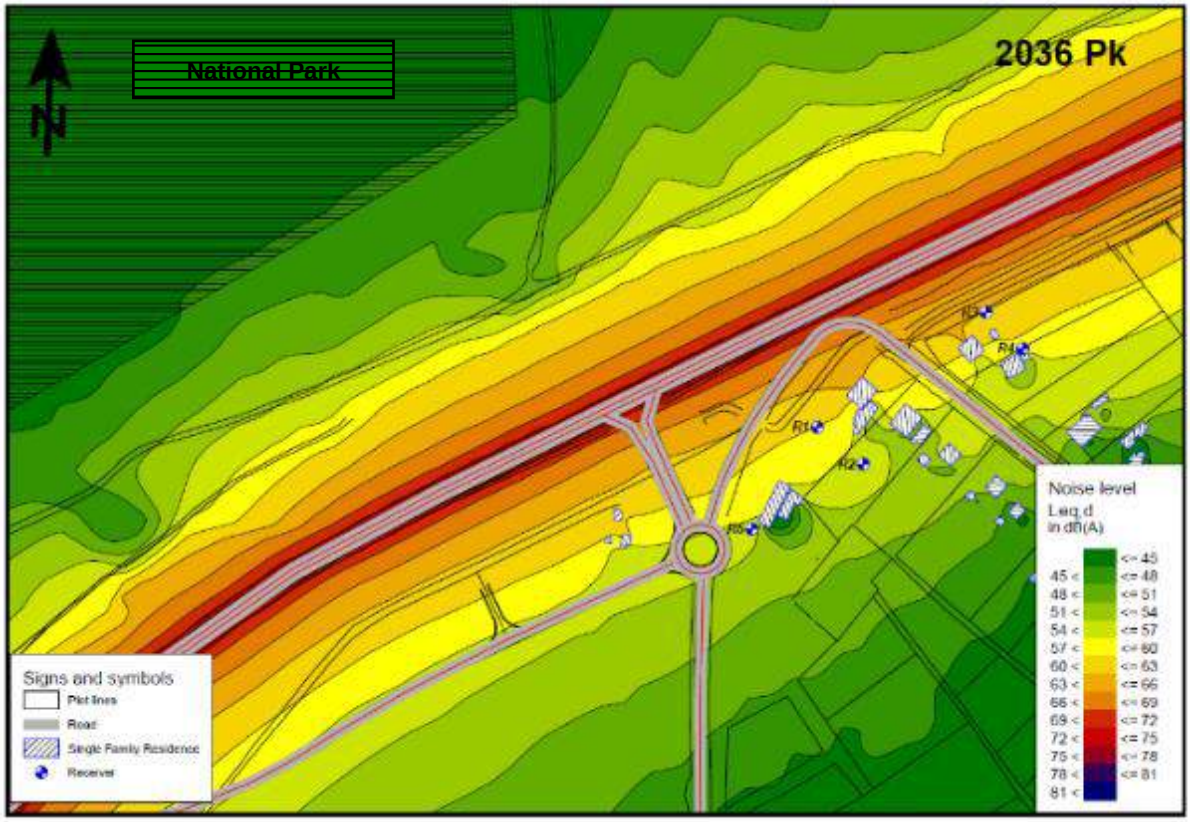
Annex 5. Noise Contour Maps

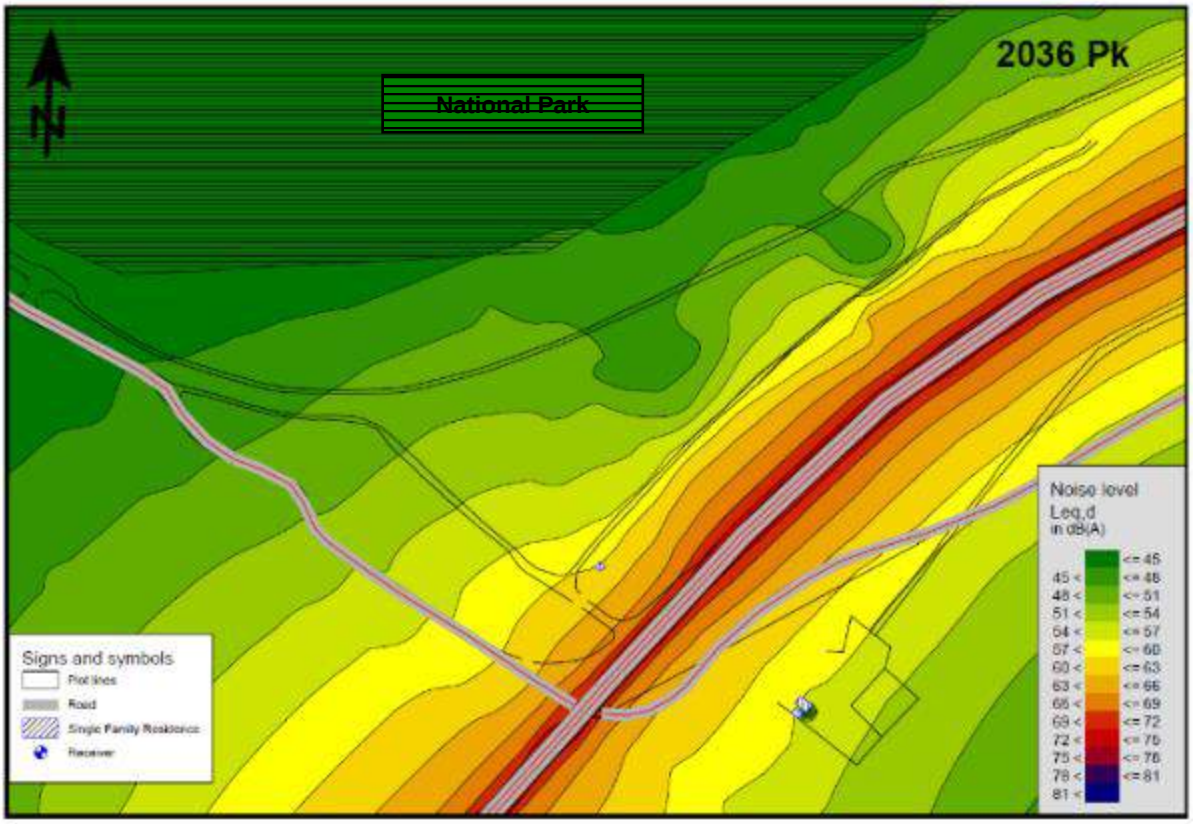


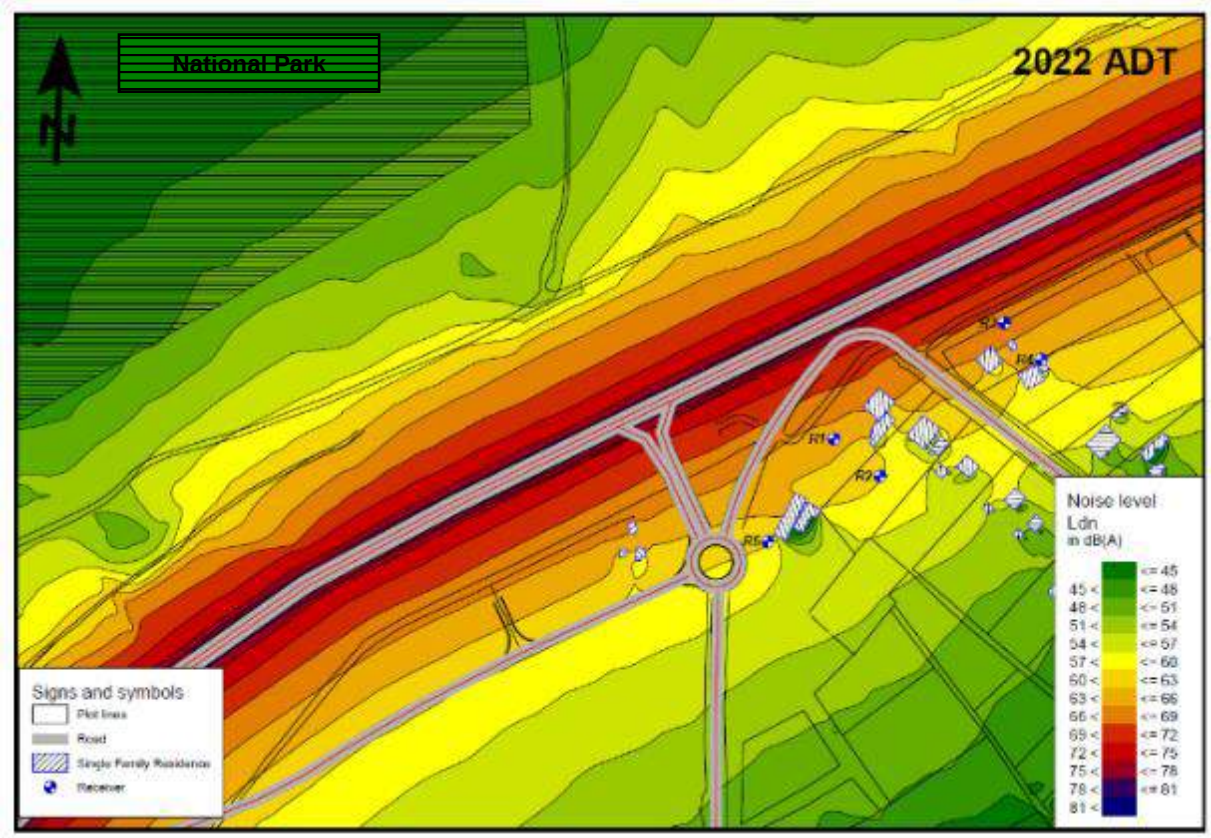



National Park
2031 Pk
N
R1
R2
R3
R4
Noise level
Ld
in dB(A)
<= 45
45 < <= 48
48 < <= 51
51 < <= 54
54 < <= 57
57 < <= 60
60 < <= 63
63 < <= 66
66 < <= 69
69 < <= 72
72 < <= 75
75 < <= 78
78 < <= 81
81 <
Signs and symbols
Plot lines
Road
Single Family Residence
Receiver


National Park
2031 Pk
N
Noise level
Leq,d
in dB(A)
<= 45
45 < <= 48
48 < <= 51
51 < <= 54
54 < <= 57
57 < <= 60
60 < <= 63
63 < <= 66
66 < <= 69
69 < <= 72
72 < <= 75
75 < <= 78
78 < <= 81
81 <
Signs and symbols
Plot lines
Road
Single Family Residence
Receiver


2036 Pk
National Park
N
Noise level
Leq,d
in dB(A)
<= 45
45 < <= 48
48 < <= 51
51 < <= 54
54 < <= 57
57 < <= 60
60 < <= 63
63 < <= 66
66 < <= 69
69 < <= 72
72 < <= 75
75 < <= 78
78 < <= 81
81 <
Signs and symbols
Plot lines
Road
Single Family Residence
Receiver


2036 Pk
National Park
N
Noise level
Leq,d
in dB(A)
<= 45
45 < <= 48
48 < <= 51
51 < <= 54
54 < <= 57
57 < <= 60
60 < <= 63
63 < <= 66
66 < <= 69
69 < <= 72
72 < <= 75
75 < <= 78
78 < <= 81
81 <
Signs and symbols
Plot lines
Road
Single Family Residence
Receiver


National Park
2022 ADT
N
R1
R2
R3
R4
R5
Noise level
Ldn
in dB(A)
<= 45
45 < <= 48
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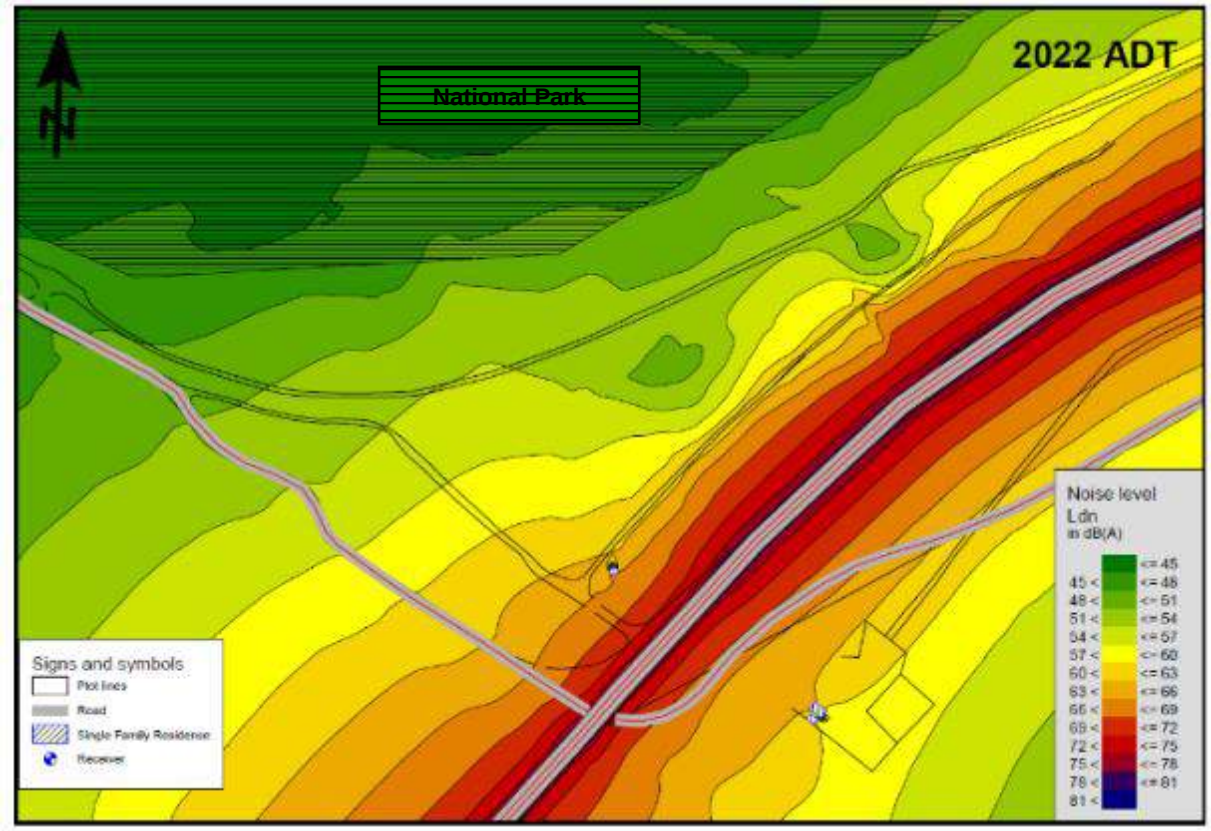
51 < <= 54
54 < <= 57
57 < <= 60
60 < <= 63
63 < <= 66
66 < <= 69
69 < <= 72
72 < <= 75
75 < <= 78
78 < <= 81
81 <
Signs and symbols
Plot lines
Road
Single Family Residence
Receiver


National Park
2022 ADT
N
Noise level
Ldn
in dB(A)
<= 45
45 < <= 48
48 < <= 51
51 < <= 54
54 < <= 57
57 < <= 60
60 < <= 63
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66 < <= 69
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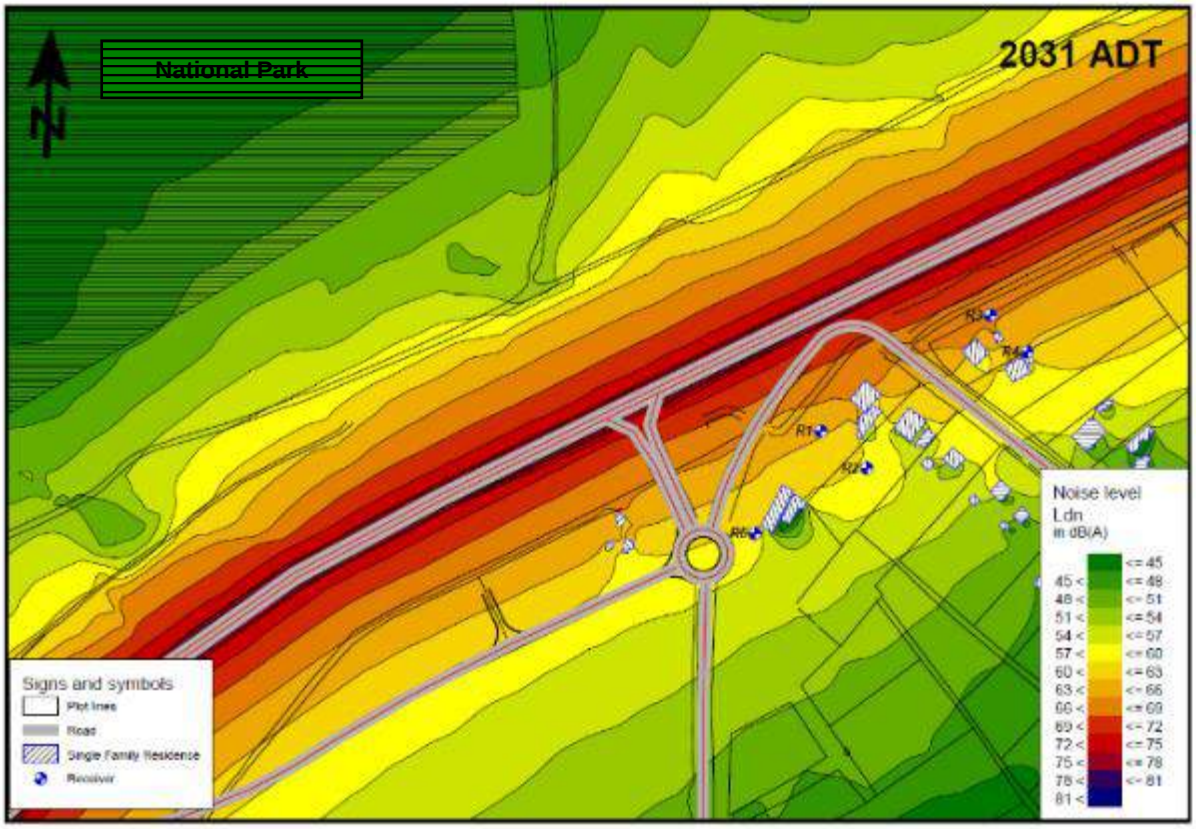
Plot lines
Road
Single Family Residence
Receiver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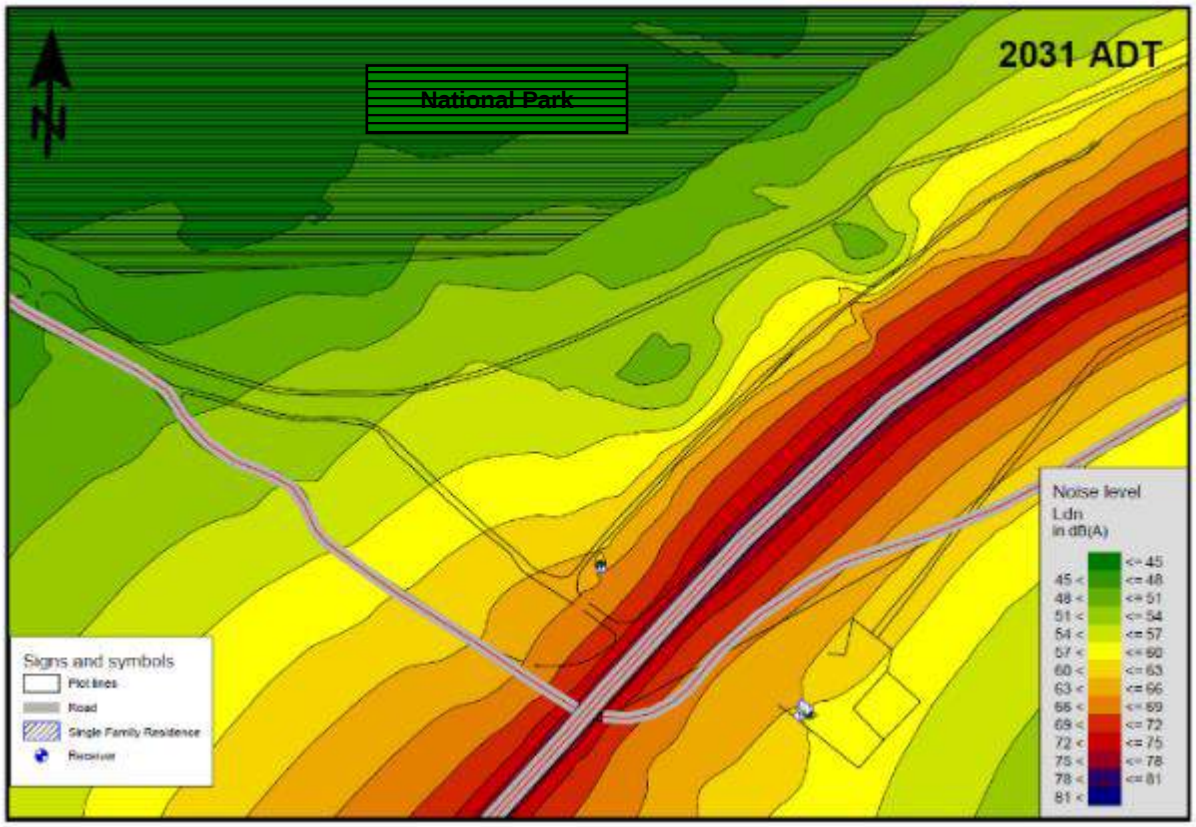
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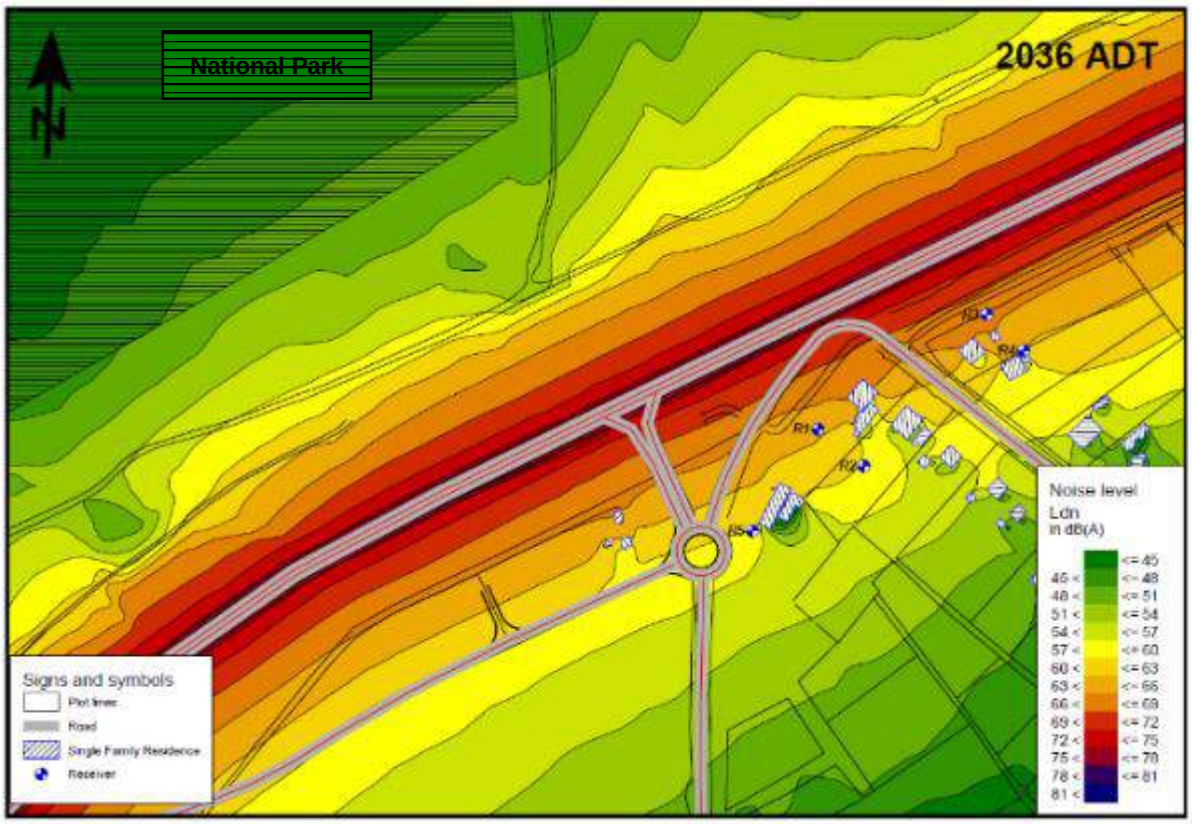
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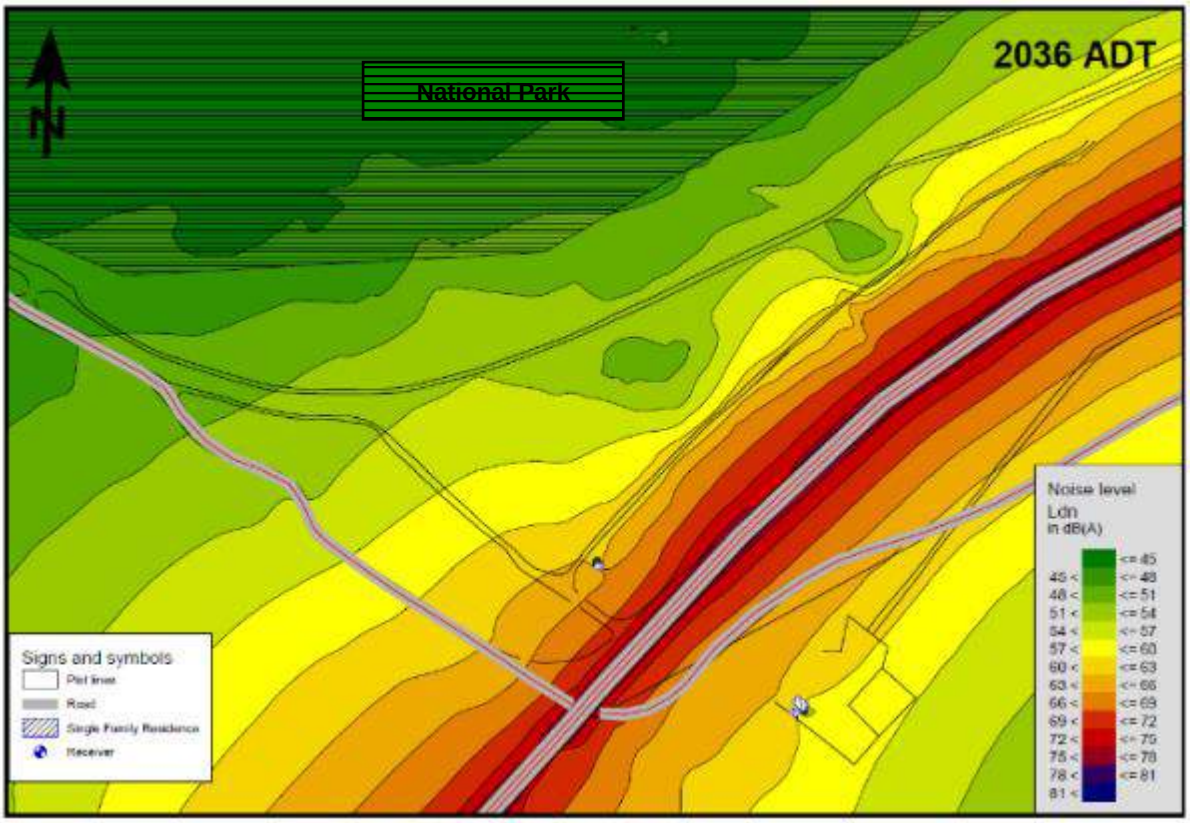
Single Family Residence
Receiver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Single Family Residence
Receiver

Annex 6. Chance Find Procedure

Purpose of the chance find procedure

49. The chance find procedure is a project-specific procedure that outlines actions required if previously unknown heritage resources, particularly archaeological resources, are encountered during project construction or operation. A Chance Find Procedure, as described in IFC Performance Standard 8 and EBRD Performance Requirement 8 and law on Cultural Heritage of Georgia, is a process that prevents chance finds from being disturbed until an assessment by a competent specialist is made and actions consistent with the requirements are implemented.

Scope of the chance find procedure

50. This procedure is applicable to all activities conducted by the personnel, including contractors, that have the potential to uncover a heritage item/site. The procedure details the actions to be taken when a previously unidentified and potential heritage item/site is found during construction activities. Procedure outlines the roles and responsibilities and the response times required from both project staff, and any relevant heritage authority.

Induction/Training

51. All personnel, especially those working on earth movements and excavations, are to be inducted on the identification of potential heritage items/sites and the relevant actions for them with regards to this procedure during the Project induction and regular toolbox talks.

Chance find procedure

52. If any person discovers a physical cultural resource, such as (but not limited to) archaeological sites, historical sites, remains and objects, or a cemetery and/or individual graves during excavation or construction, the following steps shall be taken:

- Stop all works in the vicinity of the find, until a solution is found for the preservation of these artefacts, or advice from the relevant authorities is obtained;
- Immediately notify a foreman. The foreman will then notify the Construction Manager and the Environment Officer (EO)/Environmental Manager (EM);
- Record details in Incident Report and take photos of the find;
- Delineate the discovered site or area; secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities take over;
- Preliminary evaluation of the findings by archaeologists. The archaeologist must make a rapid assessment of the site or find to determine its importance. Based on this assessment the appropriate strategy can be implemented. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage such as aesthetic, historic, scientific or research, social and economic values of the find;
- Sites of minor significance (such as isolated or unclear features, and isolated finds) should be recorded immediately by the archaeologist, thus causing a minimum disruption to the work schedule of the Contractor. The results of all archaeological work must be reported to the Ministry/Agency, once completed.
- In case of significant find the Agency/Ministry (Agency for Protection of National Heritage or Archaeological Research Centre, hereinafter referred to as Heritage team) should be informed immediately and in writing within 7 days from the find (ref.law on heritage protection).
- The onsite archaeologist provides the Heritage team with photos, other information as relevant for identification and assessment of the significance of heritage items.

- The Ministry must investigate the fact within 2 weeks from the date of notification and provide response in writing.
- Decisions on how to handle the finding shall be taken by the responsible authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage;
- Construction works could resume only after permission is granted from the responsible authorities.
- In case no response received within the 2 weeks period mentioned above, this is considered as authorization to proceed with suspended construction works.

53. One of the main requirements of the procedure is record keeping. All finds must be registered. Photolog, copies of communication with decision making authorities, conclusions and recommendations/guidance, implementation reports – kept.

Additional information

54. Management options for archaeological site

- **Site avoidance.** If the boundaries of the site have been delineated attempt must be made to redesign the proposed development to avoid the site. (The fastest and most cost-effective management option)
- **Mitigation.** If it is not feasible to avoid the site through redesign, it will be necessary to sample it using data collection program prior to its loss. This could include surface collection and/or excavation. (The most expensive and time-consuming management option.)
- **Site Protection.** It may be possible to protect the site through the installation of barriers during the time of the development and/or possibly for a longer term. This could include the erection of high visibility fencing around the site or covering the site area with a geotextile and then capping it with fill. The exact prescription would be site- specific.

A1 - Management of replicable and non-replicable heritage. Different approaches for the finds apply to replicable and non-replicable heritage.

A1_1.1Replicable heritage

55. Where tangible cultural heritage that is replicable99 and not critical is encountered, mitigation measures will be applied.

The mitigation hierarchy is as follows:

- Avoidance;
- Minimization of adverse impacts and implementation of restoration measures, in situ;
- Restoration of the functionality of the cultural heritage, in a different location;
- Permanent removal of historical and archaeological artefacts and structures;
- Compensation of loss - where minimization of adverse impacts and restoration not feasible.

A1_1.2. - Non-replicable heritage. Most cultural heritage is best protected by in situ preservation, since removal is likely to result in irreparable damage or even destruction of the cultural heritage.

[99] Replicable cultural heritage is defined as tangible forms of cultural heritage that can themselves be moved to another location or that can be replaced by a similar structure or natural features to which the cultural values can be transferred by appropriate measures. Archaeological or historical sites may be considered replicable where the particular eras and cultural values they represent are well represented by other sites and/or structures.

56. Nonreplicable cultural heritage[100] must not be removed unless all of the following conditions are met:

- There are no technically or financially feasible alternatives to removal;
- The overall benefits of the project conclusively outweigh the anticipated cultural heritage loss from removal; and

57. Any removal of cultural heritage must be conducted using the best available technique advised by relevant authority and supervised by archaeologist.

A1_2 Human Remains Management Options. The handling of human remains believed to be archaeological in nature requires communication according to the same procedure described above.

58. There are two possible courses of action:

- **Avoid.** The development project is redesigned to completely avoid the found remains. An assessment should be made as to whether the remains may be affected by residual or accumulative impacts associated with the development, and properly addressed by a comprehensive management plan.
- **Exhumate.** Exhumation of the remains in a manner considered appropriate by decision makers. This will involve the predetermination of a site suitable for the reburial of the remains. Certain ceremonies or procedures may need to be followed before development activities can recommence in the area of the discovery.

EMERGENCY CONTACTS
Ministry of Culture and Monument Protection
Address: 4 Sanapiro Street, 0105, Tbilisi, Georgia; Fax: 995 32 2999966, 2932235;
E-Mail: culturegovge@gmail.com

National Agency for Cultural Heritage of Georgia
27 Atoneli street, 0105 Tbilisi, Georgia: tel/fax: +(99532) 2932411
E mail: info@heritagesites.ge

Archaeological Research Centre under the Georgian National Museum
3, Rustaveli Avenue0105 Tbilisi, Georgia
Tel: +(995 32) 2998022; Fax: +(995 32) 2982133
E-Mail: info@museum.ge

[100] Nonreplicable cultural heritage may relate to the social, economic, cultural, environmental, and climatic conditions of past peoples, their evolving ecologies, adaptive strategies, and early forms of environmental management, where the (i) cultural heritage is unique or relatively unique for the period it represents, or (ii) cultural heritage is unique or relatively unique in linking several periods in the same site. Examples of non-replicable cultural heritage may include an ancient city or temple, or a site unique in the period that it represents.

Annex 7. Thematic Management Plans

59. Before the construction starts, the Contractor will prepare a number of thematic management plans and method statements consistent with the EMP for review and approval by the RD. Approval will be required prior to construction commencing. Contract documents shall explicitly indicate that construction cannot start until all documents are approved. The thematic management plans include the following:

7.a - Waste Management Plan

60. The Contractor will ensure that, for the relevant areas, waste is managed in accordance with local and national policies, as well as with international best practice.

61. An overarching Project-wide Waste Management Plan should be produced by the Contractor and used to ensure a consistent approach to managing waste at the construction sites. The Project-wide plan should provide a central location for all Project waste information to ensure that waste is effectively managed in accordance with the waste hierarchy, meeting regulatory control requirements, and reducing waste disposal costs.

62. The Project-wide plan should:

- make reference to statutory waste management requirements and obligations'
- record the Contractor's responsible person(s) for waste management;
- set out waste handling procedures;
- set out waste transportation procedures;
- set out waste disposal procedures;
- set out auditing and other oversight requirements;
- record the waste types generated by the entire Project;
- provide details of waste minimization actions;
- provide project-wide waste forecasts for each waste type; and
- contain a complete register of all approved waste carriers and receptor sites for the Project.

63. The Contractor is also required to produce a Wastewater Management Plan and a Spoil Disposal Management Plan. These plans can be treated as separate management plans or within the overall Waste Management Plan.

7.a.i - Wastewater Management Plan

64. The Wastewater Management Plan will need to identify:

- plans for provision of sanitary latrines and proper sewage collection and disposal system to prevent pollution of watercourses or groundwater;
- plans for the operation of the work camp (if any) indicating proposed arrangements for the collection and disposal of sewage consistent with applicable national regulations (e.g., provision of sanitary latrines, installation of proper sewage collection, and disposal systems designed to prevent pollution of land and watercourses;
- plans detailing how wastewater would be collected from all wastewater generating areas, as well as storage and disposal methods. If the Contractor intends to carry out any on-site wastewater treatment, this should also be included.

7.a.ii - Spoil Disposal Management Plan

65. The Spoil Disposal Management Plan will need to identify:

- the approach taken to excavated material and waste management taking into account the waste hierarchy;
- procedures for identifying contaminated soil;
- the dedicated area for the handling and storage of excavated materials;
- where the practicable opportunities for the use of material with recycled content during construction will be adopted;
- the types of excavated material and waste removed from site, its description and estimated quantities of waste generated;
- the authorized waste carrier details;
- plan for waste segregation to maximize opportunities for reusing and recycling;
- the types of training that will be provided to all site workers on waste management and recycling procedures;
- disposal routes and permitting requirements; and
- details of the site that the waste and/or material will be and was taken to.

66. A soil disposal assessment template is provided as an annex in this EIA and should be utilized to confirm that the site selected is appropriate and the level of assessment is sufficient to meet ADB safeguards requirements (see **Annex 10. Soil Disposal Assessment Template**).

7.b - Soil Erosion Management Plan

67. The Soil Erosion Management Plan addresses the management and mitigation of significant impacts relating to soil erosion on the site for the proposed Project. The aims of the Management Plan are to provide:

- a general framework for erosion management, which enables Contractors to identify areas where erosion can be accelerated from their actions; and
- an outline of general methods to monitor, manage, and rehabilitate erosion to ensure that all erosion caused by this development is addressed.

68. This Management Plan serves as a guideline to be applied by all Contractors on the Project. The plan is an evolving guideline, however, that needs to be updated or adapted as conditions change within the Project area, and successes and failures of procedures are identified. The objectives of the ESMP are to:

- identify the risk from soil erosion across the Project site and in relation to the areas and water assets; and
- identify and set prescriptive management actions to protect key assets in identified high risk areas.

7.c - Traffic Management Plan

69. A site-specific Traffic Management Plan will be produced, coordinated, and then implemented by the Contractor. The Management Plan will be prepared in consultation with traffic authorities and the emergency services. The Plan will need to be approved by the RD in consultation with the relevant local authorities. The Plans will need to include:

- site boundaries and the main access/egress points for the worksites;
- temporary and permanent closures and diversions of roads or highways (including program and/or phasing);
- the strategy for traffic management such as the use of parking measures and/or site operatives to manage how construction vehicles will enter and exit the sites;
- local routes to be used by trucks, cranes, and abnormal loads generated by construction activity including, where required, the timings of use of such routes, truck holding areas, truck route signing strategy, means of monitoring truck use, and any routes prohibited from use;

- a schedule and program of the planned traffic management schemes and measures required to undertake the works;
- required bus diversions and bus stop locations (likely to be the case in Patara Poti);
- measures (including notification to suppliers) to address potential risk to residents and activities on local roads adjacent to the construction site. These will include where appropriate restrictions on delivery hours where practical, and strict enforcement of speed limits; and
- procedures for carrying out regular full safety audits on all highway works and temporary diversion routes.

7.d - Method Statement for Temporary Roads

70. The purpose of this document is to describe plans for the use of temporary roads (also referred to as access/haul roads), including designs for construction of new temporary roads (if applicable). The statement shall be prepared with contribution from and in consultation with relevant traffic authorities and should cover measures to maintain the temporary roads (i.e., erosion protection, dust prevention, reinstatement, etc.)

7.e - Aggregate and Borrow Pits Management Plan

71. The Aggregate and Borrow Pits Management Plan will describe work activities, technology, potential environmental impacts, and mitigation measures for aggregate/borrow pits (if operated by the Contractor) and extraction sites. Contractors will ensure that:

- borrow areas will be located outside protected areas and the Rioni River and avoid valuable pasture/grazing land;
- after use, borrow pit areas will be graded to ensure drainage and visual uniformity;
- borrow pit restoration will follow the completion of works in full compliance with all applicable standards and specifications; and
- topsoil from borrow pits will be saved and used during restoration were possible.

72. The plan should provide information on the following:

- the location and extent of extraction areas, current land use, and assessment of the character and key features of the surrounding area;
- a reclamation strategy and plan;
- a summary of compliance and copies of licenses obtained in accordance with national and local laws; and
- a plan showing the proposed main haul routes to and from the site.

7.f - Employment and Procurement Procedure

73. During the construction phase of the Project, temporary and permanent workforce will be employed by the Contractor, subcontractors, and other contractors. Contractors to comply with all applicable labor laws and core labor standards, including the Core Labor Standards of the ADB.[101]

74. The prime Contractor will have a fundamental role in the process of managing the supply chain and implementing mitigation measures. The Contractor will implement its own Employment and Procurement Procedure, providing details on management methods and mitigation measures in line with this EIA. The plan should include the following:

[101] Core labor standards are addressed through ADB's Safeguard Policy Statement (2009) (https://www.adb.org/documents/safeguard-policy-statement), Social Protection Strategy (2001) (https://www.adb.org/documents/social-protection-strategy), and Core Labor Standards Handbook (2006) (https://www.adb.org/documents/core-labor-standards-handbook).

- provisions prohibiting employment of child laborers and forced labor;
- provisions encouraging employment of women;
- provisions on equal pay for equal work of equal value regardless of gender, ethnicity, or caste
- provisions on dissemination of information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the Project sites
- grievance mechanism that ensures concerns are addressed promptly using an understandable and transparent process that provides timely feedback to those concerned, without any retribution;
- a general framework which allows the Contractor to track the number of local firms, workers, and women that are/have been employed; and
- the types of training that will /have been provided to all site workers.

7.g – Occupational and Community Health and Safety Management Plan

For management of occupational health and safety (OHS), the Contractor will prepare a Occupational and Community Health and Safety Management Plan for the construction workers based on the EMP and in line with Georgian legislation, including the Labour Code and Law of Georgia on Labor Safety. A template is provided as an Annex to this EIA which should be utilized as a guide (see **Annex 9. Occupational and Community Health and Safety Plan Template**). It will be submitted to the RD for review. The detailed management plan will include the following provisions:

- *Clean Water.* Provide a clean and sufficient supply of fresh water, for construction and for camps (if established), offices, and workshops.
- *Sewage and Wastewater.* Provide an adequate number of latrines and other sanitary arrangements at the site and work areas and ensure that they are cleaned and maintained in a hygienic state.
- *Solid waste.* Provide garbage receptacles at construction site and camps, which will be periodically cleared.
- *Liquid Chemical Waste.* Provide receptacles in suitably bunded areas for the storage of liquid chemical waste prior to disposal. Include clear warnings with health risks.
- *Personal Protection.* Provide personal protection equipment (PPE), such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection, in accordance with relevant health and safety regulations, for workers.
- *Emergency Preparedness and Response.* An Emergency Response Plan (prepared separately) to take actions on accidents and emergencies, including public health emergencies associated with hazardous material spills and similar events will be prepared. Emergency phone contacts with the nearest hospitals will be established. The Contractor will ensure that qualified first-aid can be provided at all times. Appropriately equipped first-aid stations should be easily accessible throughout the Project site (potentially on both sides of the Rioni River deepening on staging of construction).
- *Records Management.* A Records Management System that will store and maintain easily retrievable records protected against loss or damage should be established. It will include documenting and reporting occupational accidents, diseases, and incidents. The records will be reviewed during compliance monitoring and audits.
- *Safety Communication.* Ensure that safety, rescue, and health matters are given a high degree of publicity to all persons regularly or occasionally at active construction sites. Posters in Georgian and any other language appropriate for the Contractors drawing attention to relevant health regulations will be made or obtained from the appropriate sources and will be displayed prominently at the site.
- *Training, Awareness, and Competence.* Train all construction workers in basic sanitation and health care issues, general health and safety matters, and on the specific hazards of their work. Implement HIV/AIDS and other communicable diseases awareness and prevention program to target the local community and construction workers.

7.h - Emergency Response Plan

75. The Emergency Response Plan will contain the following as a minimum:

- guidance on the storage and use of hazardous materials with the aim of preventing and containing spills and releases;
- guidelines on the degrees of containment which take account of the nature of the materials and the sensitivity of the environment;
- procedures and appropriate information required in the event of any incident such as a spillage or release of a potentially hazardous material; and
- systems for notifying appropriate emergency services, the RD and other relevant authorities, and the Contractor's personnel.

7.i - Waterway Safety Plan

76. The Contractor's Waterway Safety Plan will need to include:

- roles and responsibilities for activities associated with transportation on the Rioni River, including a navigation risk assessment, safety management and site-specific arrangements;
- dredging and pile driving arrangements;
- a standard operating methodology, including methods to meet statutory and regulatory requirements;
- emergency arrangements and a contingency plan; and
- measures and arrangements to prevent spillages of material into river.

77. The planning of the works will include consideration of access and requirements of affected river users. The Contractor will be required to undertake regular communication with parties affected by the works. Access will be maintained within the constraints of the works and the need to ensure the safety of the public.

78. The plan will need to be prepared in consultation with the relevant local and regional authorities, as well as with the emergency services. Consultation should also be held with other key river users and stakeholders.

7.j - Method Statement for River Crossings

79. The purpose of this document is to describe and define the general method used for crossing the Rioni River. Items to be included in the method statement for each river crossing include:

1) Construction schedule which related to river crossings including start date and finish date
2) Provision for liaison with the relevant local and regional authorities, as well as with the emergency services
3) Type of inclement weather which, if it occurs, will cause work to be halted
4) Materials and Equipment to be used
5) Construction method and sequence including:
    - identify the working area required on either side of the crossing
    - method of forming a temporary bridge(s) (if applicable)
    - identification and method of protecting trees and hedgerows on the two river banks
    - method of removing and storing the bank-side vegetation and topsoil, including the height of the stockpile
    - location and method of recording, removing, and storing the river bottom material include the height of the stockpile.
    - method to minimize silt entering the river
    - method of reinstating the river banks to the original profile and so as to prevent erosion
    - method for ensuring long term stability of the river bed and banks
    - method for removing excess material from the site and the disposal location

7.k - Air Quality Plan

80. Plan that outlines measures that will be taken to limit emissions emanating from construction related operations. Such measures may include, but are not limited to:

- spraying/paving of internal haul roads;
- spraying of stockpile and plant areas during dry and windy conditions;
- siting of plant and machinery away from sensitive receptors;
- provision of landscaping around the perimeter of the site, or around the dust emitting activity;
- dust suppression on plant and machinery;
- seeding and landscaping of berms and other open areas not directly affected by extraction operations;
- reduction of emissions from site vehicles;
- continual plant operator training, and management of driver behavior;
- measures to ensure road cleanliness; and
- monitoring and recording of dust-generating activities.

7.l - Spill Management Plan

81. The Contractor's Spill Management Plan will document the specific requirements, protocols, responsibilities, and materials necessary to implement an emergency spill response following an incident. The Management Plan will contain:

- an assessment of the type of materials to be used and the risk of contamination;
- guidance on the storage and use of hazardous materials, with the aim of preventing and containing spills and releases;
- guidelines on pollution prevention for sites on or adjacent to the Rioni River and other watercourses (e.g., the agriculture canal crossed in Patara Poti);
- procedures to be adopted in the event of a pollution incident, to contain and limit any adverse effects;
- systems for notifying appropriate emergency services, authorities, and the Contractor's personnel;
- standby equipment and materials; and
- specific arrangements for sites on or adjacent to the Rioni River.

7.m - Clearance, Revegetation, and Restoration Management Plan

82. The Contractor shall submit a site clearing method for all areas where the Contractor is required to, or intends to, clear vegetation, either within the ROW or at the other designated construction areas outside the proposed road and bridge footprint. The Management Plan will include:

- Clearance Plan
    - a clear indication of land reference;
    - search and rescue procedures for relocation of any priority and protected flora specimens;
    - details of relocation of any flora specimens found during the surveys (e.g., Georgian Red-listed tree species and species of conservation importance such as Colchis Water-Chestnut (*Trapa colchica*) and Spring snowflake (*Leucojum vernum*));
    - which areas will be cleared;
    - how these areas will be cleared; and
    - how the cleared materials will be stored or disposed of.

- Revegetation Plan
    - topsoil, mulch, fertilizer and soil stabilizer requirements and application;
    - landscaping and revegetation methods for each area, including locations and timing;
    - procurement requirements and list of species of plants to be procured;

  - vegetation establishment and maintenance requirements (irrigation, fertilization, etc.) for all revegetated areas; and
  - the use of any herbicides, pesticides, and other poisonous substances, if required.

- Restoration Plan
  - plan for site cleanup rehabilitated so that these can be returned as close as possible to their previous uses, including the removal of all waste materials, machinery and any contaminated soil; and
  - plan for handover, sale, or removal of all plant vehicles and machinery to ensure that no unserviceable items are left on the construction site.

83. The Contractor should appoint a suitably experienced landscaping contractor/horticulturist to compile the revegetation rehabilitation plan.

7.n - Noise Management Plan

84. The Noise Management Plan should outline measures that will be taken to limit noise emanating from the Project construction and related activities. Descriptions of the following measures should be included:

- the use of temporary noise barriers around noisier activities/machinery;
- siting of plant and machinery away from sensitive receptors;
- construction of berms or other noise barriers between the site and receptors;
- noise dampening apparatus on plant and machinery;
- limitations on working hours;
- regular maintenance of all plant and machinery;
- appropriate surfacing/grading of internal haul roads;
- regular monitoring of noise and vibration levels;
- use of plant and machinery that is suited to its application;
- continual plant operator training, and management of driver behavior.
- pre-construction survey of the nearby buildings for documents existing cracks and other issues;
- minimize use of backup alarms to the extent possible; and
- under water noise measurements during coffer dam construction and impact pilling.

7.o - Biodiversity Management Plan

85. The Biodiversity Management Plan covers all construction activities and is applicable to all Contractors and Subcontractors. While the Management Plan will act as a ‘framework’ to determine what the Contractors will be expected to produce, Contractors are required to ensure that all the requirements are adopted within their own management plans. The Management Plan should:

- outline actions and measures necessary for the effective management of biodiversity along the route;
- cover identified impacts upon biodiversity;
- detail specific control measures to be implemented by the Contractors (and Subcontractors), to achieve this;
- incorporate the requirements of the EIA findings, international standards, Georgian legislation, and Project-specific construction permits; and
- establish a framework for external collaboration and data dissemination for the benefit of the greater ecosystem.

86. To ensure the attainment of identified biodiversity objectives and outcomes, the following key principles should be adhered to:

- targets should be ‘SMART’ i.e., specific, measurable, attainable, relevant, and time-bound

- the long-term sustainability of the biodiversity management should be ensured through appropriate partnerships, resourcing, and engagement of stakeholders
- the Management Plan should be aligned with the site's rehabilitation plan and environmental management system

7.p - Laydown Area and Construction Camp Management Plan

87. The Laydown Area and Construction Camp Management Plan should propose preventive/mitigation measures for environmental impacts of laydown areas and the construction camp, i.e., offices, accommodation facilities, testing facilities/laboratories, batching areas, storage and stockpiling areas, workshops, vehicle washing areas and all other areas/facilities required for the undertaking of activities required for completion of the Project. The Management Plan should contain procedures for establishing and operating laydown areas and work camps in order to safeguard nearby communities and environment resources.

88. The Management Plan should comprise the following details:

- details of the sites selected;
- site preparation;
- arrangements/ facilities within the laydown area and camp;
- mitigation measures that will be undertaken as per the EMP;
- re-development plan; and
    - list of structures to be demolished and list of the cleanup activities that needs to be undertaken
    - proposed use of the land after demobilizing
    - presence of facilities that could be put in use by the land owner if it is a leased out private land or community in case of a public property
- working drawings and certifications.
    - electrical plan showing the electrical network planned for the site
    - location of plants, generators, master switch boards, etc.
    - plumbing drawing showing the network of water supply lines, sewerage line, and drainage line
    - copy of certificates / permissions obtained from regulatory authorities / local governing body / community etc. as applicable
    - copy of agreement entered with the owner of the site if it is a leased-out land

7.q - Asphalt, Rock Crushing, and Concrete Batching Plant Management Plans

89. The Management Plans should include, but not be limited to, providing method statements and information on the following:

- Asphalt Plant Management Plan
    - Description of the layout and management of asphalt plant, including management of bitumen (if planned to run own facility)

- Rock Crushing and Concrete Batching Plant Management Plans
    - description of the layout and management of crushing and concrete batching plants, including waste water discharge, dust management, etc.
    - Method Statement detailing cement storage, concrete batching areas and methods, method of transport of cement and concrete, storage and disposal of used cement bags, and spill contingencies for each concrete batching operation.

7.r - Bridge Construction Method Statements

90. Bridge Construction Method Statements will describe the proposed methodology for bridge construction over the Rioni River and the proposed measures for the avoidance of surface water

pollution and impact on aquatic habitat and fauna. The method statements should include the following:

- construction conditions (i.e., the restrictions concerning bridge erection), including when in-river construction is permitted;
- procedures and methods;
    - materials and equipment mobilization
    - bridge erection
    - installation of coffer dams, silt fences, sediment barriers, or other appropriate devices to prevent migration of silt during excavation within river sections and on banks
    - dewatering and cleaning of coffer dams to prevent siltation, by pumping from coffer dams to a settling basin or a containment unit
- plan to monitor pile-driving activities to ensure alignment with international interim good practice guidelines before starting to pile; and
- other measures that will be undertaken to address adverse environmental impacts such as erosion of river embankment and siltation of watercourses that may result from such activities.

Annex 8. Specific Environmental Management (SEMP) Plan

	Content of SSEMP	
	Chapter	***Brief Description of each chapter***
1.	***INTRODUCTION & OVERVIEW OF THE SEMP***	*Brief description of the project; ADB environmental category; When IEE/EIA have been prepared; The main objective of the plan; By whom the SEMP is prepared (construction contractor should be mentioned in this chapter).*
2.	***DEFINITION OF BOUNDARIES INTRODUCTION & OVERVIEW OF THE SEMP***	*Brief description of project site location; Provide here project site map with construction site boundaries;* *The decision on how to divide a project can be made based on the following criteria:* *1. If the construction activities are different* *2. If there are variations in the environments (such as a transition from agricultural land to forest or from rural to residential areas).* *Justification is also needed why this project has been divided in one or more areas for which a single or more SEMP preparation is needed.*
2.	***Access Road(s)***	*Description of access roads to site should be provided with maps. It also should be mentioned that prior to the construction activities initiation, contractor should conduct the access road's pre-construction survey to assess and record its condition.*
3.	***SENSITIVE RECEPTORS AND ENVIRONMENTAL VALUES***	*Once the boundaries of a site to be covered by a SEMP have been defined, the sensitive receptors surrounding the site and the environmental values of the area need to be confirmed and accordingly described in this chapter.*
4.	***CONSTRUCTION ACTIVITIES***	*In this chapter various phases of work for each site should be described. Different phases of work will include different activities and thus different environmental management requirements.* *For example, construction of a reservoir could have the following schedule of works:* - *Site Clearance, Topsoil Stripping* - *Site Establishment, Excavation and Materials Transportation* - *Demolition of Reservoirs* - *Concrete Pouring Activities* - *Backfilling and Compaction* - *Reinstatement*
5.	***RISK ASSESSMENT***	*The Risk Assessment Matrix should be included in this chapter. The last column of Risk Assessment Matrix includes brief description of environmental management measures (mitigation measures).*
6.	***ENVIRONMENTAL MANAGEMENT MEASURES***	*Environmental Mitigation measures and their implementation should be described in this chapter in more details than in Risk Assessment Matrix.*
7.	***SITE PLAN***	*The environmental management requirements need to be included in a site plan. This is the final, but vital stage in the preparation of SEMP. A site plan must cover the extent of the construction activity and should contain:*

		- *Indication of North, and scale;* - *Existing and planned supporting infrastructure (e.g. access roads, water supplies, electricity supplies, etc)* - *Location of planned work* - *Contours* - *Drainage systems* - *Locations of sensitive receptors*
8.	***ENVIRONMENTAL MONITORING PLAN***	*Including all of the required monitoring as per the Project EMP.*

Annex 9. Occupational and Community Health and Safety Plan Template

TABLE OF CONTENTS

ABBREVIATIONS:

INTRODUCTION

1. Brief Description of the Project

Figure 1: SITE MAP

Figure 2: Project Camp Layout

2. HEALTH AND SAFETY POLICY

2. 2.1 COMPANY POLICY STATEMENT

3. 2.2 CERTIFICATIONS

3 HEALTH AND SAFETY RESPONSIBILITIES

3.1 Management Responsibilities

Contractor's Project Management must perform or adhere to the following:

- Provide and maintain constructional plant, equipment and systems of work that are lighted, safe and without risks to health;
- Execute suitable arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage, transport and disposal of articles and sub stances;
- Provide protective clothing and equipment, first aid stations with such personnel and equipment as are necessary and such information, instruction, training and supervision as are necessary to ensure the health and safety at work of all persons employed on the Works all in accordance with the Laws of Georgia.
- Hire lawfully aged employees (According to Georgian Labor Code no one to be employed under 18);
- Ensure that the Health and Safety Policy has been communicated to all staff,
- Enforce health and safety violations with progressive discipline;
- Take every reasonable precaution for the protection of a worker;
- Establish, maintain, and review at least annually a Health and Safety Plan, and document revisions to the plan arising from the annual review;
- Ensure that workers are properly trained and instructed in safe work practices.
- Establish and maintain Safety Trainings Records;
- Report accident sand injuries to the Engineer and Employee as required by the Contract.
- Provide workers with health and safety information;
- Inspect projects and meet regularly with supervisors to monitor the Health & Safety Program and take corrective action where required;
- Consider accident prevention and safety performance when evaluating Supervisors and Workers.

A review of the management responsibilities will be done on an annual basis. This evaluation will measure each health & safety responsibility.

All management need to understand that they are accountable for health and safety performance. By including health and safety in performance evaluation systems, the Contractor demonstrates the importance of health and safety.

3.2 Health and Safety Officer Responsibilities

- Arrange all Organizational procedures according to the Contract Terms, Health and Safety Plan and Georgian Regulations, Standards and Norms.
- Prepare Supplemented H&S Plans.
- Provide all necessary trainings, information, records and coordination relating Health and Safety issues.
- Conduct H&S Site inductions for new employees, subcontractors and visitors.
- Arrange communication between Management and Workforce.
- Conduct Daily H&S Inspections of the Project Site, Office, Camp and Plants.
- Provide Weekly, Monthly and Quarterly H&S Reporting.
- Assist the Project Management in H&S issues.
- Coordinate and Control Hazard Identification and Risk Assessment Program.
- Arrange all H&S Postings at workplaces and more attended places of employees.
- Cooperate with Supervisors and Workers to comply with their H&S obligations.
- Accident Investigation and Near Miss analyses.
- Prepare Site Emergency Plan.
- Ensure compliance with the Company HSE Policy by all outside suppliers, service providers and contractors.

3.3 Supervisor Responsibilities

"Supervisor" means a person who has charge of a workplace or authority over a worker; A Supervisor must also be a competent person.
"Competent person" means a person who,

1. is qualified because of his knowledge, training and experience to organize the work and its performance,
2. is familiar with the provisions of the Act and the Regulations that apply to the work
3. has knowledge of any potential or actual danger to health or safety in the workplace;

Supervisor (s) must perform or adhere to the followings:

- Be responsible for on-site accident prevention;
- Review safe work procedures for the site;
- Take every reasonable precaution for the protection of the worker;
- Monitor the health and safety performance of subcontractors;
- Report accidents and injuries to management as required by this plan and regulations by using the forms provided with this manual;
- Investigate accidents and take actions to prevent reoccurrence;
- Ensure that the Health and Safety Plan is followed at the work level;
- Enforce disciplinary actions for violations of the Health and Safety Plan;
- Ensure that protective equipment provided, accessible, used and maintained properly by workers, and that workers understand the reasons for its use;
- Instruct personnel in proper work practices and update instructions as needed;
- Check work practices and work areas for hazards and take corrective action where required;
- Consult and co-operate with the Health and Safety Officer;
- Acquaint new workers with hazards and safe work procedures.

3.4 Worker Responsibilities

"Worker" means a person who performs work for the Project.

- Comply with Health and Safety Plan and all relevant regulations, including legal duties of workers.
- Take every reasonable precaution necessary to prevent accidents;
- Use safety equipment, devices and clothing as required;
- Work in accordance with the Health and Safety Plan and Procedures;
- Work in a manner that will not endanger anyone;
- Refrain from using any dangerous equipment or machinery without authorization;
- Report unsafe situations immediately to their supervisor;
- Report injury or illness immediately to their supervisor;
- Help new employees recognize job hazards and follow proper procedures;
- Be aware that workers are subject to disciplinary action where either Company safety rules or government regulations are violated.

3.5 Subcontractor Responsibilities

- The purpose of this policy is to establish minimum guidelines for Sub-Contractors in order to help provide and maintain a safe work environment for all employees.
- All Sub-Contractors are responsible for complying with the requirements of H&S Plan, other Health and Environmental Plans, Procedures, Instructions and Georgian Regulations, Norms and Standards.
- All Sub-Contractors must prove that his employees are trained and competent to implement their work.

3.6 Visitors

To ensure the safety of all visitors the following responsibilities must be communicated. All employees are required to enforce this policy.

Each visitor must read the visitor responsibilities and sign in at reception. It is the responsibility of the company contact to remain with the visitor at all times.

Visitors must:
- Sign in and sign out in the log.
- Remain with their designated host.
- Wear the appropriate personal protective equipment when touring the Site.
- Not touch any company equipment or product.
- Remain out of restricted areas.
- Follow all posted signs and rules.
- In the event on an emergency follow the Emergency instructions and remain in the gathering area until given further instruction.

4. HEALTH AND SAFETY TRAINING AND INFORMATION

Company believes that training is crucial to establishing and maintaining the high safety standards expected in performing all job functions. We are committed to ensuring that all employees are adequately trained to perform their job functions safely. Workers must participate in their training and follow the instructions that they are given.

4.1 Planned Trainings

- Site Health and Safety Induction
- Overview of the Health and Safety Plan and the applicable Regulations.
- Hazard Identification and Risk Assessment
- WHMIS Information.
- Safe use of Tools and Equipment
- Confined space
- Specific Supervisor Training.
- Lockout/Tagout
- New Worker Orientation.
- Safe work procedures for road building operations.
- Use of Personal Protective Equipment.
- Traffic Control
- First Aid and Medical Care
- 5 Minute Safety Talks

4.2 New Worker Orientation

Inexperienced workers are generally involved in more accidents than veteran workers. Health and safety education should start with orientation as soon as a worker joins the organization or is given new duties.

A record of the orientation will be placed in the employee's personnel file.

New worker orientation shall include the following:

- Explanation and review of the Health and Safety Policy and Plan by H&S Officer;
- Introduction to the co-workers and explanation of all job functions at the workplace by Supervisor;
- Introduction to the Health and Safety Representative, where applicable;
- Orientation of the workplace and/or jobsite with attention to the site specific hazards;
- Identification of the location of the first aid kit or first aid station, fire extinguishers, telephone and washrooms;
- Explanation of the proper use of the personal protection equipment applicable to the particular work being performed;
- A reminder that the worker has the right to refuse to perform hazardous work and that a hazardous conditions should be reported immediately to the supervisor;
- Explanation of emergency procedures;
- Partnering of the new worker with a more experienced worker, where possible.

4.3 Policy Violation

Policy Violation procedure has the following steps*:*

1. Step one: Supervisor gives a verbal warning and provides corrective action to worker. Worker must acknowledge receiving verbal warning by signing the Discipline Acknowledgement form. The form will be placed on the worker file, and removed after 12 months.

2. Step two: Worker receives a written warning using the Written Discipline form. This will outline the issue, corrective and timeframes for compliance. The worker must sign the form in the presence of their supervisor and a Health and Safety Officer. The form will be placed on the worker file for a period of 24 months.

3. Step three: Should the worker not abide with the corrective action, then suspension or termination will occur.

The severity of the violation will determine the step that is applied to the worker. For example inappropriate use of an excavator will result in immediate termination.

4.4 Health and Safety Policy Acknowledgement form

All employees of our company are subject to:

- Take every reasonable precaution to ensure the safety of himself and his fellow-workers.
- Wear the proper personal protective equipment (PPE) and use the protective devices as provided by the company (example hardhats, vest, safety goggles and any other special equipment required to do your job, the employee is responsible for the own safety shoes).
- Not use or be under the influence of alcohol or mind altering drugs while on the jobsites.
- Must take every preventive measure when operating machinery and/or equipment to ensure the safety of the employee and co- workers.
- Report any unsafe work practices or unsafe site conditions as well as any accidents or injury immediately to your foreman or supervisor and obtain treatment as necessary.

I agree to abide by and work in accordance with the Health and Safety Plan and Procedures, Management's safety directions and Safety policy.

Employee's Signature: _____

Date:

4.5 WHMIS- Workplace Hazardous Materials Information Systems

Workplace Hazardous Materials Information Systems (WHMIS) is a materials labeling system which addresses the workers "Right to Know".

WHMIS training shall include:

- Education in the content, purpose and significance of informationon label sand Material Safety Data Sheets (MSDS).
- Education in the use of types of identification.
- Training in the procedures for the safe storage, handling, use and disposal of controlled products.
- Training in emergency procedures involving controlled products.
- Training in procedures to follow when fugitive emissions are present.
- The joint health and safety committee or the health and safety representative will be consulted during the development, implementation and review of the job specific WHMIS training program.
- The Company will ensure, as far as reasonably practical, that this WHMIS training program results in the worker being able to apply the information as needed to protect health and safety.

The Company shall also be responsible to ensure that:

- All materials have supplier labels.
- Workplace labels are provided.

- Material Safety Data Sheet (MSDSs) is readily available in the workplace.
- A current MSDS is obtained on or before the date of the first shipment of every controlled product.
- The MSDSs are kept updated.

The Worker shall be responsible to:

- Learn the information on controlled products which the Contractor is required to provide.
- Follow the instructions provided and the information in the MSDS.
- Both the Company and Workers are responsible to ensure that no product that requires a Material Safety Data Sheet is permitted on the jobsite or in the workplace unless an MSDS accompanies it.

5. INSPECTIONS, HAZARD REPORTING AND INVESTIGATION PROCEDURE

5.1 Workplace Inspections and Hazard Reporting

Workplace health and safety inspections are vital to maintaining a safe workplace and identifying existing or potential hazards in order that appropriate corrective action can be taken.

An assessment should be made by the Health and Safety Officer in conjunction with the supervisor of the frequency of inspections required based on the potential hazards and dangers at the workplace or project. These inspections must be conducted on a monthly basis, a minimum. Workplace specific checklists should be developed by supervisors and used for regularly-scheduled inspections. Completed reports should be forwarded to management promptly.

It is important to observe both conditions and procedures during the inspection. If a hazard poses an immediate threat, take immediate action to eliminate the hazard.

A follow-up of all reports and action taken to eliminate hazards must be completed in a timely manner. Subsequent workplace inspection will review the items from previous inspections to ensure that remedial action has resolved the concern.

5.2 Accident Investigation and Reporting

PURPOSE

To identify all immediate and basic causes of the incident and make the necessary recommendations to prevent the injury/incident from recurring.

SCOPE

Review once a year reports of the following injury/incident types to determine any investigative needs:

- First aid
- Accidents
- Incidents
- Near miss

Definitions:

First Aid:

- Includes but is not limited to: cleaning minor cuts, scrapes or scratches ;treating a minor burn, applying bandage sand/or dressings, cold compress, cold pack, splint, changing a bandage or a dressing after a follow-up observation visit and any follow-up for observation purposes only

HealthCare:

- An injury that results in attention received from a recognized health care provider but that does not result in time away from scheduled work nor a wage loss.

Near Miss:

- An event that under different circumstances could have resulted in physical harm to an individual or damage to the environment, equipment, property and/or material.

The following categories of injury/incidents may produce a loss to people, equipment, material and environment .Immediate investigation of the following is required:

Fatality:

- An injury that results in the loss of life

Lost time:

- A work related injury that results in the injured employee missing scheduled time from work resulting in a wage loss.

Property Damage:

- An event where contact is made between two objects resulting in alteration to one or both of the objects.

Occupational Illness:

- A condition that results from exposure in a workplace to a physical, chemical or biological agent to the extent that normal physiological mechanisms are affected and the health of the worker is impaired.

Environmental Release:

- An accidental discharge of a physical, biological or chemical substance into the workplace and/or community.

Fire/Explosion:

- An event where undesired combustion occurs.

PROCEDURE:

In the event of a workplace accident/incident, ensure the following:

- Arrange for prompt medical treatment for the injured worker(s)
- Secure and do not disturb the accident scene until proper people are notified
- Call Health and Safety Officer and Security Supervisor immediately
- Notify supervisor
- Investigate accident/incident
- Notify the Engineer
- Decline any comment to media and refer them to Senior Management

In case of First Aid Treatment only:

- Provide first aid if trained
- Record what first aid was given and materials taken out of first aid kit
- Treatment recorded
- In the event he/she does seek outside medical treatment they must notify the supervisor
- Investigate accident, as a preventative measure to ensure that future occurrences do not occur

In case of near misses:

- All near misses to be reported to supervisor
- Near misses must be investigated, as a means of prevention. Corrective action to be taken and communicated to all employees to prevent future occurrences resulting in accidents

In case of Medical Aid/HealthCare:

- Provide first aid where possible
- Arrange transportation to medical center
- Where possible a Functional Abilities Form should be given to the worker to take to their treating agency in the event it becomes a lost time incident.
- Investigate the accident scene to determine what caused the accident and have a form completed
- Ensure that preventative measures are put in place to avoid future occurrences
- Take witness statement regarding accident/incident
- Notify the Engineer

Fire/explosion:

- Call Health and Safety Officer or Security Supervisor immediately
- Inform Supervisor and all workers around
- Notify the Engineer and Emergency Services

Property/equipment damage:

- Inform supervisor immediately
- Inform Senior Management
- Document the details of the damaged goods and complete an investigation report
- If necessary, photographs can be taken of the damage equipment/property
- Ensure that damaged equipment/property is fixed promptly
- If motor vehicle accident, stop at scene, obtain first aid if required
- Contact Police officials if necessary
- Advise supervisor/management of accident location
- Obtain details of third party name and driver's license numbers, vehicle plate number and description of the vehicle and damage
- If necessary obtain names and addresses of eyewitness to the accident
- Notify the Engineer

Chemical/environment releases:

- Notify the Engineer and emergency services immediately.
- Comply with Spill Response Procedure

COMMUNICATION

The results and the injury/incidents will be communicated to the employees in a number of ways:

- Minutes of the health & safety committee meetings
- Supervisors holding safety talks with employees
- Through postings on safety bulletin boards
- Testimonial by the involved employees.

INVESTIGATOR RESPONSIBILITIES:

Collect Information:

- Interview workers involved,
- Interview witnesses
- Interview outside experts if applicable i.e. suppliers, equipment designersetc.
- Insure the interviews are conducted as soon as reasonably possible.
- The interviews should be conducted in a quiet place, one on one.
- The interview must be documented.

Scene assessment

- Make observations, on site assessment of the scene (site, equipment, material).
- Use photographs/sketches/drawings etc.

Identify Contributing Factors

- Factors to consider are People, Equipment, Material, Environment and Process.

Write Report:

- Use the injury investigation report form to identify contributing factors through a review of items such as maintenance records, plant layout, training records, time of day, length of service in this-work area, etc. Considerations given to lack of safety equipment and/or the need for safety equipment.
- The standard investigation reporting system (form) must capture all the requirements contained in the investigation procedure.
- Copies of the investigation report are sent to the appropriate people.

Recommendations for corrective action:

- Responsibilities must be assigned
- Recommendations are documented on a standard form.
- The recommendations must focus on corrective actions(s) to all the contributing factors identified.

6. WORKPLACE SAFETY AND WELFARE

Offices, Workshops, Dormitories, Kitchen, Concrete Plant, Asphalt Plant, Road Construction Sites, Borrow Pits, Bridge Construction

6.1 Workplace Safety - General

- Fence the site against unauthorized entry
- Take measures to prevent objects from falling from height
- Provide and keep safe egress and access to the each place of work located at site
- Put up appropriate signs including traffic routes, authorized personnel only etc.
- Keep the site tidy, well lit and well laid out
- Provide sufficient welfare and first aid facilities
- Provide adequate fire precautions such as fire extinguishers, escape routes
- Ensure that existing power lines (buried or overhead) are identified and associated safe systems of work in place
- Take necessary precautions to ensure that electrical systems are well maintained in a safe condition
- Ensure that vehicles and people are kept apart, with traffic routes maintained in a safe condition
- Minimize and eliminate risk of manual handling by the use of mechanical equipment, or arrange material to be supplied in manageable sizes and weights to reduce the risk of back injury
- Take all measures to reduce exposure to noise and vibration
- Ensure that holes are protected, with clear marking and fixed covers to prevent falls
-

6.2 Site Security

- Erect suitable barricades, fencing, and hoarding
- Proper signage and lighting in suitable places when passers-by or entry by public is likely
- Footpaths kept clean and free from debris
- Site access controlled
- Traffic control procedures in place

6.3 Traffic And Pedestrian Arrangement

- Improved design and layout of the workplace to minimize transport accidents
- Signs to be used as a secondary measure where risks cannot be eliminated
- Avoiding the need for reversing by better layout design
- Segregating pedestrian and vehicle traffic routes if feasible
- Posting adequate warnings in conspicuous places
- Ensuring suitable pedestrian crossing points on vehicle routes
- Introducing a one-way traffic system, if possible, to reduce the risk of head-on collision
- Checking to see if vehicle traffic routes are suitable for the types and flow of vehicles that use them
- Keeping all floor and road surfaces in good condition
- Removing obstructions or otherwise, making sure they are clearly visible
- Avoiding sharp bends in road layouts
- Providing suitable fixed mirrors at blind corners
- Suitable direction, speed limit and priority signs
- Suitable physical speed restrictions such as speed bumps
- Edges of loading bays, pits etc must be clearly marked and fitted with either a temporary or permanent barrier
-

6.4 Housekeeping

- Nothing should be left lying around the site unnecessarily. When equipment is in use it should be sited so as to minimise health, safety and environmental risks. For example it should not create a trip hazard and plant should not be located over site drains.
- Materials and equipment should be stored away from doorways and gangways. In particular in will not be allowed to block fire exits.
- Once work is finished for the day all portable tools and equipment should be put away tidily. Where appropriate tools must be cleaned. However, used oil will not be used for cleaning.
- Kitchen, canteen and living areas must be kept clean and tidy.
- Where possible avoid vehicles tacking mud from the construction site onto the highway.

6.5 Storage Areas

- Storage areas must be kept tidy with materials properly labeled.
- Drums and containers must be kept upright, in good condition and with lids and bungs in place.
- Hazardous material storage locations should be on hard standing and must have a bund or drip tray. Secondary containment must be sufficient to contain 110% of the contents stored.
- Bunds and drip trays will be emptied on a regular basis. If contaminated the contents should be disposed of as hazardous waste. If the bund contains oil or fuel storage contaminated water will have a sheen on the top. If the bund contains chemical storage it may be more difficult to tell if the contents are contaminated. If in any doubt the contents must be disposed of as hazardous waste. Contaminated bund water must never be poured down the drain.
- When not in use materials must be returned to their storage location. If hazardous materials are required at their point of use for a period of time they must be kept in a drip tray.

- Drip trays must be used under stationary or parked plant.

6.6 Waste Areas

- All wastes must be segregated and stored correctly in designated areas.
- All wastes must be correctly labeled.
- Burning or burying waste on site is strictly prohibited.

6.7 Spill Control

- Nozzles or funnels must always be used for decanting and refueling.
- Plant and machinery will be inspected for leaks.
- When used spill cleanup material must be restocked.
- All spills must be reported to the Construction Superintendent.

6.8 Passageways

- Unobstructed and clearly defined
- Provide adequate lighting
- Ensure clear sightline at breaks and corners

6.9 Lighting

- Adequate and free from glare
- Lighting clean and efficient
- No flickering
- Maintain steady lights
- Provide and maintain all emergency lighting systems

6.10 Access to Worksites

- Keep all walkways and stairways clear of debris and other materials such as used boxes, wooden scrap, loose gravel, oil leakage, tools and supplies to prevent tripping and slipping
- Put them in a bin or debris area to prevent fire and tripping hazards
- Provide adequate lighting to prevent accidents

6.11 Stacking Of Materials

- Ensure the proper heights and correct stacking
- Allow sufficient space for moving stock
- Store materials in racks/bins
- Keep shelves free of rubbish
- Keep floors around stacks and racks clear
- Check drums and ensure pallets in good repair
- Heavier items stored low and without danger of falling objects
- Avoid sharp edges and provide safe means of accessing high shelves

6.12 Maintenance of Stairs, Steps And Landings:

- Replace or remove worn-out or broken steps
- Keep handrails and fencings in good repair
- Keep clear of all obstructions
- Maintain adequate lighting
- Provide and maintain emergency lighting
- Ensure non-slip treatment/treads in good condition
- Keep clear of debris and spills

6.13 Fire Fighting General Rules:

- Prepare Fire Fighting Procedure (See H&S Procedures)
- Ensure all extinguishers and firefighting equipment serviced and marked
- Provide adequate fire alarm and communication system
- Restrict smoking/naked flame
- Avoid storage of excess quantities of flammable substances at worksites
- Establish storage procedures for flammable substances
- Provide fire extinguishers near all diesel tanks, generators, welding, oxy-acetylene cutting or other sources of ignition
- Keep fire extinguishers easy to locate and reach in case of an emergency
- Never store flammable or combustible materials in common areas, stairways or exits
- Avoid spraying of paint, solvents, or other types of flammable substances in areas with poor ventilation to avoid build-up of fumes and vapors leading to explosions or fires
- Store gasoline and other flammable liquids in a safety can in a ventilated place or an approved storage facility
- Ensure that leaks or spills of flammable or combustible materials are cleaned up promptly
-

6.14 Emergency Response:

- Prepare Emergency Response Plan (supplemented Plan)
- Employ and train emergency personnel
- Ensure emergency procedures are documented and issued
- Display emergency telephone numbers

- Conduct regular fire alarm checks
- Perform periodic testing and trial evacuations
-

6.15 Welfare and Toilet Facilities

Matters to be considered when planning the welfare and toilet facilities include:

- The work to be carried out and the health risks associated with it
- The duration and spread of the site locations
- The number of people working at different locations
- The distance from rest places and welfare facilities

6.16 Toilet Facilities

Fixed Installation:

- at the site base, usually near the site office,
- at different satellite locations, especially when the coverage of worksite is wide and far from the base

Portable Installation on the Worksite

6.17 Washing Facilities

- Hand basins or bowls
- Water tap with buckets or receptacles
- Shower or eye-bath where necessary

6.18 Rest Areas

- Fixed installation:

- at the site base location
- at different satellite locations
  - Temporary installations on the worksite

7. VEHICLE / EQUIPMENT AND TOOLS SAFETY

7.1. Maintenance of Vehicles and Equipment Procedure

Standards:

All vehicles, machinery and equipment are serviced with respect to:

- Manufactures recommendations
- Industrial standards
- Legislated requirements
- Contractor's best practices

To ensure the safe operating condition of all equipment, our daily/seasonal pre-inspection and our preventive practice is based on the highest protocol.

Schedule

All equipment will be inspected to the manufactures recommendations, industrial standards and legislated requirements.

- Pre-use inspection-daily
- Pre-use inspection, complete mechanical, at season beginning
- Schedule preventative inspection/maintenance

Preventative Maintenance Schedule

All maintenance on all vehicles, machinery and equipment to be done yearly and as required.

Standard Recording System

The system uses Daily Inspection Book for recording the inspections and listing required maintenance. The book records the following:

- List of items to be inspected for each significant piece of equipment
- Inspectors name and signature
- The date of the inspection
- Description of required work to be performed, if required
- Reporting of any suspected problems for correction
- General recommendations for correction of any deficiencies recorded

All out of service equipment, machinery or vehicles has designated area assigned so employees cannot put equipment, machinery accidentally back into service.

Qualified Person

All inspections and specifically, repairs and service can only be performed by qualified, competent persons. They are either qualified by an outside source or by our own competency program.

The Supervisor is responsible to help identify any equipment deficiencies or items requiring maintenance or preventative maintenance and activate the prescribed corrective action or required preventative maintenance.

All Employees are responsible to report any defects, deficiencies or hazards pertaining to the workplace and or equipment.

Operator pre–use inspections of equipment

The inspection will be performed by the competent operator that will be using the equipment at the beginning of the day or the first time the operator is going to use the equipment each day.

Mobile Equipment:

- Operator observes the equipment in place to ensure that the surrounding environment is safe and the equipment is in a safe location and on stable ground to be inspected.
- The operator retrieves the inspection book/form and proceeds with the pre-use inspection for the day and/or first time use that day.
- Any issue identified on the checklist that is deficient, will be checked off and comments added. The equipment is taken out of service and tagged until a qualified person has looked at the identified deficiency and corrected it.
- Once corrected, the operator will once again inspect the equipment immediately before use.
- Should the operator leave the equipment for any reason and it is out of sight and control of the operator for any length of time during the same day, the operator will perform a walk around and cursory inspection of the equipment before continuing its use.

The following information will be included on the inspection forms:

- Name and identification of equipment inspected
- Inspectors name/or initials
- Date of inspection
- Listing of the components to be inspected with minimum standard expected
- Description of the hazard(comments section)
- Recommendations for corrective action(comments section and given to the mechanic)
- Action taken(the repair report from the mechanic or their organization)

Non-Mobile Powered Equipment:

- Operator observes the equipment in place to en sure that the surrounding environment is safe and the equipment is in a safe location and on stable ground to be inspected.
- The operator will inspect the power equipment in compliance to the manufacturer’s recommendations and in conformance to procedure.
- Any piece of equipment found deficient will be taken out of service and corrected it.
- Once corrected, the operator will once again inspect the equipment immediately before use.
- Should the operator leave the equipment for any reason and is out of sight and control of the operator for any length of time during the same day, the operator will perform cursory inspection of the equipment before continuing its use.

Corrective Action

Any piece of equipment, whether Mobile Powered Equipment or hand operated power equipment, that is found to have deficiencies or in a sub-standard condition, will immediately tagged and/or locked out of service as per procedure.

The equipment will only be brought back into service after corrective action by a competent repair service and an inspection by a competent person.

The equipment being returned for use will and must be accompanied with a repair document from service provider with a description of the corrective action, a date and a signature of a competent provider.

Follow Up

Once the corrective action or repair has been made on the equipment and there is documentation on the repair/corrective action with an authorized signature, the equipment will be inspected to

ensure the integrity of the repair/corrective action. This inspection will include testing of the function of the equipment.

7.2 Key Points of Equipment Maintenance

MANAGER/SUPERVISOR	**WORKER**
Ensure that all vehicles and equipment are maintained in safe and good working order	Obtain training to operate vehicle or equipment in a competent and safe manner
Have a competent worker inspect and repair vehicles and equipment	Other
Ensure a copy of the operating manual for vehicles or equipment is available	
Assign qualified worker to operate the equipment/vehicles	
Provide a cab or a screen when the driver or operator is exposed to overhead hazard	
Provide and maintain a log for all vehicles and equipment	
Install handrails, footholds that would facilitate mounting and dismounting	
Ensure Roll Over Protection are installed	
ON SITE PREPARATION	
Provide a copy of operating manual for all vehicles and equipment on site	Review maintenance and safety procedures with supervisor
Review maintenance and safety procedures with all operators and drivers	Perform inspection of equipment and vehicles prior to the start of each project
	Other
DURING CONSTRUCTION	
Ensure that daily inspection and maintenance is done	Every morning
Repair all reported and detected defects	Circle check equipment and vehicle for leaks
Periodically inspect logbooks	Check for crack, bent, loose or missing components
Other	Check operation of: windshield wipers/washers, seatbelts, horn beacon, turn signals, brake lights, four-way flashers, all gauges ,reverse alarm
	Check tire pressure ,loose or missing wheel nuts
	Adjust mirrors, clean windshields
	Other
OFFICE STAFF OR SUPERVISOR	**WORKERS**
During construction (Continued)	During construction (Continued) After starting the engine, check air brake pressure

MANAGER/SUPERVISOR	WORKER
	For aerial devices:Check basket leveling for proper tension Inspect buckets for damage Check for cracks around welds, hinge pins and boltsInspect cables for fraying or flattening of cables Check for loose material inside the boom Check hydraulic system and all control levers of boom
	For hydraulic equipment: Check low pressure devices to ensure they work properly Check all outrigger and holding valves to ensure that they are working If repair, adjustment or replacement was done to the vehicle, check to make sure the part is operational Check all levers to make sure that they are working properly
ANY TIME DURING THE DAY	
	If low pressure warning device comes on at any time, STOP IMMEDIATELY IN THE SAFEST AVAILABLE PLACE and correct loss of pressure before proceeding.
Ensure that buckets and hydraulic devices are properly parked and blocked	Report any defects to supervisor and stop using equipment or vehicle
Provide blocking for dismantling, altering or repairing equipment	Never leave buckets or any hydraulic devices unsupported
Ensure that workers do not use fork-lift truck, frontend loader or similar machines as workplace platform	Use blocking when dismantling, altering or repairing equipment

7.3 Work Shop and Field Mechanics

MANAGER/SUPERVISOR	WORKERS, DRIVERS, OPERATORS, MECHANICS
In General	In General
Ensure that workers are properly licensed and competent to do the job	Ensure proper training and familiarity with equipment
Ensure good working order of all tools, especially cranes, booms, lifting devices and power tools	Follow all recommendations in operating, service and maintenance manual. Always refer to the manual when in doubt
Ensure availability of manual of all equipment being repaired	Ensure clean work area and keep it free of spilled oil, grease and slipping hazards
Schedule regular inspection and maintenance of equipment and machinery at least as recommended by the manufacturer	Refrain from smoking at all times when working near fuel, batteries and ether

MANAGER/SUPERVISOR	**WORKERS, DRIVERS, OPERATORS, MECHANICS**
Provide means of proper storage and secure material inside all shop vehicles	Do not wear jewellery or loose fitting clothes
Ensure clean work area	Position equipment/machine on hard/level surface
Determine required PPE	Disengage power and stop engines before servicing
Ensure adequate ventilation and lighting	Support equipment with blocks or stands; never work on machine if only supported by life jacks or hoist
Provide necessary equipment to complete job safely	Lower all equipment attachments to ground, if not, secure it by proper blocking
Provide replacement parts recommended by manufacturer	Relieve all pressure in air, oil, and water systems before disconnecting
	Allow systems to cool down before repairing
	Engage all safety locks before working on equipment
	Post “Do Not Operate” signs at operator’s station and disconnect battery to prevent inadvertent start up
	Use proper tools to complete the job safely
	Read and understand warning plates and decals
	Use appropriate PPE
	Change oily clothing as needed
Shop Operation	**Shop Operation**
Provide adequate floor space for work anticipated	Ensure adequate ventilation at all times
Designate special areas for duties such as welding, cleaning and painting	Maintain shop in a clean and orderly manner by cleaning up as you go
Provide separate rooms for the delivery and storage of parts, equipment and tools	Ensure clear pathway to fire extinguishers and emergency exits
Provide proper lunch and wash-up areas	Keep cleaning solvents away from sparks, flame and ignition sources
Provide adequate heating	
Ensure adequate ventilation at all times	
Ensure good housekeeping practice in keeping the shop free of fire hazards, oil, and debris	
Field Repairs	**Field Repairs**
Ensure that traffic control devices are available	Secure all material from spilling in the service vehicle
Ensure that each service vehicle is in good working order	Ensure that the first aid kit and fire extinguisher are in working order

MANAGER/SUPERVISOR	WORKERS, DRIVERS, OPERATORS, MECHANICS
Equip each vehicle with a fire extinguisher and first aid kit	Obey road signs at all times
Perform periodic inspection of service vehicles	Remove equipment or machine from traffic and construction activities or isolate the equipment so that it will not be accidentally moved during repair
	Ensure that the equipment or machine is secured before commencing work

7.3 Safe Operating Procedures for The Heavy Equipment:

- Backhoe
- Dozers
- Loaders
- Road Graders
- Skid steers
- Trucks

7.3.1 Backhoes

- Know the working range of the machine.
- Be sure attachment or load doesn't catch on obstructions when lifting or swinging.
- When lifting a load, do not lift, swing or stop unnecessarily fast.
- Be sure everyone is in the clear before swinging or moving in any direction. NEVER swing or position attachment or load over personnel or vehicle cabs.
- Never allow personnel to walk or work under any part of the machine or load while the machine is operating.
- Never allow anyone to ride the attachment or the load. This is an extremely dangerous practice.
- Do not load a truck unless the driver is in a safe place. Then, load the truck from the rear or side.
- Use a signal person. The signal person must be in direct communication with the operator, and the operator must pay close attention to the signals.
- Never exceed the lifting capacity of the machine. Stay within the lifting limits shown on the Load Rating Chart. Remember - you may be able to lift the load in close, at ground level, but as the load radius and elevation change, the lifting capacity of the excavator may decrease.
- Keep the machine well back from the edge of an excavation. Avoid undercutting the machine. If necessary, provide adequate shoring to prevent the machine from falling into the excavation.
- Level off the work area if possible.
- Avoid swinging or extending the bucket farther than necessary in a downhill direction. This will reduce the stability of the machine.
- Avoid working with the tracks across the slope, as this reduces stability and increases the tendency for the machine to slide.
- Always be sure that slings or chains used to lift the load are of adequate strength and that they are in good condition.
- Watch your boom clearance at all times.
- Turn off the engine and allow the machine to cool before working on the machine. Most fluids on the excavator are hot enough to cause severe burns at normal operating temperatures.

NEVER leave the machine without first lowering the bucket, stopping the engine, setting the parking brake, and placing the shift in park. Dismount the machine carefully. Do not jump out of the machine.

7.3.2 Dozers

- Operate the controls only with the engine running.
- Do not allow riders on the machine unless additional seat, seat belt, and rollover protection are provided.
- The operator must satisfy himself that no one will be endangered before moving the machine.
- Report any needed repairs noted during operation.
- Carry implements close to the ground, approximately 40cm (15 in) above ground level.
- Stay a safe distance from the edge of cliffs, overhangs, and slide areas.
- If the machine begins to sideslip on a grade, immediately dispose of the load and turn the machine downhill.
- Be careful to avoid the condition which could lead to tipping when working on hills, banks, or slopes, and when crossing ditches, ridges, or other obstructions.
- Work up and down slopes, rather than sideways, whenever possible.
- Keep the machine under control and do not work it over its capacity.
- Be sure hitch points and the towing device are adequate.
- Connect trailing equipment to a drawbar or hitch only.
- Never straddle a cable, wire rope, or similar device nor allow others to do so.
- Personnel are prohibited to be between the machine and trailing equipment when maneuvering to connect them. Block the tongue or hitch of trailing equipment to align it with the drawbar or hitch.
- This is a one-person machine, NO RIDERS ALLOWED.
- Know the pinch points and wrap points on the loader.
- Operate at a speed consistent with working conditions, visibility, and terrain.
- Ensure loader has an adequate rear counterweight
- When crossing exposed railroad tracks, ditches, ridges, or curbs reduce speed and cross at an angle.
- Carry loaded buckets as close to the ground as possible. The further a loaded bucket is from the ground the more unstable the loader becomes.
- Use extreme caution when operating a loader on a side slope. Slow down and carry the bucket, loaded or empty, as close to the ground as possible.
- Stay in gear when traveling downhill - this will help control speed.
- Never move a load above the heads of other workers.
- When back filling, use extreme caution. The weight of the material plus the weight of the machine could cause the new construction to collapse.
- Keep work area level; avoid developing ruts by occasionally back dragging the bucket to smooth the surface.

NEVER leave the machine without first lowering the bucket, stopping the engine, setting the parking brake, and placing the shift in park. Dismount the machine carefully. Do not jump out of the machine.

7.3.3 Road Grader

- Do not permit riders in or on the grader. Grader is a one-person piece of equipment.
- Do not dismount from the grader with the engine running - lower all attachments and stop engine first.
- Before backing up, use extra care to ensure persons and vehicles are clear of the grader.
- Know and use hand signals required for particular jobs and know who has the responsibility for signaling.

- Select a gear that will prevent excessive speed when going downhill. Do not coast downhill.
- Note and avoid all hazards and obstructions such as overhangs, ledges, slide areas, electrical lines, underground cables, water mains, or gas lines.
- Watch for bystanders and never allow anyone to be under or to reach into the grader and its attachments while operating.
- Check the local traffic laws for correct traveling requirements. If necessary, pull over and allow traffic to pass.
- When working near traffic areas or at night, use extra care. Use precautions, such as flares or reflectors, cones, red flags or red lights, barricades, flashing lights, and flagmen.
- Do not operate the grader in areas where volatile gases, dust, and combustibles may be present.
- Ensure the grader is properly equipped for grading in dry or forested areas.
- Avoid lubrication or mechanical adjustments with the grader in motion or the engine operating.
- Keep your head, body, limbs, feet, and hands away from all moving parts.
- Use extreme care when working with hydraulic systems. Relieve the hydraulic system pressure before performing any service.
- Match speed of the vehicle to job conditions.
- Be careful when operating with the wheels at right angle to a slope.
- When hooking up trailing equipment, keep all personnel away.
- Know your stopping distance at any given speed.
- Use caution when crossing side hills, ridges, ditches, and other obstructions.
- Keep close to inside bank when working on a side hill road or cut. Extend the blade to material near outer edge.
- Use extreme care to avoid tipping when working on hills, banks, or slopes.
- Cross obstacles at an angle and at slow speed. Be alert for sudden movement of machine when going over center of obstacle.
- Operate the vehicle only on level surface when cutting high banks.

NEVER leave the machine without first lowering the bucket, stopping the engine, setting the parking brake, and placing the shift in park. Dismount the machine carefully. Do not jump out of the machine.

7.3.4 Skid Steers

- Check to see that counterweights as recommended by the manufacturer are in place.

NOTE: This is very important as improperly balanced skid-steer loaders are easily upset.

- Clean steps, pedals, and floor of any slippery substances
- Clear the driving compartment for loose items that might interfere with the controls.
- Check the work area for hazards such as holes, soft spots, and obstructions. Check overhead for utility lines, doorway clearances, or other obstructions.
- Mount the machine wearing clean, dry shoes using the grab bars or handrails provided.
- Adjust the seat, fasten the seat belt, set the brake, and place transmission in park or neutral before cranking the engine.
- Visually check for the presence of others in the area and warn them away. Be especially alert for children.
- If the machine is garaged, leave the door or some windows open for ventilating the exhaust. CARBON MONOXIDE KILLS!
- Start the engine and check all controls to see that they are functioning properly.
- Check horn and backup alarm to see that they are working.
- Operate with caution on uneven surfaces. Avoid steep slopes completely.
- Carry the load as low as possible. Avoid sharp turns and slopes with a raised load.

- Travel straight up or down, with the heavy end of the machine pointed uphill.
- Operate with extreme caution near areas with sharp drop-offs.
- NEVER leave the machine without first lowering the bucket, stopping the engine, setting the parking brake, and placing the shift in park or neutral. Dismount the machine carefully. Do not jump out of the loader.
- If stopping for any length of time, lock the ignition and remove the key.

7.3.5 Trucks

- Truck drivers will be properly and thoroughly trained before attempting to do any work with or on any type of truck.
- Our motor vehicle policy, prohibit the operation of commercial motor vehicles by individuals who do not have the proper training and license. Do not attempt to operate any dump truck unless you have the proper license and training.
- Always use the steps and grab irons and face the vehicle when getting in or out of the truck.
- Place the gearshift into neutral and set the parking brake before starting the engine.
- Allow the engine to reach operating temperature and the air pressure to build to operating pressure before placing the truck into motion.
- Carefully check the area around the truck before placing it into motion. Objects or people that are very close to the truck may not be visible from the driver's seat.
- Always make sure that your seatbelt is properly fastened before driving the truck.
- Allow adequate stopping distance between the truck and the vehicles in front of it.
- Check the area around the truck for obstructions (tree limbs, overhead wires, etc.) before raising the dump box. Make sure that the spreader chains aren't set if you intend to dump in a pile.
- Always try to be on a level surface when you raise the dump box. As the box raises the truck's center of gravity goes up and the truck becomes less stable and more apt to tip over. If you must dump on a slope place the truck so that it faces straight up, or down the slope. Do not try to raise the box with the truck parked parallel with the slope. Remember that a dump truck is much more apt to tip over (or run into overhead obstructions) when spreading material then it is when dumping in a pile.
- NEVER work under a raised box (not even "for just a little bit") unless the box is adequately supported by a prop rod or cribbing. Do not rely on the truck's hydraulic system to hold the box up while you work under it.

NEVER leave the machine without first stopping the engine, setting the parking brake and placing the shift in park. Dismount the machine carefully. Do not jump out of the machine.

7.4 Vehicle Management Procedure

7.4.1 Construction Vehicle Management

Contractor will manage construction vehicle movements to ensure that all traffic associated with the works can safely travel on the road network to and from the construction site, safely enter and exit the site access points, maneuver to and from traffic streams and turn at work areas, depots, stockpile sites and quarries. Contractor will plan all construction vehicle movements with the aim to minimize the risk to other road users and keep the traffic generated by the project to minimum.

Contractor will monitor the use of local roads by construction heavy vehicle traffic in consultation with Local Traffic Police to minimize and/or restrict use of local roads by heavy vehicle traffic as far as reasonable and practicable.

The types of construction vehicle movements may include: deliveries of materials, supplies, plant or equipment to site; transportation of over dimension loads;
Haulage of materials on and off site associated with earthworks operations; deliveries of soil, gravel, asphalt, concrete and bitumen from batching plants to pavers; and regular trips by construction personnel in work trucks.

7.4.2 Heavy Equipment Operation (General)

All vehicles must have:

- A service brake system, an emergency brake system, and a parking brake system
- Working headlights, tail lights, and brake lights
- An audible warning device (horn)
- Intact windshield with working windshield wipers
- Ensure that all operators have been trained on the equipment they will use
- Check vehicles at the beginning of each shift to ensure that the parts, equipment, and accessories are in safe operating condition. Repair or replace any defective parts or equipment prior to use
- Do not operate vehicle in reverse with an obstructed rear view unless it has a reverse signal alarm capable of being heard above ambient noise levels or a signal observer indicates that it is safe to move
- Vehicles loaded from the top (e.g., dump trucks) must have cab shields or canopies to protect the operator while loading
- Ensure that vehicles used to transport workers have seats, with operable seat belts, firmly secured and adequate for the number of workers to be carried
- Equipment should have roll-over protection and protection from falling debris hazards as needed
- Prior to permitting construction equipment or vehicles onto an access roadway or grade, verify that the roadway or grade is constructed and maintained to safely accommodate the equipment and vehicles involved
- Do not modify the equipment's capacity or safety features without the manufacturer's written approval
- Where possible, do not allow debris collection work or other operations involving heavy equipment under overhead lines

7.4.3 Material Falling from Vehicles

- Do not overload vehicles
- Ensure that loads are balanced and are fully contained within the vehicle. Trim loads, where necessary, to ensure loads do not extend beyond the sides or top of the vehicle
- Cover with tarpaulin and secure loads before moving the vehicle

7.4.4 Driver Responsibilities

All drivers employed on the project, whether direct employees or subcontractors, have a responsibility to drive safely and in accordance with the Georgian Traffic Rules and any other safe driving instructions issued on the project.

Drivers must exercise care at all times and work in accordance with Vehicle Movement Plans (VMPs).

7.4.5 Hazardous Movements

When planning construction vehicle movements, the following hazardous movements will require particular consideration:

- Entering and exiting work sites to and from adjacent travel lanes;
- U-turn movements across travel lanes and at median crossover points between dual carriageways;
- Reversing maneuvers within the work area and in the adjacent travel lane; travelling through the work area between construction personnel and hazards; and the stopping of construction vehicles within adjacent travel lanes.

Contractor will apply controls and measures to mitigate the risk of these hazardous movements including the restriction of specific movements (e.g. turning bans);

- The provision of temporary traffic controls;
- The installation of deceleration, acceleration and turning lanes outside of the through lanes;
- Educating drivers;
- The installation of warning devices on vehicles;
- The implementation and compliance with project Vehicle Management Plans.

7.4.6 Planning Vehicle Movements

It is essential that satisfactory arrangements are planned and implemented for vehicles associated with the construction works. This mainly involves entering and leaving the traffic stream at work areas, accesses and side roads, or turning around.

Locations for turning across lanes carrying traffic and for entry and exit to and from work areas for vehicles associated with the work will be restricted to well defined points selected after considering relevant factors including:

Sight distance;

- Vertical grades horizontal grades
- Traffic volumes of through traffic;
- Approach speeds of through traffic;
- Areas clear of traffic lanes for accelerating and decelerating.

When planning construction vehicle movements Contractor will comply with all relevant environmental approvals;

- Minimize the number of vehicle movements by balancing earthworks and recycling excavated materials;
- Conduct a risk assessment to identify specific hazards and to facilitate the application mitigation measures;
- Promote safe driving principles;
- Develop on-road haulage routes that not only provide an efficient operation but minimizes the impact on the road network and local community;
- Analyze, assess and mitigate the impacts of the traffic generated by the construction works;
- Set-up depots, stock piles and batching plants at locations that minimize travel distances and impacts;
- Limit haulage operations to the construction corridor as much as feasible;
- Limit the number of access points and haul road crossings;
- Evaluate the need for temporary traffic control; implement appropriate environmental controls; provide an efficient and well maintained vehicle fleet;
- Determine the most appropriate hours of operation that will minimise the impact on the road network and local communities.

7.4.7 On-Site Construction Vehicle Movements

Construction vehicle movements on the construction site need to be carefully planned to address the various hazards and conflict points that occur within the work area and where a number of work areas interface with each other including the presence of workers on foot adjacent to working plant, mixing light vehicles with heavy vehicles, rough surfaces, poor sight distance and alignments, deep excavations and steep embankments.

To address these risks Contractor will ensure that:

- Regular toolbox meetings are held to discuss on-site vehicles movements;
- All plant are fitted with the appropriate safety features;

- All plant are regularly inspected for road-worthiness and are deemed 'fit-for-purpose';
- All access tracks are clearly defined and sign posted;
- Pedestrian tracks and crossing points are provided where necessary and clearly sign posted;
- Large plants, such as scrapers are separated from small plant items where possible;
- Workers do not operate within exclusion zones of moving plant;
- Exclusion zones at work areas and around plant are clearly delineated and where possible, physical separation is provided;
- Spotters and traffic controllers are positioned to assist and warn workers who are operating in close proximity to access roads and moving plant;
- Appropriate temporary traffic controls are installed where required;
- Consideration is given to the installation of reduced on-site speed limits;
- Site escorts are considered at locations where high-risk activities are being undertaken.

7.4.8 Road Network Construction Vehicle Movements

Contractor will plan all vehicle movements to minimize the impact on the road network. However, where on-road haulage operations are required Contractor will:

- Conduct traffic analysis to determine the number of vehicle movements and assess the potential impact on the road network;
- Develop a route that maximizes the use of the arterial roads and minimizes the use of local roads;
- Consult with Traffic Police during the development of haulage plans;
- Where possible, avoid movements during peak periods; develop a detailed VMP and toolbox all drivers; and ensure that the fleet are regularly maintained.

7.4.9 Construction Access Points

The most hazardous movement for construction vehicles occur when the vehicle is entering or exiting the construction site to and from the adjacent travel lane. When planning construction access points Contractor will:

- Consider the use of existing local road junctions to access construction work areas where feasible;
- keep the number of access points to a minimum;
- Ensure that the new construction access points do not adversely impact on any existing
- Intersections, traffic facilities or traffic generating developments;
- Ensure that all access points comply with the Road Design guide standards in relation to sight distance, turning paths appropriate for the vehicle usage, intersection layouts, lane widths, acceleration and deceleration lanes and right turn bays to protect the right turn movement;
- Ensure the junction configuration has sufficient capacity to accommodate the traffic generated by the construction site;
- Ensure that security fences and gates at access points are indented to enable vehicles to park clear of the adjacent travel lanes;
- Ensure that access points are constructed of a suitable all weather surface that prevents debris from being tracked onto the adjacent travel lanes;
- ensure that all access points are clearly visible to approaching traffic and signposted accordingly;
- Consider the use of temporary traffic control to facilitate short-term major haulage operations and the movement of over-dimension vehicles where required.
- Each site access will show the exact entry and exit points for works vehicles and the associated signage.

7.5 Tools Safety Procedure

7.5.1 General Requirements

A. Broken, defective, burned, or mushroomed tools should not be used. They should be reported and turned in for replacement.

B. The proper tool and equipment should be selected and used for each task. For example, a wrench should not be used as a hammer or a screwdriver as a chisel.

C. Leaving tools on scaffolds, ladders, or any overhead working surfaces is hazardous because they may fall. Racks, bins, hooks, or other suitable storage space must be provided to permit convenient arrangement of tools.

D. Striking two hardened steel surfaces together is hazardous because pieces of metal may break off; i.e., two hammers, or a hammer and hardened steel shafts should not be struck together.

E. The practice of throwing tools from one location to another, from one employee to another, or dropping them to lower levels should be prohibited. When it is necessary to pass tools or material under the above conditions, suitable containers and/or ropes must be used.

F. Wooden tool handles must be sound, smooth, and in good condition and securely fastened to the tool.

G. Sharp-edged or pointed tools should never be carried in employee's pockets.

H. Only non-sparking tools shall be used in locations where sources of ignition may cause a fire or explosion.

I. Tools requiring heat treating should be tempered, formed, dressed, and sharpened by workmen experienced in these operations.

J. Tools designed to accommodate guards must be equipped with such guards when in use.

K. All rotating, reciprocating or moving parts of equipment (belts, gears, shafts, flywheels, etc.) must be guarded to prevent contact by employees using such equipment.

L. All hand-held power tools (e.g., circular saws, chain saws, and percussion tools) without a positive accessory holding means must be equipped with a constant pressure switch that will shut off the power when pressure is released.

M. Besides safety hazards, the use of power tools sometimes creates potential health hazards as well. The use of jackhammer and chiseling equipment often results in silica and nuisance dust exposures that can sometimes be controlled by wetting the work surfaces. Many times, however, the use of dust/mist respirators is required to prevent overexposures.

N. In addition to dust hazards, the hand vibration inherent in the use of some power tools may result in a restriction of blood flow to the hands and fingers, causing numbness or tingling. If workers consistently experience these symptoms after the use of power tools, they should contact their supervisor so that steps may be taken to prevent further harm to the nerves and blood vessels in their hands. The use of a different tool, changes to the offending tool to reduce vibrations, and/or the use of special gloves may be recommended to deal with the vibration problems.

8. SAFE SYSTEMS OF WORK

8.1 Risk Assessment Procedure

1 Introduction

1.1 Purpose
It is a requirement of the Permit to Work procedure that a Risk Assessment is carried out before a permit is issued to carry out work on any site.
The purpose of this procedure is to describe only the Risk Assessment process in support of the Permit to Work System.

2 Responsibilities

2.1 Area Authority- Supervisor
Area Authorities are responsible for:

- Determining the extent of Risk Assessment required to support any Permit to Work application
- Organizing and participating in the Risk Assessment process.

2.2 Performing Authority - Foremen
Performing Authorities are responsible for taking part in the Risk Assessment process and disseminating the output from the Risk Assessment process to the personnel who will be doing the work.

3 Risk Assessment Categories

3.1 Risk Assessment Levels
Three escalating levels of Risk Assessment can be used depending upon the complexity and inherent risks of the task. Tasks may be classified as:

- tasks carried out without a Permit to Work
- tasks classified as moderately low risk
- tasks and activities requiring a formal Risk Assessment.

All Risk Assessments require input from those who will be doing the work. In addition, most formal Risk Assessments will require the input of expertise from outside the normal site team.

3.2 Tasks Carried Out Without a Permit to Work
Routine jobs frequently do not require a Permit to Work.
For this type of work, assessment through a periodic review of training needs is appropriate. In this way, the risk is minimised by ensuring that all personnel are trained and competent to undertake the tasks that they are required to do.

3.3 Moderately Low Risk Tasks
Tasks of a moderately low risk are carried out under permit control. The process of issuing the Permit to Work requires the identification of hazards and mitigating measures through the use of a simple Risk Assessment.
The Permit to Work form provides the prompt list and structured approach for this type of Risk Assessment.
As a general guide this level of Risk Assessment is appropriate to tasks which do not require authorisation of the permit by the Supervisor.

4. **Note:** Discussing the job with the workforce involved is an important part of this process.

3.4 Formal Risk Assessment
Tasks require a formal Risk Assessment:

- the Permit to Work process indicates that authorisation is required by the Supervisor
- the risks to people, the environment or property may not be adequately controlled by the normal safeguards because:

⇒ those safeguards cannot be used

or...

⇒ the task is of an unusual nature or is new to the operation

- the task involves an interface between two operations.

A formal Risk Assessment must **always** be undertaken for any job which requires:

- entry into a confined space
- heavy lifts (more than 50 T)
- lifts over power lines or process plant

A formal Risk Assessment is carried out against a check list (see *Appendix A Risk Assessment Check Lists*) and usually involves specialist / expert input.
The risks identified during a formal Risk Assessment are weighted.

3.5 All Risk Assessments
All Risk Assessments require a practical input from the people who will be doing and controlling the job. Only the formal Risk Assessment may require external input.

4 Formal Risk Assessment Team
The objective of a formal Risk Assessment is to use local knowledge and specialist knowledge in a structured way in order to achieve a practicable reduction in the risk involved in an activity to an acceptable level.
The Risk Assessment team should include:

- the Area Authorities for the areas in which the task will be carried out
- the Performing Authority
- the person who will undertake the task
- a specialist from inside and external to the operation as required
- an HSE specialist who is responsible for ensuring that the Risk Assessment is carried out in accordance with this procedure and for recording the results.

5 The Stages of Formal Risk Assessment

5.1 Define the Task to be Assessed
The Risk Assessment team must first ensure that they fully understand the task and its implications. The overall task may need breaking into steps to facilitate carrying out the Risk Assessment.

5.2 Identify the Hazards
A visit to the work site will usually be necessary in order to assess the layout of the area, site conditions and adjacent plant and activities. The check lists in *Appendix A* are designed to assist in this process.

5. **Note:** These checklists are supplied as a guide for reference purposes only. They should not be considered as being comprehensive.

5.3 Evaluate the Risk
Once familiar with the task to be carried out, the team should list all the significant hazards. This should be done in a group discussion, using the check list for formal Risk Assessments as a prompt. The main input at this stage should come from the knowledge and experience of the team. The team should also consider the possibility of the interaction of different hazards, including those related to:

- Location
- Critical Activities
- Simultaneous Activities.

i) Location
Attention should focus on the proximity to other plant or equipment, e.g., Fuel tanks, ventilation systems, drains, ignition sources.

ii) Critical Activities

Critical activities include isolation, confined space entry, work at height, hot work, heavy lifting, use of power tools, temporary power and air supplies, radiography.

iii) Simultaneous Activities

Simultaneous activities should be investigated both within the task itself and with other unrelated activities taking place nearby.

iv) Formal Risk Assessment Check Sheet

The list of established hazards is entered onto the Formal Risk Assessment Check Sheet (see *Figure 3*). Any safeguards which are already in place are then entered in the second column of the table.

Note: Hazards are given a weighting **taking into account the safeguards already in place** based on the potential severity of the "effects" of hazard should things go wrong and the likelihood (probability) of the hazard occurring.

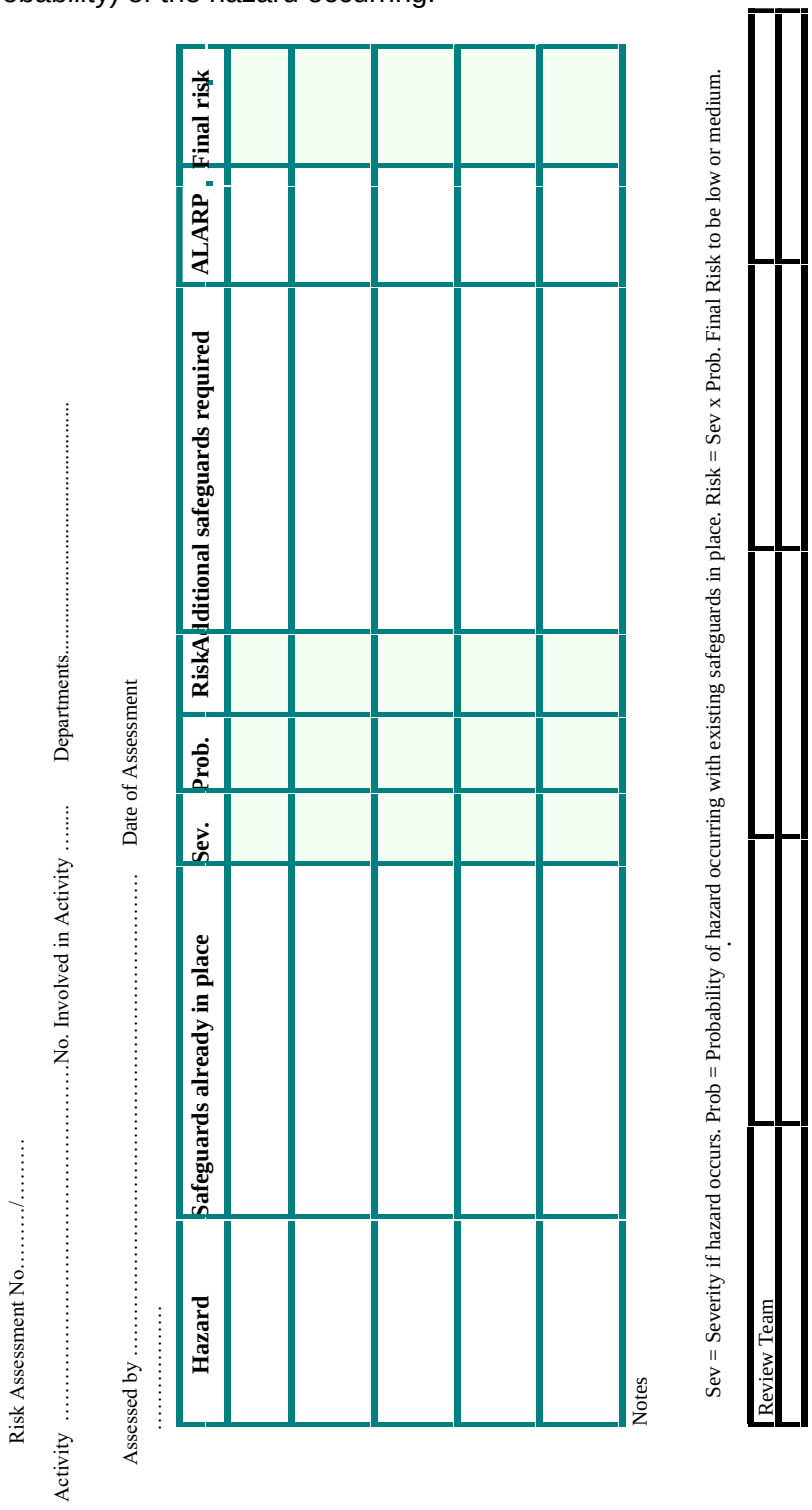

Figure 3 Formal Risk Assessment Check Sheet

v)

vi) Risk Matrix

Having identified the risks, the Risk Matrix (see *Figure 4*) is then used to estimate severity of the hazardous effect and probability as high, medium or low. The risk ratings are then entered on the Risk Assessment check sheet.

Figure 4 Risk Matrix

Level	Likelihood	Description
A	Almost certain	Is expected to occur during the project, 90% or > probability
B	Likely	Will probably occur during the project, ~50% probability
C	Moderate	Might occur at sometime during the project, ~10% probability
D	Unlikely	Could occur at some time during the project, ~1% probability
E	Rare	Only occur in exceptional circumstances, < 1% probability
Level	**Consequence**	**Description**
1	Insignificant	Insignificant Breach of Environmental Statutes
2	Minor	Minor Breach of Environmental Statutes
3	Moderate	Moderate Breach of Environmental Statutes
4	Major	Major Breach of Environmental Statutes
5	Severe	Shutdown of Project Due to Environmental Breach

Likelihood	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Severe
A (Almost Certain)	Medium	Significant	High	High	Extreme
B (Likely)	Medium	Medium	Significant	High	Extreme
C (Moderate)	Low	Medium	Significant	High	High
D (Unlikely)	Low	Low	Medium	Significant	High
E (Rare)	Low	Low	Low	Medium	Significant

5.4 Determine the Additional Safeguards Required

The team must next work through the list of identified hazards and determine the safeguards needed to reduce the risks to an acceptable level. Risk levels are determined as being either low, medium, or high.

Risks determined as “low” at this stage need not be considered further. Transfer the risk rating to the right hand column of the check sheet.

Additional safeguards must be considered for all risks not determined as “low”. The greater the risk, the greater the number and quality of the safeguards which should be in place.

6. **Note:** Controls and safeguards which prevent the hazard being realised should be used in preference to controls which reduce the effect of a hazard.

Typical controls and safeguards that may be used include, but are not limited to:

- **Physical:** disconnect a power supply
- **Procedural:** test for toxic or flammable atmosphere; control of adjacent work

- **Human:** use of specialist personnel; special briefing of workers
- **Time:** planning to avoid simultaneous adjacent work; limiting work to daylight hours
- **Contingency:** additional ESD (Engineering Safety Devices) provision; special PPE; provision of rescue equipment.

The measures to be adopted should be recorded in the "Additional Safeguards" column of the check sheet.

5.6 Re-evaluate the Risks for Acceptability

The team must then re-evaluate the risk for all those hazards for which extra safeguards have been determined. The new risk level (high, medium or low) should be determined and the team should consider whether the risk is now as low as reasonably practicable.
If the risk is not as low as reasonably practicable, the review team must decide what further safeguards need to be put in place. The ALARP status and final risk are entered into the right hand columns of the check sheet.
If at this stage any hazard has a high risk against it in the Final Risk column of the check sheet, the task in its present form must be abandoned.
The team must finally decide on the acceptability of the overall remaining risk for the task.
Individual hazards with a medium risk may be acceptable provided the overall risk of the task is considered low. If the team decides that even with the safeguards in place, there are too many hazards which still have a medium risk, this must be recorded and the task in its present form must be abandoned.
The team must finally sign off the check sheet in the review team boxes.

6 Management of Risk

6.1 Approval

On completion of the Risk Assessment, the Risk Assessment Check Sheet must be attached to the permit application for the job. It must be reviewed and signed by the Supervisor before he approves the associated Permit(s) to Work.
Should the Supervisor feel that the task presents risks beyond his level of accountability, he must refer to his Manager for guidance, and if necessary request a more sophisticated analysis of the risks and mitigation than can be provided by the method described in this procedure.

6.2 Implementing Safeguards

The safeguards specified by the team must be implemented by the Supervisor before the permit is issued.
The Supervisor must ensure that any training requirements or special pre-task briefings are completed before work commences.

7 Recording the Risk Assessment

Where a task is likely to be repeated, a record of the Risk Assessment should, at the permit issuer's discretion, be retained for future reference. In any event Risk Assessments which include hazards to the health of those undertaking the task must be attached to the permit(s) for the job and retained for 12 months.

Appendix A Formal Risk Assessment - Checklists

Note: These checklists are for guidance only. They should not be regarded as comprehensive in nature and do not replace sound judgment in the recognition of all hazards associated with any task undergoing assessment.

Several check lists are provided below AS A STARTING POINT FOR FORMAL RISK ASSESSMENTS. The team should choose the list which it feels is the best starting point for the assessment to be carried out.
The Incident Causation Check List or the General Check List can be used for guidance on all tasks, in combination with a more specific checklist if appropriate.

Hazard Checklist - General	
Falling from height	Noise
Manual Handling	Vibration
Lifting operations	Pressure
Falling object	Biological agents
Noise	Welding/cutting
Lighting	Power tools
Fume/dust	Hand tools
Minimise potential for ignition	Work on safety systems
Collision	Transport by sea/air
Hand tools	Storage
Machinery	Water jetting
Asphyxiation	Grit blasting
Cold/Heat	Loss of containment from nearby system
Mental Stress	Loss of containment from system being worked on
Ionising Radiation	Ignition
Chemical hazard	Fire
Inert gas	Explosion
Flammable gas	Structural damage
Flammable liquid	Personal injury
Electricity	Barriers/access restrictions
Static Electricity	Weather

Hazard Checklist - Confined Space Entry
Residual gases/vapours
Sludge which may give rise to vapours/gases when disturbed
LSA scale
Adequacy of ventilation
Need for air movers during entry.
Communication difficulties within the Confined Space or with the standby man
Standby man communication with the CCR
Ingress of gases/vapours from other nearby activities or systems
Use of mechanical tools/power tools/electrical equipment
Slip hazards within the Confined Space or at the point of entry
Ionising radiation; nucleonic instrumentation
Danger of falling into Confined Space boots or sumps
Noise, general
Noise when using power tools
Visibility within the Confined Space
Adequacy of lighting within the Confined Space
Temperature effects
Oxygen enrichment
Oxygen deficiency
Frequency of gas testing
Location of rescue kits
Competency of standby man
Disposal of Confined Space cleanings

Appendix B - Definitions

List of Definitions

Confined Space Entry:	where there is inadequate ventilation to dispel injurious or flammable fumes, vapor or gas or to provide sufficient oxygen. Also includes areas where access / egress is restricted.
Hazard:	the potential for human injury or loss of life, damage to the environment or to material assets or a combination of these.
Hazardous Consequence:	the result when a hazard is realised.
Inhibition:	the isolation of the executive action of a protective system. Where practicable, this should not prevent the operation of the visual / audible warning system.
Isolation:	• Process Isolation involves the closing and locking of valves. This may include depressurising, flushing and purging, e.g. single valve isolations. • A Positive Isolation involves the disconnection of plant, equipment and systems from sources of motive power, liquids and gases. • Electrical Isolation - The secure, disconnection and separation of a circuit, or item of equipment, from every source of electrical energy. This may involve electrical, instrument and communication isolations. • Long Term Isolation - An isolation that remains in place after permit cancellation, and recorded as “Long Term”.

Isolation Certificate Board:	a board used to display the status of Isolation Certificates, Isolation Certificate Continuation Sheets and Boundary Isolation Certificates, maintained by the Area Authority.
Isolation Certificate Register:	a register maintained in the control room identifying the status of all Isolation Certificates by the Control Room Operator-referenced to individual permits.
Likelihood:	the chance of occurrence of an event. Likelihood can be expressed as a probability, frequency, class, rank etc.
Permit:	an authorising document approved by management, specifying the required precautions and conditions under which potentially hazardous or interacting activities can take place
Permit Display Board:	a board used to display the status of active and suspended permits.
Permit Register:	a register maintained in the control room identifying the status of all permits.
Risk:	a combination of the likelihood of a hazardous event and the severity of the possible consequences of that hazardous event.
Risk Assessment:	the overall process of risk analysis and risk evaluation.
Risk Evaluation:	the process to support management decisions as to acceptability or risk reduction requirements by comparing the estimated risk against relevant criteria.
Safeguards:	steps taken to reduce either the likelihood or consequences, or both of a particular risk.

8.

8.2 Excavation and Backfilling Procedure

1 Introduction

1.1 Document Purpose
This document sets out the precautions and conditions considered necessary for the safety of all excavation works.

1.2 Document Scope
This document refers to:

- Method of excavation
- Excavation and protection of third party pipelines and services
- Excavation of oil contaminated soils
- Backfilling guidelines.

2 Responsibilities

2.1 Site Supervisor

- The Site Supervisor is responsible for the safety of all personnel on site and the safe execution of all work carried out on the site
- The implementation of, and compliance with, this Safe System of Work on site
- Ensuring that only suitably trained and qualified personnel are employed on site and for using only those contractors who employ suitably competent and experienced personnel
- Ensuring that a risk assessment is carried out for the work site by a competent person
- Reviewing all Risk Assessments carried out on site
- Maintenance of site records including those for Risk Assessments, equipment inspections and training.

2.2 Area Authority

Area Authorities are responsible for:

- Compliance with this Safe System of Work within their area of authority
- The safety of personnel and the safe execution of activities within their area
- Ensuring daily equipment checks are completed on equipment within their area and that equipment is maintained in good working order.

2.3 Machinery Operator

Machinery operators are responsible for:

- The safe and responsible operation of machinery under their control
- Immediately reporting to their supervisor if they believe the equipment they are using is in a dangerous or unsafe condition
- Ensuring that the machinery or equipment they use has all the safety devices and guards in place and that all guards are properly fitted.

2.4 Banksmen

Banksmen are responsible for:

- Preventing access to working areas under their control by unauthorised personnel
- Providing safe guidance and assisting in the safe operation of machinery under their direction.

2.5 All Personnel

All personnel are responsible for:

- Carrying out their duties in a safe and responsible manner
- For halting any work where they feel that conditions are unsafe and for bringing this to the attention of their immediate supervisor.

2.6 ENVIRONMENTAL MANAGER

ENVIRONMENTAL MANAGER is responsible for:

- Providing advice and assistance to the Site Supervisor on environmental matters as and when required
- Providing Information regarding natural, archaeological and other important features within and adjacent to the excavation site.

  Note: Photographs of important features should also be provided if required.

3 Access Routes

Access routes to proposed sites shall be properly surveyed and reconnoitred. In particular, for all access routes:

- Risk assessments shall be made, and actions documented, for all crossing points and other points of difficulty recognised on the route
- Method statements shall be produced for negotiating all crossing points and other points of difficulty
- The route shall be clearly marked.

4 Route Identification and preparation

4.1 Locating and Marking Existing Pipelines

Note: At locations where there is hydrocarbon or a suspected leak a gas survey must be carried out before pipeline location activities begin.

Prior to the commencement of any excavation a site survey shall be carried out in order to:

- Locate, identify and mark any existing pipelines and foreign services and utilities and any cathodic protection system components, using pipe locating equipment and hand excavated trial holes
- Peg out the pipeline routing
- Define and log the point of excavation.

4.2 Pipeline Crossing Points

Requirements

Construction traffic and other plant shall cross the pipeline only by:

- Public roads
- Previously agreed and clearly marked crossing lanes or bridges.

Construction

All crossing lanes shall be fenced on both sides over a width to be specified and agreed by the Pipeline Patrolman as far as is reasonably practicable as dictated by local conditions and acts of vandalism. These fences shall be returned along the edge of the wayleave strip for a distance of 6 m away from the crossing.

Where it is necessary at crossing points to install a temporary bridge to protect the pipeline. Such a bridge will consist of the laying of steel plates of adequate thickness with hard core laid in, or an approved sleeper raft, or a combination of these methods. The design and construction of such bridges and crossings shall be by a competent person or approved civil engineering subcontractor where it is deemed necessary.

Markings

Any temporary crossing or bridge, must be clearly marked by appropriate notices and flags, and additionally with lights at dusk, at night or in foggy conditions.

5 Site Safety

5.1 Access and Security

Guards and Barricades

Open excavations in a plant or near public areas must be

- attended by a watchman

or…

- protected by a barricade and mark with a warning sign.

All other open excavations should be attended by a watchman, marked or barricaded. If there is a recognised chance of people or cattle falling into the excavation, a decision may be taken regarding the use of a night watchman.

Note: If a night watchman is used, he shall be equipped with appropriate communications and shelter for use in case of prowling animals, sickness or other emergency. Vehicle for night watchman to be provided as far as is reasonably practicable.

Fencing, Gates and Safety Notices

Erection of stock fencing, gates and bunting safety notices, etc., shall be undertaken over access ways and worksites.

5.2 Vehicle Traffic

Vehicular traffic should not operate within 1 m of a trench or excavation. Vibration created by traffic may cause cave-ins.

5.3 Personnel

Protective Equipment (PPE)

With temperatures experienced in Georgia use of Inherently Fire Resistant or Flame Retardant Coveralls during summer where personnel are working all day outside could be unbearable. An alternative to IFR/FR coveralls for the low flash risk applications is 100% cotton. Personnel involved in specific work activities should wear Flame Retardant coveralls.

During all activities on site all personnel shall wear minimum PPE (helmet, safety boots/shoes, fire coveralls, and eye protection).

Personnel involved in specific work activities shall wear additional PPE to suit the requirements of the work as agreed/detailed at the pre-work toolbox talk.

Excavator Operators

Only experienced operators shall operate the excavating equipment.

Banksmen
Trained and qualified banksmen shall attend all operations involving excavating equipment and movement of heavy plant to prevent personnel entering the field of work and to ensure safe working of the equipment.

5.4 Equipment

Type and Location
All equipment shall be checked and registered on the appropriate checklists and registered in accordance with the site operating procedures. All operatives' certificates shall be checked and logged prior to works commencing.

Warning: Machinery vibration may cause cave-in. No running plant shall be located within 1 m of an excavation.

Equipment Inspection
Equipment shall be inspected daily and maintained as necessary to ensure that it is in good working order. This includes the inspection of brakes, pivot pins, hydraulic cylinders, hoses, snap rings, main attaching bolts, etc.

Adjustments and Repairs

- **Do not** lubricate or make mechanical adjustments to the unit while the unit is in motion or the engine is running.
- **Do not** repair or tighten hydraulic hoses or fittings when the:
  - system in under pressure
  - engine is running

or…

  - equipment hydraulic cylinders are under a load.

Refuelling
A method statement covering spill containment and management of personnel injury risks shall be prepared for all refuelling operations
In all cases, equipment shall be shut down prior to being refuelled.

Lighting
All lighting shall be either explosion proof or located outside Zone 2.

5.5 The Use of Mechanical Equipment Near Overhead Power Lines

Introduction
All personnel working near overhead power lines with a machine or mechanical equipment shall be made aware of:

- the dangers associated with power lines
- the precautions they should follow to deal with those dangers
- what to do if they make contact with a power line.

Warning: Physical contact with high-voltage overhead power lines is likely to be fatal or cause severe and irreversible maiming.
It is impossible to say whether an overhead cable is a power line or a telephone line from observation alone. The only sure method is to make contact with the line owner.

Safe Vertical Working Clearance
The minimum safe working distance between mechanical excavation equipment and live overhead power lines will vary according to:

- type of power line (for example, insulated or uninsulated)
- voltage carried by the power line
- ground and weather conditions.

To establish and maintain safe **vertical** working distances between mechanical equipment and overhead power lines the following practice shall always apply:

1. Establish and record the maximum vertical reach of all machines on site.
2. Identify the routes of all overhead lines on or near the land to be excavated and clearly mark these routes on site plans.
3. For each overhead power line, identify the line owner.

4. From the line owner find out:
    a. if the line can be conveniently made DEAD
    b. the line type (for example, insulated or uninsulated)
    c. the voltage carried
    d. minimum safe working clearance for mechanical machinery operating near the power line.
5. If the line cannot conveniently be made DEAD then the established minimum safe operating clearance shall be adhered to at all times.

Reducing the Risk from Overhead Power Lines
Risks associated with working close to overhead power lines can be reduced by:

- Taking care not to damage poles and stays
- Fitting shorter radio aerials or repositioning existing ones on high machines so they cannot cause danger
- Carrying long items (for example, pipes or ladders) horizontally and not storing pipes or other materials and equipment near or under power lines and their supports
- Designating safe areas for high-risk activities; for example, tipping trailers
- Using barriers and goalposts: by erecting goalposts and barriers, machines which have to pass beneath lines can be limited to a safe height – an option especially suited to gateways and tracks.

If Contact is made With an Overhead Power Line

- Never touch an overhead line – even if it has been brought down by machinery, or has fallen through other means.
- Never assume that lines are dead.
- When a machine is in contact with an overhead line, electrocution is possible if anyone touches both the machine and the ground. Stay in the machine and lower any raised parts that are in contact or drive the machines out of the lines if you can.
- If you need to get out to summon help or because of fire, jump out as far as you can without touching any wires or the machine – keep upright and away from the machine.
- Get the line owners to disconnect the power supply. Even if the line appears dead, do not touch it – automatic switching may reconnect the power.

5.6 Working Hours
Excavation work shall only be carried out during daylight hours where practicable. If the task overruns dayshift then the area will be barriered off and illuminated using approved out side site lighting. Preferably this should be a mobile tower, diesel driven arc light if available. These are additional requirements in addition to the site being fenced off.

5.7 Fires
Storage of material for lighting of fires in the vicinity of above ground installations associated with it **is not** permitted.

6 Pre-excavation requirements and Procedure

6.1 Excavation activity should preferably be undertaken in the summer as far as is reasonably practicable, in order to minimise both ground disturbance and soil compaction.

6.2 Landowners
Ensure that access has been granted by the landowner, that a pre-entry survey with photographs has been done and that compensation, access route and area protection have also been agreed. Landowners and neighbours in close proximity to the proposed excavation must be informed that work is about to begin and that the inspection is of a routine nature.
Note: This requirement may be negated under an emergency situation.

6.3 Third Party Services

Owners of third party services shall be contacted before the excavation of their services begins. A No Objection Certificate shall be obtained when applicable.

6.4 Excavation Boundaries

The extent of required excavation shall be clearly marked out prior to commencement of the work.

6.5 Excavation design requirements

Access

Whenever personnel will be in an excavation, ramps, stairways or ladders should be kept within 7.6m of workers for all excavations over 1.2m deep.

Windsocks

Wherever the presence of hydrocarbons is reasonably suspected, for example in all Red Zones, windsocks or flags must be positioned on both sides of the excavation in order to determine wind direction.

Planning for Water Accumulation

Works shall be suspended / re-scheduled during periods of severe/inclement weather. A portable diesel driven dewatering pump with a suitable length of hose shall be in attendance to drain the excavation if required.

When someone will be working in an excavation where water may accumulate, consideration **should** be given to:

- Special support or shield systems
- Water removal equipment, and
- Emergency rescue procedures.

Confined Spaces

If the depth of excavation is 1.2m or greater, it shall be treated as a confined space. Risk Assessment should stipulate if all confined space entry requirements are to be met. Gas testing must be carried out prior to entry. Where hazardous atmospheric conditions may exist or develop in an excavation/confined space, controls such as proper respiratory protection (BA sets, respirators), ventilation, availability of trained and competent Rescue Teams and Emergency Rescue equipment must be provided.

7 Excavation Procedures

7.1 Excavation Inspections

Where personnel are required to work in excavations of 1.2m or deeper a safety inspection by a competent person must be carried out on each shift as follows:

- before work is started
- after rainstorms
- after other occurrences which may increase the hazard of cave-ins.

All high-risk excavations as defined by the Risk Assessment must be attended by a geo-technical engineer/person trained in soil analysis.

7.2 Toolbox Talks

A toolbox talk shall be carried out prior to works commencing with all parties involved in the works. Talks shall be carried out during the works when the initial shift handover takes place and when new works come on site.

Note: Toolbox talks shall be recorded.

7.3 Operating restrictions

The following are operating restrictions for excavating equipment.

- Tracked vehicles **should be used in preference** to wheeled equipment on the side of the excavation to minimise soil compaction.
- Equipment **must** be operated within its rated capacity.
- Personnel **must** stay clear of excavating equipment while in operation.

Examples of unsafe areas include: under or beside the bucket of a backhoe, near hydraulic rams of a bulldozer, etc.

- A seat belt **must** be installed on equipment manufactured with a ROPS.
- Do **not** use equipment if the ROPS has been removed.

Note: "Pure" ditching machines (those without blades or backhoe attachments) are excluded from ROPS requirements.

Operators

Equipment operators must:

- be trained in the use of the equipment
- be properly seated when operating equipment controls
- wear seat belts if the equipment is in operation and furnished from the manufacturer with a Roll Over Protective Structure (ROPS)

  Note: Seat belts **should not** be worn if the equipment is not fitted with a ROPS.
- use care at all times to maintain equipment stability
- always drive at safe speeds for the conditions encountered (for example, on rough ground, slopes, crossing ditches, turning, etc)
- always use steps and handles provided when mounting or dismounting equipment.

Equipment operators must not:

- start the engine unless seated in the driver's seat
- allow other personnel to ride on the equipment unless it is designated for more than one occupant
- get off the equipment while it is in motion, except in an emergency.

Parking and Moving Equipment

The table below describes the operator requirements for specific excavating equipment.

Activity	**Precautions**
Parking excavating equipment	• Park the unit on the level ground if possible and… • Lower the boom to a relaxed position
Parking a backhoe on an incline	• Lower the bucket so that the cutting lip contacts the ground • Apply the parking brake and… • Securely chock the wheels.
Loading equipment on a trailer	• Use the crawl gear.
Storing or transporting a ditcher on a trailer	• Use trainer ramps • Lower the boom • Place the transmission in gear and… • Fasten the ditcher securely to the trailer.

Using Backhoes

The following precautions apply whenever a backhoe is used during excavation:

- Personnel **must not** be in an excavation within the full reach of the backhoe while it is excavating
- The boom must be raised and centered before engaging or disengaging the transport.
- Avoid using the full reach or swinging a loaded bucket to the downhill side.

  Note: This will prevent upsets when operating in a slope.
- Attach towlines at a point below the rear axle.

  Note: Attaching above this level increases the risk of rollover.

Waste Management

Waste Management Plan to be referred to.

Power Lines
Before operating equipment, all utility lines and overhead power lines must be located and identified.

7.4 Excavated Materials
Excavated material shall be placed at least 1m away from the edge of the excavation and shall be stockpiled within the Right of Way area.

Topsoil
The stripped topsoil shall be stored for re-use away from the side of the excavation and separate from the sub-soil.
The height of stored soils should be limited to 3 m in order to reduce erosion problems and prevent the development of anaerobic conditions within the stockpile. Weed growth may need to be controlled by spraying with approved herbicides.

Warning: **Do not** pile topsoil under overhead power lines.

Subsoil
The stripped sub-soil shall be stored for re-use away from the side of the excavation and separate from the topsoil.

Warning: **Do not** pile subsoil under overhead power lines.

Contaminated Soil

Note: Any excavation where contaminated ground is encountered shall have a Hazard Risk Assessment completed. This Risk Assessment shall take into consideration the duration that the excavation is expected to be open.

8 Backfilling Procedures

8.1 Preparation

Backfill Materials
No perishable materials such as vegetable growth, timber bush, etc are to be filled into the trench.

Backfilling Guidelines
Backfilling operations in well-compacted layers should be carried out in such a manner as to prevent heavy loads passing over the pipeline. Allowance should be made for sufficient overfilling or mounding of the filled trench to compensate for subsequent settlement.
The following guidelines apply to backfilling operations:

Note: If a compactor is used, area gas monitoring shall be conducted throughout the compacting activity

1. All water shall be removed from the trench before backfilling commences.
2. The bottom of the trench shall be padded as far as is reasonably practicable with a minimum of 150mm of suitable granular material, i.e., building sand.

Note: The removal of any fine materials from riverbanks and / or riverbeds is strictly prohibited.

3. The original topsoil is to be replaced in the top of the trench with the same depth as that on the working width.
4. All surplus excavated materials, rock, welding rods, waste and all unwanted material shall be removed from the site of the works and the site left in a tidy condition.
5. On completion of backfilling all fields, verges, tracks, paths, garage drives and access roads should be permanently reinstated to a condition equivalent to that before the commencement of the work.
6. Any damage to field drains etc must be repaired and local farmer/land owner be invited to inspect the repair(s) prior to backfill.

9 Site Reinstatement
Reinstatement of the site shall be implemented in accordance with the Contract Specifications.

9.1 Drainage

Any field drains that have been damaged should be repaired or replaced.

Drainage patterns should be returned to their original state by using the same permeable materials that were excavated.

Topsoil reinstatement should take place in dry conditions to prevent permeability and drainage characteristics from being altered through compaction.

9.2 Topography

In addition, excavated soils should be redistributed across the entire right-of-way to restore the natural topography. Any areas outside the trench area that have been compacted by moving vehicles should be loosened using deep-tine cultivators.

The responsible department in order to ensure that restoration is satisfactory or to ensure that monitoring should continue should carry out a final inspection.

9.3 Fire Fighting Procedure

1 Introduction

1.1 Document Purpose

This Safe System of Work provides the information necessary for ensuring the safety of personnel, buildings, installations, and plant with regard to fire prevention, detection and protection.

1.2 Document Scope

The contents of this Safe System of Work apply to all personnel employed on this project.

This Safe System of Work does not remove the responsibility for compliance with local legislation and statutory requirements, which shall be complied with at all times.

2 Responsibilities

2.1 AREA AUTHORITY - SITE SUPERVISOR

Within their particular areas, Area Authorities are responsible for ensuring:

- compliance with this safe System of Work
- that fire prevention and housekeeping standards are maintained at all times
- that all fire fighting equipment is in date and fully functional
- that all activities are carried out in a safe and responsible manner with regard to fire risks, and that Risk Assessments are carried out wherever necessary.

2.2 All Personnel

All personnel, including contractors, are responsible for the prevention and detection of fire. In particular, all personnel are responsible for:

- immediately informing their supervisor of any situation that they consider to be a potential fire risk
- conducting themselves and their work in a fire-safe manner
- ensuring that they are aware of and fully understand the actions they must take in the event of a fire alarm
- ensuring that they are fully aware of the actions they must take on discovering a fire.

3 Fire Prevention

Prevention is the first line of defence against fire. All reasonably practicable measures shall be taken to reduce the fire risks to as low as reasonably practicable.

3.1 Housekeeping and Procedures

Properly established and applied housekeeping procedures are required in order to reduce both the risk of fire and the ultimate consequences should a fire occur.

Work Areas and Walkways

No materials, flammable or otherwise, should be allowed to accumulate in the workplace or in walkways, where they can present direct fire hazards or obstruct attempts to deal with a fire.

- Work areas and walkways should be kept free of any unnecessary flammable materials, including:
    - flammable materials or agents no longer required for the activity
    - combustible waste (for example, wood shavings, flammable dust)
    - packaging materials, particularly plastics and polyester foam waste which, when ignited, can give off large amounts of dense, black smoke and toxic fumes.
- All spills involving flammable liquids shall be cleaned up immediately. Where necessary, suitable cleaning materials should be provided and used.
- Flammable liquids should be dispensed over a drip tray, the contents of which should be disposed of at frequent regular intervals (for example, on completion of dispensing activities)
- Where necessary, working areas should be kept free of flammable dust accumulation by regular cleaning, and vacuuming spillages as they occur.

Waste Materials

- Suitable containers must be provided for waste materials. These containers must be clearly labelled with regard to their use and contents.
- Oily or paint soaked rags, waste, or clothing shall be placed in closed, metal containers that shall be emptied frequently, ensuring safe disposal of their contents.
- Contaminated waste materials should be disposed of safely in accordance with the Environmental Management Plan. If necessary, waste disposal experts should be used.

Working Practices

- Keep containers closed when not in use. If possible, use safety containers with self-closing lids.
- Only dispense flammable liquids in a safe place where there is good ventilation and no source of ignition.
- Take extra care when dealing with, or working close to, engine fuels, solvents and thinners. Nearly all refined liquid petroleum products will emit a flammable vapour and may convert naturally to a gaseous state at or below temperatures found in a normal working environment
- Do not use flammable liquids for cleaning machinery or machine parts.
- Suitable signs should be posted in areas where ignition sources or flammable materials are likely to be in use
- Identified fire risks should be dealt with immediately

3.2 Risk Assessments

All Activities

Risk Assessments shall assess the potential for a fire and its possible consequences. In particular, Risk Assessments should address the:

- existence of planned and accidental ignition sources
- proximity of combustible materials to the work area or storage area
- possible consequences of fire and the possibility of the fire spreading to adjacent areas
- provision of suitable and adequate fire fighting equipment and personnel
- requirement for contingency plans in the event of a fire or spillage
- competency of personnel involved in the work and of those who may be required to deal with the initial outbreak of a fire.

Hot Work

Hot Work, spark potential or naked flame, shall only take place under the control of a Permit to Work that is supported by a formal Risk Assessment.
See also *3.4 Hazardous Areas*.

3.3 Hazardous Areas

Area Classification

Areas are classified as hazardous or non-hazardous using recognised standards. The process of identification of hazardous areas is a multi-discipline task performed by Process and Safety Engineers in the development of a hazardous area classification.
The areas may be classified as:
Zone 0: in which a flammable atmosphere is continuously present or present for long periods.
Zone 1: in which a flammable atmosphere is likely to occur in normal operation.
Zone 2: in which a flammable atmosphere is not likely to occur in normal operation, and if it does it will exist for only a short time.
Non-Hazardous: in which an area is not one of Zone 0, 1 and 2.

Plant and Equipment in Hazardous Areas
Equipment and plant used in Zones 0, 1, and 2 must be explosion proof and electrical devices must be intrinsically safe.
Any source of unplanned ignition, including mobile phones, matches and cigarette lighters **shall not** be taken into these areas.

Motor Vehicles and Internal Combustion Engines
Special precautions are required for the use of motor vehicles and internal combustion engines. In particular:

- motor vehicles and internal combustion engines shall not be allowed in Zones 0 and 1
- motor vehicles and internal combustion engines shall only be allowed into Zone 2 under a Hot Work (Spark Potential) Permit.

Hot Work in Hazardous Areas
All hot work, in a hazardous area or otherwise, shall only be carried out under the control of a Hot Work permit, either spark potential or naked flame. The issue of a Hot Work permit is dependent upon the results of a formal Risk Assessment that shall fully address the fire risks involved and the Hazardous Zone classification.

3.4 Handling and Storage of Flammable Substances
Handling

- Site Managers and Area Supervisors shall be aware of hazardous and flammable materials that are used or stored within their areas of responsibility and shall have contingency plans in place for dealing with spills and fires involving these materials
- Personnel handling flammable materials shall be suitably qualified and trained in the use and properties associated with those materials
- Personnel handling or dealing with flammable substances shall be equipped with suitable personal protective equipment, including but not necessarily limited to face protection, hand protection and fire-proof overalls
- Suitable fire fighting equipment shall be made available in areas where flammable substances are handled.

i) Storage

- Site Managers and Area Authorities shall be aware of all flammable materials stored within their areas of authority
- Flammable substances shall not be stored near to sources (potential or real) of flame, high heat or near other combustible materials
- Flammable substances shall be stored in secure storage areas or facilities
- Storage areas for flammable liquids and gases shall be well ventilated in order to promote rapid dispersal of vapours given off from leaks, spills or unplanned releases
- Storage areas for flammable substances shall have signs and notices clearly posted warning personnel that flammable substances are present
- Where necessary, storage areas shall be equipped with adequate containment facilities, for example trays or bunding, to prevent spills from spreading to other areas
- Containers used for flammable materials shall be clearly and accurately labelled with regard to their contents
- Glass containers shall not be used for storing flammable liquids.

3.5 Fire Protection of Buildings and Plant

As a minimum, building work shall comply with local authority requirements.
New and altered buildings / installations and work sites shall be formally assessed and adequate provision made for:

- fire detection
- fire fighting equipment (fixed and portable)
- personnel escape routes.

Note: Any buildings, installations, or sites undergoing structural alterations or a change of use must be reassessed for the above points.

4 Fire Detection

4.1 Fixed Fire Detection Systems

Description and Types
Heat detectors (electro-pneumatic; electronic; heat sensing wire; quartzoid bulbs)
Smoke detectors (photo-electric cell, ionisation detectors, continuous air sampling)
Flame detectors (infra-red detectors, ultra violet detectors)
Location and Use
As a minimum, fixed fire detection systems shall be located and used in accordance with the manufacturer's recommendations and in accordance with local legislation.
Detection systems shall not be modified in any way without undergoing a thorough Risk Assessment.
All modifications shall be recorded and held on site.
Operation
Fire detection systems shall include an automatic alarm system that:

- alerts personnel to an outbreak of fire
- provides indication of where the fire is.
- activates a fire suppression system (for example, sprinkler system).

If for any reason these facilities must be overridden:

- personnel must be informed (for example by public announcement)
- smoking shall not take place in the affected area
- any hot work in the affected area shall only be allowed under the control of a Permit to Work and only when alternative arrangements for fire detection and protection have been arranged (for example, the use of fire watchers).

Inspection and Maintenance
Fire detection systems should be inspected and maintained by a competent person and in accordance with the manufacturer's instructions and recommendations. The Site Manager shall ensure that a suitable inspection and maintenance programme is in place for fixed detection systems.
Inspection results and any repairs carried out to a fixed fire detection system must be recorded and held on site for future reference.

4.2 Manual Fire Detection

Site Specific Procedures
Personnel shall be made aware of site-specific fire and emergency procedures during their initial safety induction. The induction should cover:

- action to take in the event of a fire
- escape routes and muster points
- manual alarm point locations
- extinguisher locations

In addition, fire and muster instructions shall be posted at strategic locations around the site.

Note: At all times, personnel are responsible for making themselves aware of the fire and emergency procedures relevant to their location.

Person Discovering Fire
Personnel discovering a fire should:

1. Raise the alarm the alarm by shouting "FIRE FIRE FIRE".

2. If the fire is small and easily extinguishable and a suitable extinguisher is available, attempt to put out the fire without endangering themselves or others

or…

if the fire is not easily extinguishable or the initial attempt to extinguish the fire fails, evacuate the area closing any doors en route.

3. Follow the fire and emergency procedures specific to the site / installation.

4.3 Personnel Response to Fire Alarm

Upon hearing the fire alarm, personnel should:

1. Switch off / make safe the equipment they are using and leave the area / building by the nearest safe exit, closing doors and windows behind them
2. Proceed in accordance with local fire and emergency procedures.

Note: Personnel should not delay from evacuating to collect their personal belongings.

5 Fire Protection

5.1 Fixed Fire fighting Equipment

Description and Types

The most common types of fixed fire fighting systems are:

- Sprinklers
- High Velocity Water Spray (Automatic and Manual)
- Medium Velocity Water Spray (Automatic and Manual)
- High Expansion Foam Flooding Systems (Fixed and Portable)
- CO_2 Fire Suppression Systems (may be used in unmanned areas).

Location and Operation

As a minimum, fixed fire fighting systems shall be located and used in accordance with the manufacturer's recommendations and in accordance with local legislation.

Fixed fire fighting systems shall not be modified in any way without undergoing a thorough Risk Assessment.

All modifications shall be recorded and held on site.

Inspection and Maintenance

As a minimum, fixed fire fighting systems should be inspected and maintained by a competent person and in accordance with the manufacturer's instructions and recommendations and local legislation. The Site Manager shall ensure that a suitable inspection and maintenance programme is in place for fixed fire fighting systems.

Inspection results and any repairs carried out to a fixed fire fighting system must be recorded and held on site for future reference.

5.2 Portable Fire fighting Equipment

Description and Types

- **Water:** Water filled extinguishes are suitable for use on fires involving paper, wood, and rubbish.

  Warning: Water extinguishers must not be used on electrical fires where there is a possibility of the water coming into contact with electrical sources.

- **Foam:** Foam filed fire extinguishers may be used successfully on fires involving paper, wood and general rubbish. However, foam fire extinguishers are primarily designed for use on oil fires.

  Warning: Foam extinguishers must not be used on electrical fires where there is a possibility of the foam coming into contact with electrical sources.

- **Dry Powder:** Dry powder filled extinguishers may be used on fires involving rubbish and oil and may also be used on electrical fires. However, the use of dry powder on electrical equipment usually makes that equipment unusable.

- **Carbon Dioxide (CO2):** CO2 extinguishers are intended for use on electrical fires only. If used on fires involving rubbish and debris, the pressure from the extinguisher is likely to disturb the seat of the fire and spread burning material. For the same reason they are not suitable for oil based fires.

Location
Portable fire fighting equipment must be placed in accordance with local fire regulations, national fire protection guidelines and any other requirements.
The location of all portable fire fighting equipment should be shown on safety plans placed at strategic locations around the site / installation.

Operation and Use - Recharging
All extinguishers must be recharged immediately after each use. Chemicals must never be mixed, as the resulting chemical reactions may damage the extinguisher.
Recharging must only be done by trained personnel.

Inspection and Maintenance
All maintenance of portable fire fighting equipment must be carried out by a competent person and in accordance with the manufacturer's recommendations and local legislation.
The following inspections represent the minimum requirements of any inspection programme:

- All extinguisher units must be in the designated location and clearly visible. Signs or painted red backgrounds may be used to identify extinguisher locations.
- All extinguishers must be visually checked every month to ensure operational reliability (for example, seals are in place, nozzles and hoses are free from damage and the units can be accessed easily).
- Annual inspections must be performed as per manufacturer's specifications and applicable regulations.
- Inspection results shall be documented for each extinguisher unit and retained on file at the local site.

6 Training and Drills

6.1 Training Programme
All personnel are required to be knowledgeable on the common causes and types of fire and must be familiar with the use of fire fighting equipment. This is achieved by the use of a comprehensive training programme that includes:

- established training courses for all personnel
- regular on-site drills and practices.

6.2 Training Records
Training records for all personnel shall be held on site.

6.3 Practice Drills
Practice drills shall be held at regular intervals according to an established programme. The drills shall be used to practice and improve personnel skills and knowledge in fire fighting techniques and also to highlight any shortcomings in established fire fighting procedures.

Appendix A - Definitions

List of Definitions

Fire Protection:	All measures used to minimise injury and loss through fire, including procedures, design, selection, installation and maintenance.
Fire Prevention:	Procedures used to minimise or prevent fire.
Fire Detection Systems:	Equipment designed to detect fire and raise the alarm.
Fire Suppression Systems:	Systems designed to suppress or extinguish fires through automatic or manual activation.
Emergency Procedures:	Planned measures designed to minimise the risk of injury in an emergency situation.
Combustible:	The property of any material or substance that will readily burn.
Flammable:	The property of a substance that ignites easily, burns intensely and has a rapid flame-spread.
Flash Point:	The lowest temperature at which a flammable or combustible liquid gives off vapours to form an ignitable mixture with air.
Ignition Temperature:	The lowest temperature at which a mixture of vapour and air will ignite without a spark or flame. The term also applies to the temperature of a hot surface that can ignite flammable vapours.
Flammable or Explosive Range:	The range between the smallest and largest amounts of vapour in a given quantity of air that will explode or burn. The amount is usually given in percentages and are based on normal atmospheric temperatures and pressures.
Water Solubility:	The capability of a flammable or combustible liquid to be soluble in water.
Spontaneous Combustion:	Ignition due to the rapid oxidation of a substance that generates enough heat for ignition to occur.

Appendix B – Checklist for Fire Safety Management

Note: This checklist in this appendix is provided as an *aide memoir* only, and is not intended for use as an approved test certificate or an official document:

Checklist for Fire Safety Management

- Ensure that written fire safety and emergency evacuation instructions are provided, properly displayed and regularly updated.
- Ensure that all means of escape from buildings, installations and work areas are properly indicated and readily accessible.
- Ensure that adequate fire fighting equipment is provided, correctly located and indicated.
- Make all personnel aware of the location of escape routes, fire alarms and fire fighting equipment.
- Arrange training in the use of fire fighting equipment.
- Keep readily combustible materials and flammable liquids to a minimum consistent with reasonable requirements and ensure that relevant statutory requirements, codes and client standards are observed, particularly during cutting and welding operations.
- Ensure that good housekeeping is practised, for example, the removal of unwanted rubbish and packing materials from the work area.
- Ensure that an annual fire safety audit of all premises is carried out.
- Refer to the HSE Adviser in the event of queries.

8.4 Work at Height Safety Procedure

1 Introduction

1.1 Document Purpose

This Safe System of Work provides the guidelines and precautions that must be adhered to in order to reduce the risks involved with personnel working at heights to as low as reasonably practicable.

1.2 Document Scope

The contents of this Safe System of Work apply wherever personnel are required to work at heights of 2m or above on this Project.
This document should be used in conjunction with Safe Systems of Work Procedure Scaffolding.

1.3 Requirement to Work at Height

The guidelines in this document only reduce the risks involved with working at height to a point where they are as low as reasonably practicable. They do not remove the risks entirely. For this reason, wherever possible, every effort shall be made to minimise the need for personnel to work at elevated positions.
In addition, all personnel have an obligation to halt any activity that they believe to be unsafe.

2 Responsibilities

2.1 PROJECT MANAGER

The Site Manger / OIM is responsible for:

- ensuring the requirements of this Safe System of Work are fully implemented and followed on the site / installation
- appointing competent person(s) to inspect and certify fall arrest equipment and associated systems, scaffolds, etc., as safe to use.

2.2 Supervisors

Supervisors of personnel working at height are responsible for following and implementing the guidelines and precautions included in this safe System of Work and shall ensure that all personnel under their supervision comply with the same.

2.3 Competent Person

The competent person shall be suitably trained, experienced and qualified to carry out the inspections and examinations, etc., as detailed in this Safe System of Work.

3 Working Platforms

The preferred system for working at heights requires the use of fixed platforms with guardrails or handrails fitted, and approved for use by a competent person, for personnel working at raised elevations. Fixed platforms may include:

- Aerial lifts (boom, scissor and snorkel types) used in accordance with manufacturers recommendations.
- Industrial trucks that are fitted with specifically designed personnel work platforms
- Scaffolding that has been erected to meet all requirements (refer to *Scaffolding Procedure*)
- Man lifts, specifically designed and used in accordance with requirements.

4 Fall Arrest Equipment

4.1 Use of Fall Arrest Equipment

Where work at height must take place without a fixed working platform, fall arrest equipment shall be used at all times.
Fall arrest equipment shall:

- be capable of limiting a fall to two metres or less
- be capable of supporting a static load of 5000lb (2275kg) per person
- be fitted to a proper anchor point (preferably overhead)
- include a full body harness with double latch self-locking snap hooks at each location
- use only synthetic fibre lanyards
- include a shock absorber

Harnesses, inertial reels, lanyards and lifelines, shall not be used for purposes other than protection of personnel.

4.2 Maintenance of Fall Arrest Equipment

All fall arrest equipment and systems shall be visually inspected at regular intervals and tested in accordance with the manufacturer's recommendations. Any equipment that is damaged or has been activated shall be removed from service immediately.
Any harness, lanyard or lifeline that has been subject to in service loading shall be removed from service.
Safety harnesses, inertial reels, lanyards and lifelines shall be inspected before each use and by a competent person. Any damaged items shall be removed from service immediately.
Any used fall arrest equipment must be cleaned regularly.

5 Movement and Working At Height

5.1 Access

Use only the safe means of access provided. Do not climb bracing or frames that are not specifically designed for climbing.

Note: All personnel are responsible, where necessary for insisting that proper and safe means of access are provided.

5.2 Movement

While working at height, personnel shall take care to move and climb safely. In particular, when on ladders:

- face the rungs as you climb up or down.
- use both hands on the ladder and maintain 'three point' contact (keep one hand firmly on frame or ladder at all times)
- do not try to carry materials while you climb
- ensure footing and balance before releasing hand grips
- do not work on slippery rungs.

5.3 Working on Roofs

Shallow Sloped Roofs

Work on roofs with slopes less than or equal to 4 in 12 (vertical to horizontal), with unprotected sides and edges 2m or more above lower levels, shall require fall protection measures that may include:

- guard rail systems
- personnel fall arrest systems
- combination of warning line system and guardrail system, or safety monitoring system.

Steep Sloped Roofs

Work on roofs with slopes greater than 4 in 12, with unprotected sides and edges 2m or more above lower levels, shall require fall protection in the form of guard rail systems with toe boards, safety net systems or personal fall arrest systems.

5.4 Working on Scaffolding

All scaffolding must have:

- guard rails on all open sides: top rail 42 inches above the work platform surface, middle rail 21 inches above the work surface.
- toe boards on all sides
- side screens on sides adjacent to passageways or thoroughfares
- scaffold boards in good condition and extending not less than six inches, nor more than 12 inches, beyond their end supporters (unless otherwise secured from being dislodged)
- an access ladder secured to the scaffold with minimum required clearances between ladder rungs and away from obstacles that interfere with safe use of the ladder.

Note: Loose articles and materials must be kept to an absolute minimum on scaffolding platforms. All necessary precautions must be taken to prevent objects from falling from scaffolds, e.g., by use of toe boards.

5.5 Safe Use of Ladders

Ladders may be used as a short-term alternative to scaffolding or as means of access to scaffolding, providing the points listed in this section are considered.

Note: Ladders are potentially dangerous. The must common type of accident occurs through a ladder slipping.

- Always place a ladder on a firm base, set the angle near to 75°
- Make sure the ladder projects well above the level at which the user stands.
- Ensure sufficient overlap between stages of extension ladders.
- Do not load ladder beyond maximum intended load.
- Barricade traffic areas in vicinity of ladder use, and lock, barricade, or guard doorways in which a ladder is placed.
- Keep area around the top and bottom of ladder clear.
- Use only non-conductive side rails around live electrical equipment.
- Do not use top or top step for standing/stepping.
- Do not stand on cross bracing.
- Always face the ladder when ascending or descending.
- Always maintain 3 points of contact with the ladder (2 feet/1 hand or 2 hands/1 foot should be in contact with ladder at all times).
- Carry tools in pouches around waist; use a rope to raise or lower large items such as toolboxes or materials.
- Do not overextend sideways. Use the belt buckle rule: keep your belt buckle positioned between the side rails at all times, which will maintain your centre of gravity.
- Never allow more than one worker on the ladder at a time.
- Do not erect ladders on sloping surface ,leaning to one side or at to steep an angle.
- Do not erect ladders for use as a plank or bridge.

Training

All personnel required to perform elevated work shall be fully trained in appropriate, safe work practices, including the wearing and care of associated safety equipment and the safe use of all elevated work equipment.

8.5 Scaffolding Safety Procedure

Introduction

1.1 Document Purpose

This document contains the guidelines necessary for the safe:

* construction, use, dismantling and control of scaffolding
* use of ladders.

1.2 Scaffolding Definition

Scaffolding is a temporary structure on which persons work and which provides support for the materials used in construction, maintenance, repair or demolition work. It can also be used to obtain access to certain areas of equipment.

Where work cannot safely be carried out from ground level or from part of a building or other permanent structure, there must be provided either scaffolding or, where appropriate, ladders or other means of support.

Note: The erection, dismantling and alteration of scaffolding must be carried out by competent workmen under competent supervision

2 Responsibilities

2.1 Project Manager

The Project Manager is responsible for:

* ensuring the requirements of this standard are implemented on their facilities

* appointing a competent person to inspect and certify scaffolds as safe to use.

3 Scaffolding Design requirements

3.1 Materials
All Materials
Before use, a competent person must inspect all scaffolding and material used in construction in order to ensure:
* it is in good condition and is serviceable
  Note: Damaged or deteriorated equipment **shall not** be used
* It is in compliance with this Procedure.

Wood Planks
Wood plank should be inspected to see that it is:
* graded for scaffold use
  Note: Wood planks used for scaffolding must be specifically graded for scaffold use by a nationally recognised grading agency.
* is sound and in good condition
* straight grained, free from saw cuts, splits and holes.
* In the case of 38mm thick, are banded at either end or nail plates fitted

3.2 Construction
National Requirements
The scaffold assembly must be designed to comply with local state and İnternational Safety requirements, whichever is the higher.
Scaffolds required with a loading capacity greater than 2.5kn/m2 must always be subject to qualified scaffold designer input / approval.
Load Calculations
Frame spacing and mud sill size can only be determined after the total loads to be imposed on the scaffold and the strength of the supporting soil or structure are calculated and considered. A qualified person prior to the scaffold structure being built must do this analysis.
Note: Manufacturers load carrying information shall be used for design calculations
Construction, Dismantling and Alteration
Competent workmen under competent supervision must carry out the erection, dismantling and alteration of scaffolding.
Plumb and level scaffold until connections can be made with ease. Do not force members to fit. Be sure scaffold stays level and plumb as erection progresses.
During dismantling of scaffolding, poles and fittings shall not be dropped to the ground but always carefully lowered. Poles shall be stacked flat and fittings collected into bags or containers.
Support and Bracing
Scaffolding must be securely supported or suspended, and where necessary braced to ensure stability. Unless constructed as freestanding independent scaffolding, it must be rigidly connected with the building or structure (not to pipe work).
Ties, guys, bracing and/or outriggers may be needed to assure a safe stable scaffold assembly. Determine the need for stability bracing.
If in doubt – ask.
The requirement for stability bracing is dependent upon:
* the height of the scaffold in relation to the minimum base width
  Note: Freestanding Scaffolds with a height in excess of 4 times internally or 3.5 times externally, the minimum base width dimension must always be secured to a rigid structure or seek alternative means of support.
  Internally = no wind loading
  Externally = relatively sheltered locations / minor wind loading
* wind loads
* the use of brackets or cantilevered platforms
* imposed scaffold loads.

Ties:

* The bottom tie must be placed no higher than four (4) times the minimum base width and every four (4) meters vertically thereafter. Ties should be placed as close to the top of the scaffold as possible and, in no case, more than three (3) times the minimum base width of the scaffold from the top.
* Vertical ties should be placed at the ends of scaffold runs and at no more than 4meters horizontal intervals in between.
* Ties should be installed as the erection progresses and not removed until the scaffold is dismantled to that height.
* Ties should be constructed to 6.25kn (slipload) unsheeted & 12.5kn sheeted

Guys:

* Each leg of a freestanding tower must be guyed at the intervals outlined above or otherwise restrained to prevent tipping or overturning.

Note: Circular scaffolds erected completely around or within a structure may be restrained from tipping by the use of "stand off" bracing members.

Planks

* Work platforms must be fully planked either with scaffold graded solid sawn or laminated plank, in good sound condition, or with fabricated platforms in good condition.
* Each plank must overlap the support by a minimum of 1.5 x thickness or be cleated / securely tied for example, 3 metre planks on 2.8 meter spans must be cleated/securely tied.
* Plank must not extend beyond the support by more than 4.5 x thickness Such overhangs should be separated from the work platform by guard-railing so that they cannot be walked on.
* Spans of full thickness, 50mm by 250mm scaffold grade planks, should never exceed 2.6m. Loads on plank should be evenly distributed and not exceed the allowable loads for the type of plank being used.
* Spans of normal thickness (38mm) boards should never exceed 1.5m.
* Planks and/or platforms should always be secured to scaffolding to prevent uplift or displacement due to high winds or other job conditions.

Guardrails and Toe Boards

* The scaffolds shall be supplied with the toe boards and guardrails when the height of planks location is 1,3 m and over.
* The height of the top guardrails shall be between 910mm & 1150mm and distance between the posts of guardrails should not exceed 2.7 metres.
* Guardrails must be used on all open sides and ends of scaffold platforms. Both top and mid-rails are required. Local codes specify the minimum heights where guardrails are required, however, use at lower heights if falls can cause injury.

Transoms

A transom is a length of scaffold tubular used as a cross-member to support planking on working lifts & provide lateral structural support on non-working lifts. Particular care and attention shall be paid to the use of transoms. In particular:

* transoms should overhang the support points by at least 150mm
* transoms hangers shall be used with bolts fastened to support transoms on frames
* transoms spans greater than 2.7m (very light duty), 2.4m (light duty) or 2.1m (general purpose) require knee bracing and lateral support
* transoms used as side or end brackets need special bracing.

Note: Transoms **must not** be used for the storage of materials.

Scaffold Access

Access must be provided to all work platforms. If it is not available from the structure, access ladders, frames with built-in ladders, or stairways must be provided. When frames with built-in ladders are used, cleated plank or fabricated plank must be used at platform levels to minimize or eliminate platform overhang. Access ladders must extend at least 1 metre above platforms.

Bridging Scaffold

Bridging between towers should not be done with plank or stages unless the overturning moments have been compensated for & suitable guardrails, ties etc are fitted.

Mud Sills and Screw Jacks

Mud sills must be of adequate size to distribute the loads on the scaffolding to the soil or supporting structure. Sills should be level and in full contact with the supporting surface.
Base plates or screw jacks with base plates must be in firm contact with both the sills and the legs of the scaffolding. Compensate for uneven ground with screw jacks with base plates. DO NOT USE unstable objects such as blocks, loose bricks, etc.

Dismantling Scaffold

3.3 Rolling Scaffolds
The tower height must not exceed 3.5 times internally or 3 times externally the minimum base dimension. Outrigger frames or outrigger units on both sides of the tower may be used to increase base width dimension when necessary.
All casters must be secured to frame legs or screw jacks with a nut and bolt or other secure means. Total weight of tower + men, materials & tools etc should not exceed the capacity of the casters.
Screw jacks must not be extended more than 300mm above caster base. Tower must be kept level and plumb at all times.
Horizontal/diagonal (plan) bracing must be used at the bottom and top of tower and at least every alternate lift. Fabricated planks with hooks may replace the top diagonal brace.
* All frames must be fully cross-braced.
* Only prefabricated plank or cleated / tied planks should be used.
* Casters must be locked at all times the scaffold is not being moved.

4 Inspections and Scafftags

4.1 Site Inspection (Pre-Construction)
The job site should be inspected to determine ground conditions or strength of supporting structure, and for proximity of electric power lines, overhead obstructions, wind conditions, the need for overhead protection or weather protection coverings. Special care is needed when scaffolding is to be erected on fill or other soft ground or on frozen ground. These conditions must be evaluated and suitably provided for.

4.2 Site Inspection (Post-Construction)
A competent person shall inspect scaffolding:
* before it is first used and then at least once every week
* following any alteration
* if it has been exposed to weather conditions likely to affect its strength or stability.

Details of inspections must be recorded.

4.3 Scafftags
"Scafftags" shall be used on all scaffold structures, whether complete or part complete/dismantled to indicate whether or not the scaffolding is safe to use.
Scafftags must be positioned prominently at access points to scaffold structures.
When scaffolding is incomplete (whether partly erected or dismantled) or considered to be unsafe for any reason, the green scafftag must be pulled to display the red (Do Not Use) tag.
In addition, access to the scaffold shall be barriered off as soon as practicable.
Scaffolding Use

5.1 Inspection
Inspect the scaffold assembly before each use. In particular, check:
* the Scafftag – Pay particular attention to the load rating
* that the scaffold is assembled correctly:
* that it is level and plumb
* base plates are in firm contact with sills
* bracing is in place and connected
* platforms are fully planked with guardrails in place
* safe access is provided
* that the scaffold is properly tied and/or guyed

* there are no overhead obstructions or electric lines within 4 meters of the scaffold assembly.

5.2 Access

Use only the safe means of access provided. Do not climb bracing or frames not specifically designed for climbing. If access is not provided, insist that it be provided.

5.3 Working Safely

Personnel Movement on Scaffold

While working on scaffold, personnel shall take care to climb safely. The following work practices shall apply:

* Climb safely. In particular, when on ladders:
* face the rungs as you climb up or down.
* use both hands on the ladder and maintain 'three point' contact (keep one hand firmly on frame or ladder at all times)
* do not try to carry materials while you climb
* ensure footing and balance before releasing hand grips
* do not work on slippery rungs.
* do not overload platforms with materials
* **Never** add sheeting to a scaffold structure without consulting a qualified person.
* do not extend working heights by using planking guardrails or by use of boxes or ladders on scaffold platforms
* Do not remove any component of a completed scaffold assembly. Alterations shall only be carried out by suitably qualified / authorised personnel under the supervision of a qualified person.

Note: Any removed component should be immediately replaced.

Dropped Objects

Loose articles and materials must be kept to an absolute minimum on scaffolding platforms. All necessary precautions must be taken to prevent objects from falling from scaffolds, e.g. by use of toe boards.

Cantilevered Platforms

Materials should never be placed on cantilevered platforms unless the assembly has been designed to support material loads. (These types of platforms cause overturning and uplift forces, which must be compensated for. All frames should be fastened together to prevent uplift an overturning moment compensated for with counterweights or adequate ties).

Hoisting and Lifting

Scaffold should not be used as material hoist towers or for mounting derricks unless the assembly is designed for that purpose.

5.4 Rolling Scaffolding

* Do not ride manually propelled rolling scaffold. No personnel should be on the tower while it is being moved.
* Lock all casters before getting on the tower.
* Work only within the platform area: do not try to extend overhead work area by reaching out over guard railing.
* Do not bridge between two rolling towers with plank or stages.
* Secure all materials before moving scaffolds.
* Be sure floor surface is clear of obstructions or holes before moving scaffold.
* Be sure there are no overhead obstructions or electric power lines in the path of rolling scaffold.
* Rolling towers must only be used on level surfaces.
* Move rolling towers by pushing at the base level only. Do not pull from the top.

5.5 "Quick Erect" Aluminium Scaffolding

The use of "quick erect" aluminium scaffold systems can be used subject to local controls such as restricting use to non-hazardous areas and appropriate storage.

6 Ladders

Ladders may be used as a short-term alternative to scaffolding or as means of access to scaffolding, providing the points listed in this section are considered.

Note: Ladders are potentially dangerous. The must common type of accident occurs through a ladder slipping.

6.1 Transporting and Moving Ladders

Unless space restrictions dictate otherwise, always carry ladders parallel to the ground.
Do not move, shift, or extend a ladder while the ladder is occupied.
Note: **Do not** walk a ladder
Tie ladders down securely when transporting.

6.2 Maintenance

Ladders shall be inspected and maintained by a competent person. The record of inspections shall be registered not be longer than six months.
Maintain ladders free of oil, grease, and other hazards.
Do not use any ladder with structural defects; properly tag the ladder with a "Do Not Use" notice and withdraw the ladder from service.

6.3 Preparation

Inspect ladder prior to EVERY use.
Before using a ladder, ensure that it is the correct item of equipment for the job in hand and that it is in good condition

Warning: Aluminium ladders **must not** be used in hazardous areas due to the danger of sparks when the ladder impacts steel).

Use ladders only for the purpose for which they were designed (refer to manufacturer's labelling and recommendations).

6.4 Safe Use of ladders

* Always place a ladder on a firm base, set the angle near to 75°.
* Make sure the ladder projects well above the level at which the user stands.
* Ensure sufficient overlap between stages of extension ladders.
* Secure the ladder in place wherever reasonably practicable.
* A standby person should remain at the base of the ladder whenever the ladder is in use.
* Do not load ladder beyond maximum intended load.
* Barricade traffic areas in vicinity of ladder use, and lock, barricade, or guard doorways in which a ladder is placed.
* Keep area around the top and bottom of ladder clear.
* Use only non-conductive side rails around live electrical equipment.
* Do not use top or top step for standing/stepping.
* Do not stand on cross bracing.
* Always face the ladder when ascending or descending.
* Always maintain 3 points of contact with the ladder (2 feet/1 hand or 2 hands/1 foot should be in contact with ladder at all times).
* Carry tools in pouches around waist; use a rope to raise or lower large items such as tool boxes or materials.
* Do not overextend sideways. Use the belt buckle rule: keep your belt buckle positioned between the side rails at all times, which will maintain your centre of gravity.
* Never allow more than one worker on the ladder at a time.
* Do not erect ladders on sloping surface ,leaning to one side or at to steep an angle.
* Do not erect ladders for use as a plank or bridge.

8.6 Confined Space Entry Procedure

1 Introduction

Note: A Hazard Assessment must be completed before any entry into a confined space (See *Risk Assessment Procedure*).

The Hazard Assessment should identify the:

- sequence of work to be performed in the confined space
- specific hazards known or anticipated
- control measures to be implemented to eliminate or reduce each of the hazards to an acceptable level.

No entry shall be permitted until the Hazard Assessment has been reviewed and discussed by all persons engaged in the activity.

Personnel who enter a confined space must be informed of all known or potential hazards associated with the confined space to be entered.

1.1 Purpose

The purpose of this procedure is to:

- identify and define confined spaces
- describe the proper procedures and preparations to protect the health and safety of all personnel who must work in confined spaces.

1.2 Scope

This mandatory procedure applies to road construction project of XXXX

1.3 Confined Space - Definition

Properties of a Confined Space

A **"confined space"** is any enclosed or partially enclosed space which:

- is large enough for any person to bodily enter it and perform assigned work
- has limited or restricted means of entry or exit
- has unfavourable natural ventilation
- is not designed for continuous occupancy.

Note: Confined spaces often present, or have the potential to present, hazards related to atmospheric conditions (e.g., toxic, flammable, asphyxiating), engulfment, or entrapment.

Confined Space Examples

The general definition of a confined space shows that many types of space may be considered confined and therefore hazardous, including:

- tanks
- vessels
- ducts
- sewers
- pits
- flues

Other Confined Space Examples

The definition also includes any space in which dangerous levels of contaminants can accumulate and ventilation is restricted, which can include:

- excavations (normally deeper than 1.2m)
- the space above floating roofs on floating roof tanks
- open topped tanks
- closed or unventilated rooms
- sumps and culverts
- any other poorly ventilated area.

1.4 Confined Space - Hazards

The hazards associated with entering and working in confined spaces are capable of causing bodily injury, illness, and death to the worker. Hazards commonly encountered in confined spaces include:

- toxic substances in hazardous concentrations, e.g., hydrogen sulphide (H_2S), benzene and hydrocarbon gases
- flammable gases, vapours and liquids with potential for fire or explosion; above 10% of the lower explosive limit (LEL) or above 0% LEL if hotwork is required

- gas, vapour or fumes produced by operations carried out in the confined space, e.g., welding and cutting, brush and spray painting, and the use of adhesives and solvents
- lack / insufficient oxygen supply, causing asphyxiation (oxygen content below 19.5 % by volume is considered oxygen deficient atmosphere)
- oxygen enriched atmospheres (oxygen content above 23% by volume)
- electric shock or ignition of flammable gases from portable lights, tools, or associated electrical equipment
- injury from mechanical equipment such as mixers, conveyors, etc., inadvertently activated
- direct contact with corrosives or irritants
- contaminants entering from other areas through ducts, piping, etc
- ignition from static electricity
- sources of ionising radiation (e.g., level gauges, naturally occurring radioactive materials)
- general safety hazards, including communication problems and physical hazards. For example:

⇒ falling objects, inadequate visibility, excessive temperature / noise / vibration, etc
⇒ possible collapse of excavations.

2 Training and Responsibilities

2.1 Training

Employees who will be involved in the entry must be fully conversant with the Emergency Action Plan and be trained in:

- hazard recognition
- Safe Systems of Work - permit to work procedures, isolation procedures, purging and/or ventilation procedures
- the use of gas detectors
- the use of safety equipment such as breathing apparatus (BA set), respirator, retrieval harness and lines
- the use of communication equipment
- self rescue.

2.2 Responsibilities

Note: For all confined space work, the responsibility for safety, during the entire operation, rests with the Performing Authority, Rescue Team personnel and Authorised Entrants. These personnel must ensure that adequate steps have been taken to eliminate or control the hazards present.

Area Authority

The Area Authorities are responsible for:

- identifying all confined spaces existing within their areas of responsibility
- identifying and labeling Entry Certificate Controlled Confined Spaces
- providing training in confined space entry
- reviewing entry operations to ensure personnel are protected from confined space hazards
- canceling or suspending the Confined Space Entry Certificate when the job is complete or when unacceptable conditions arise.

Performing Authority

The Performing Authority shall:

- know and recognise hazards that may be faced during entry
- authorise entry and allow entry to begin (provided that the requirements of this procedure have been met)
- ensure that responsibilities are safely and effectively transferred

- ensure that personnel entering a confined space have all necessary personal protective equipment
- ensure that rescue services are available and that the means for summoning those services are operable
- ensure acceptable entry conditions are maintained and that they remain consistent with the terms of the Confined Space Entry Certificate.

Authorised Entrants
The authorised entrants shall:

- follow established safety standards and practices
- know and recognise the hazards that may be faced during entry including signs or symptoms, and consequences of the exposure
- make proper use of equipment and protective devices
- maintain communication with the attendant to enable the attendant to monitor the entrant's status as well as to alert the entrant to exit the confined space if there is a hazard noted
- alert the attendant if a prohibited condition exists or when symptoms of exposure appear
- exit from the space as soon as possible when:

⇒ ordered by the attendant
⇒ the entrant recognises the warning signs or symptoms of exposure
⇒ a prohibited condition exists.

Confined Space Attendant
The attendant must be properly trained to carry out his duties. He must remain outside the confined space, **in a safe atmosphere**, at all times during a confined entry operation and perform the assigned duties under this procedure. He must also:

- maintain an accurate count of all persons in the space by:

⇒ using a tally board on which the name, entry and exit times for all personnel entering or leaving the confined space shall be recorded
⇒ airlines and / or safety lines are marked so that each individual inside the tank is clearly identified in the event of a problem

- be aware of the hazards that may be faced during entry, including the mode, signs or symptoms, and consequences of any exposure
- monitor conditions and activities inside and outside the space to determine if it is safe for entrants
- remain outside the confined space during entry operations until relieved by another attendant
- maintain effective and continuous communication with authorised entrants during entry
- order authorised entrants to evacuate the confined space immediately if:

⇒ a condition is observed that is not allowed
⇒ behavioral effects of hazard exposure are detected
⇒ a situation occurs outside the confined space that could endanger the entrants
⇒ an uncontrolled hazard is detected inside the confined space
⇒ the attendant must leave the work station

- summon rescue and other emergency services in emergencies.
- take necessary actions when unauthorised persons approach or enter a confined space while entry is underway.

3 Rescue Team

3.1 The Rescue Team
The Rescue Team should respond immediately to rescue calls from the Attendant or any other person recognizing a need for rescue from the confined space.

The Rescue Team must be trained to perform the assigned rescue functions. In particular, members must be trained in the proper use of personal protective and rescue equipment, including breathing apparatus. Also, at least one Rescue Team member shall be certified in first aid and in cardiopulmonary resuscitation (CPR).
Note: New personnel **shall not** be assigned to the confined space entry tasks, unless under training and accompanied by a competent person who is familiar with the hazards of confined space entry.

3.2 The Rescue Plan

The rescue plan should be formulated to include as a minimum:

- an assessment of the hazards associated with the confined space
- the required gas testing/monitoring equipment
- the personnel required to perform the rescue
- all precautions to be taken while in the confined space
- the required personnel protective equipment
- the required rescue equipment
- the required tools and any other special equipment.

A means of communication shall be provided and a system of signals agreed and understood by all personnel involved. These communication arrangements shall be maintained throughout the duration of the entry.
In all cases of confined space entry, a trained attendant shall be posted outside the entry/exit in order to handle emergencies. Circumstances may require an assistant to the attendant or more than one attendant posted at different access/entry points. The attendant(s) must be aware of their responsibilities and be trained as rescue team members.

4 Personal Protective Equipment

4.1 Personal Protection

Appropriate personal protection, e.g., head, foot, hand, eye, ear, face, body and respiratory protection, must be worn when entering an Entry Certificate Controlled Confined Space.
A life line attached to a full body harness must be used by all entrants during entry into a confined space.

4.2 Respiratory Protection

Dependent upon the type and concentration of contaminants, respiratory protection may range from a simple cartridge respirator to air-supplied respiratory equipment.
When the level of airborne contaminants is beyond the filtration capability of a respirator or where there is an oxygen deficiency, then breathing apparatus must be used.

Breathing Air Standards

The need to ensure a continued provision of good quality breathing air relies on regular changing of air filters and maintenance of dryers, supported by periodical analysis of the breathing air supply.

Note: Breathing air shall conform to *BS 4275, "Recommendations for the Selection, Use and Maintenance of Respiratory Protective Equipment".*

Air Line Mask

Air line breathing apparatus shall be approved and conform to *EN 139*. The full face mask enables the wearer to work for a long periods in harmful atmospheres, whilst breathing air is supplied by either portable air compressors fitted with reservoir air tanks, or a battery of compressed air bottles.
Connections to the air line mask hose are made via instantaneous bayonet spring couplings. These couplings must be kept in good condition and **must not** be used for any purpose other than supplying air to breathing apparatus.

Using Portable Air Compressors

Where no compressed air bottle supply is available, portable air compressors having a reservoir air tank may be used. In such cases:

- the compressor air intake(s) of the compressor must be upwind of any known source of contamination to ensure clear air being fed to the user (a wind sock indicating wind direction should be flown in the vicinity of the intake to the compressor)
- the system of air supply employed should incorporate a receiver of sufficient capacity to enable persons to escape from an irrespirable atmosphere in the event of a failure of the prime mover supplying the air
- the air must be passed through suitable filters to remove excess moisture and oil mist.

Note: To ensure that an adequate supply of air is available and being received by the wearers, a suitably competent person must be appointed who is responsible for checking the pressure in the air receiver, and for ensuring the filters are functioning properly.

Self Contained Compressed Air Breathing Apparatus (SCCABA)

SCCABA shall conform to *EN 137 "Self Contained Compressed Breathing Apparatus"*. These sets are provided where a portable supply of air is required for a short period of time.

The air for this apparatus is supplied under pressure either from compressed air cylinders carried by the wearer or from trolley sets.

4.3 Escape Breathing Apparatus

Any person entering a Confined Space using an airline Breathing Apparatus or a SCCABA set shall be provided with an Escape Breathing Apparatus set with a bottle capable of supplying an emergency air supply for approximately 10 minutes. This set shall also conform to *EN 137 "Self Contained Compressed Breathing Apparatus".*

All persons required to use breathing apparatus must receive initial training and refresher training at intervals not exceeding six months. The training shall be recorded.

5 Confined Space Entry Precautions

These precautions shall be applied on each occasion of confined space entry.

5.1 Confined Space Entry Certificate

A Confined Space Entry Certificate must be completed before an approval can be given to enter an Entry Certificate Controlled Confined Space.

A copy of the certificate should be kept at the job site for the duration of the job. If the circumstances cause an interruption in the work or a change in the rescue arrangements for which the Confined Space Entry Certificate was approved, a new Confined Space Entry Certificate must be completed.

5.2 Pre-entry Briefing

Before the entry, the Performing Authority must brief entrants, attendants and supervisors on their responsibilities and the hazards and controls for safe entry.

5.3 Isolation

The confined space must be positively isolated from All Energy sources and flooding.

5.4 Cleaning

Before entering the interior of any vessel or tank, depending on the nature of its content, it must be emptied of residual material by being drained, pumped out, washed, and made clean by hot or cold water flushing, steaming, chemical neutralisation, inert gas or air purge.

Use of Chemical Cleaners

If chemical cleaners are to be used then the MSDS for the chemical should be consulted and a risk assessment conducted in accordance with procedure

Chemicals Risk Management prior to use.

When introducing a chemical into a confined space, the compatibility of that chemical with the contents of the confined space must be checked. If any doubts exist regarding the compatibility of a chemical, the HEALTH AND SAFETY Department shall be consulted.

Sludge and spent cleaning fluids must be contained and disposed of in a safe and environmentally acceptable manner.

Bonding and Grounding

To reduce the possibility of static electricity build up, proper bonding and grounding procedures must be followed.

Welding

Before any welding, cutting and grinding may be carried out in a confined space, the space shall be proved completely gas free, and free of all flammable residuals.

5.5 Ventilation

Clean-out Doors

Where confined spaces are provided with clean out doors, these doors shall be opened after purging, and the confined space thoroughly ventilated.

Use of Ventilation Equipment

Ventilation shall preferably be accomplished using a positive method of mechanical ventilation that is arranged to:

- introduce sufficient fresh air and remove contaminants from all pockets or corners of the confined space
- avoid re-circulating contaminated air.

Even after the confined space is cleaned and ventilated, the mechanical ventilation equipment must be kept operating to provide secondary protection:

- in case of accidental introduction of harmful substances
- to remove contamination or heat that may be produced by the work (e.g., welding and cutting, painting, coating).

The atmosphere must continue to be gas tested and monitored for hazardous atmospheres while personnel are inside the confined space.

Ventilation Air Source

The ventilation air used will be from either:

- an electrical blower

or...

- an air driven blower.

The air intakes for these devices shall be located where no contaminants may enter the stream.

Disposal of Confined Space Atmosphere

Outlets for power driven blowers, pneumatic air eductors, or air/steam eductors used to draw vapours out of a confined space must be directed to a safe place far from possible sources of ignition.

5.6 Atmospheric Testing

Confined space atmospheres must be tested by qualified personnel (i.e., an Authorised Gas Tester Level 1) before entry is allowed. Tests shall be conducted for:

- oxygen deficiency or excess
- flammable gases and vapours
- toxic vapours and gases.

Test Requirements

Testing must be carried out in accordance with the following requirements:

- Ventilation equipment must be shut off before the tests commence.
- The atmosphere must be tested at the bottom, top, and the middle of all confined spaces.
- The atmosphere inside must be continuously monitored while work is being conducted in the confined space.
- If the confined space is left for any reason, the atmosphere shall be re-tested before re-entry may be permitted.

Testing from Within a Confined Space

Where practicable, the gas test shall be carried out from outside the confined space, e.g., using extension probes. If it is not possible to perform sufficient testing from the outside of the confined space then upon initial entry to a confined space to conduct any testing, self-contained or air-supplied breathing apparatus must be worn.

Note: If breathing apparatus has to be worn, the Authorised Gas Tester shall, if practicable, also wear a harness and a life line.

Test Equipment
Testing instruments must be calibrated and operationally checked before and after use in accordance with manufacturer specifications.

Test Record
The atmospheric tests and operational checks shall be recorded on the entry certificate.

5.7 Lighting and Portable Tools
Temporary Lighting
The following precautions shall be observed when using temporary lighting:

- Where the confined space has not been declared gas free, air driven flameproof lights or certified battery powered torches must be used.
- Confined spaces, which have been certified gas free but where flammable residues could remain, may be illuminated as above; or by extra low voltage (25V ac) portable lighting equipment.
- Where the confined space has been cleaned of all flammable residues and certified gas free, or is a confined space by virtue of restricted access alone and there has never been the possibility of it containing a flammable atmosphere, standard low voltage industrial lighting may be used.
- The supply cables to the transformers, for extra low voltage portable lights, must always be supported above ground and the transformers never taken inside the Confined Space.

Tools
If the atmosphere inside the confined space is classified as flammable/combustible no electrical tools must be used by the entrants. Air-driven tools only may be used. No tools with the potential to produce sparks, e.g., grinders or needle guns must be used.

6 JOB COMPLETION
The Entry Certificate must be canceled upon completion of the entry and after all entrants have exited.
At the end of a job, a thorough check must be made by performing authority to ensure that no personnel, tools or equipment have been left behind.

Appendix A - Definitions
List of Definitions

Acceptable Entry Conditions	Conditions that must exist in a Confined Space to ensure that employees can safely enter and perform work.
Attendant	An individual stationed outside the confined space who monitors the authorised entrant(s) and performs attendant's duties defined in this procedure.
Authorised Entrant	An employee who is authorised and trained to enter a confined space.
Authorised Gas Tester	An individual designated by the area authority to undertake gas test in confined spaces.
Breathing Apparatus (BA set)	A device which ensures that the wearer has a continuously available supply of uncontaminated air through a face mask, helmet or mouthpiece.

Entry	The action by which a person passes through an opening into a Confined Space.
Engulfment	The surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction or crushing.
Entry Certificate	A document to allow and control entry into an entry certificate controlled confined space.
Entry Certificate Controlled Confined Space	A confined space that has one or more of the following characteristics: 1. Contains or has a potential to contain a hazardous atmosphere. 2. Contains a material that has the potential to engulf an entrant. 3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly-converging walls or by a floor that slopes downward and tapers to a smaller cross-section. 4. Contains any other recognised serious safety or health hazard. Spaces in which dangerous contaminants can accumulate and ventilation is restricted, e.g. excavations (normally deeper than 1.2 m or 4 feet) the space above floating roof tanks, open-topped tanks and other poorly ventilated areas are also considered as Entry Certificate Controlled Confined Spaces.
Hazardous Atmosphere	An atmosphere that may expose authorised entrant(s) to the risk of death, impairment of ability to self-rescue, injury or acute illness.
Ionising Radiation	Gamma rays, X-rays or corpuscular radiation, such as alpha and beta, which are capable of producing ions either directly or indirectly.
Naturally Occurring Radioactive Material	Radioactive material produced in conjunction with oil and gas as deposits within process equipment.
Performing Authority (Entry Supervisor)	A designated supervisor appointed by area authority to accept the Confined Space Entry Certificate and subsequently be in charge of the confined space entry work. This person is responsible for ensuring that all precautionary measures stipulated on the Confined Space Entry Certificate and accompanying documentation are followed.
Rescue Team	The personnel designated to rescue entrants from confined space.

8.7 Permit to Work Procedure

1. Introduction

1.1 Purpose
This procedure describes the Permit to Work system which is used to provide the controls necessary in achieving the safe performance of a specified range of potentially hazardous tasks.

Note: All personnel should be aware that the Permit to Work system is not an absolute safeguard in itself. It is the responsibility of each individual to be alert to hazardous situations that may arise during the operation.

1.2 Scope

The control of tasks on sites without High Risk Potential , e.g., supply bases and offices, will generally be satisfied by the use of an Application to Perform Work and an associated procedure. However, Permits to Work and supporting procedures shall be used where assessment of the risks indicates that they are necessary.

2 Responsibilities

Note: Within the activities controlled by the Permit to Work and Isolations procedures, a person may have more than one role, e.g., the Performing Authority and Isolator may be the same individual provided that all relevant training and competence requirements are completed.

2.1 Site Manager
The Site Manger is responsible for:

- the safety of all personnel on the site and for the safe execution of all work carried out on the site
- the implementation of the Permit to Work procedure in accordance with this procedure and its supporting procedures (and any local rules) at the site
- ensuring that the Permit to Work system is subject to active assurance, acting upon all recommendations and proposing system improvements
- ensuring that the personnel appointed under this procedure are competent to carry out the task for which they are authorised
- communicating the responsibilities of key participants within the Permit to Work and Isolations procedures, to those personnel under his direction
- reviewing the risk assessments and ensuring that they have been carried out for all permits that they are required to authorise prior to issue

Note: Site Managers shall request a higher level of risk assessment should they consider that risks have not been fully addressed

- approval and revalidation all Hot Work (Naked Flame), Hot Work(Spark Potential) and Cold Work(Special Task) Permits and Confined Space Entry Certificates in Hazardous Zones (see Hazardous Zones- Risk Assessment Procedure)
- auditing compliance with this procedure.

2.2 Area Authority - Supervisor
The Area Authority is responsible for:

- the safety of personnel and the safe execution of all activities undertaken within his area of authority
- processing all Applications to Perform Work and all applications for Permits to work
- the operation of the Permit to Work System and its supporting procedures in his area
- determining the extent of risk assessment required to support any permit application and for organizing and participating in the risk assessment process
- facilitating the identification of the hazards and precautions to be taken before, during and after all tasks covered by all Permits to Work and Supplementary Certificates
- identifying the impact of tasks and precautions on other areas and informing the Affected Area Authority of the proposed activities (this includes specifying the precautions which may be necessary as a result of activities in another area and ensuring that these are disseminated to all affected personnel)
- providing accurate and up to date cross-referencing between Permits and Supplementary Certificates including those in other areas
- ensuring that work site inspections are undertaken before, during and after the performance of each task (some of the inspection may be delegated to an appropriately competent person)
- the issue of Permits etc., to Performing Authorities in his area and subsequent re-validation (subject to approval by the Site Managerin appropriate cases)
- ensuring that adequate hand over takes place at shift change, crew change or other change-out of Area Authorities, Performing Authorities and Isolating Authorities
- maintaining a display board of all Permits and Certificates in use in his area of authority, together with a separate display board for Isolation Confirmation Certificates under

which a Sanctioned Test is being performed and for long-term Isolation Confirmation Certificates.

2.3 Affected Area Authority

An Affected Area Authority is an Area Authority whose area of responsibility will be affected by work being undertaken principally in another area and under the control of another Area Authority. The Affected Area Authority is required to be aware of, and in agreement with, work activities taking place which have a potential impact on his area of responsibility and control.

2.4 Performing Authority

The Performing Authority is the person who requires the work to be done (or who will do the work) and is the senior person in charge of the work controlled by a permit.

7. **Note:** The same person **shall not** have the role of both Area Authority and Performing Authority for the same Permit to Work.

The Performing Authority is responsible for

- safety at the work site
- taking part in the risk assessment process and disseminating the resulting output to the personnel who will be doing the work.
- ensuring that only those activities included in the Specification of Work detailed on the Permit to Work are undertaken
- immediately informing the Area Authority of any event which might impact on the safe performance of a task or on the associated precautions
- ensuring that adequate handover takes place at shift change, crew change or other change-out of Performing Authority
- ensuring that the work team have been withdrawn and the work site is left in a safe and clean condition on completion (or suspension) of the task.

2.5 Authorised Gas Tester

After appropriate training, the Authorised Gas Tester is authorised to test for the presence of flammable gas or vapor for Permit to Work compliance.

2.6 Authorised Electrical Persons and Senior Authorised Electrical Persons

Authorised Electrical Persons and Senior Authorised Electrical Persons are authorised for specific types of electrical / instrument work, and are responsible for defining and carrying out electrical isolations in co-ordination with the Area Authority.

All Authorised Electrical Persons shall be competent to the level of Electrical Technician or Instrument Technician and authorised for work on low voltage systems.

The Senior Authorised Electrical Person shall be competent to the level of Electrical Supervisor and authorised for work on high voltage systems. The voltage (low or high) for which the person is authorised shall be stated on the authorisation certificate.

2.7 Process Isolators

Process Isolators are responsible for:

- the specification, application, removal and recording of process isolations (process / mechanical Isolations) in accordance with the Area Authority's request on the Isolation Confirmation Certificate
- immediately informing the Area Authority of any event which might impact on the security of the isolations.

2.8 The Control Room Operator

The Control Room Operator shall:

- inhibit and re-instate sections of the Detection or Protection systems according to requests made by the Area Authority on the Permit to Work
- immediately inform the Area Authority of any event which might impact on the safe performance of a task or on the associated precautions

- maintain up to date written or computer-based registers of Permits and Supplementary Certificates, together with cross-references, unless local rules assign this responsibility to someone else
- maintain a display board of all Permits and Certificates in use **over the whole site**, together with a separate display board for Isolation Confirmation Certificates under which a Sanctioned Test is being performed and for long-term Isolation Confirmation Certificates.

2.9 Fire Watchers
Personnel appointed as Fire Watchers shall monitor work areas and the precautionary measures taken in those areas, when specified by the Area Authority on the Permit to Work, and shall undertake response activities as required.

2.10 The HEALTH AND SAFETY OFFİCER
The HEALTH AND SAFETY OFFİCER is responsible for:

- providing Permit to Work system design, including master documentation
- providing an advisory service on request
- arranging independent audits
- collating information on operating experience, from all sources, and initiating periodic system reviews aimed at further improvement.

3 TYPES OF PERMIT to Work
3.1 Permit to Work Categories
In the Permit to Work System tasks are allocated to one of the following categories:

- Hot Work (Naked Flame)
- Hot Work (Spark Potential)
- Cold Work (Special Task)
- Cold Work (Other Task)
- Formal Procedure
- No Permit Required.

Details of Permit colors, re-validation, maximum lives and senior signatories are shown in *Table 1*.

	Hot Work (Naked Flame)	**Hot Work** (Spark Pot.)	**Cold Work** (Special Task)	**Cold Work** (Other Task)	**Formal Procedure**	**No Permit Required**
Color	Red	Green	Yellow	Blue	White	N/A
Re-validation	At shift change of Performing Authority or 12 hours				Implicit at each shift change of Area Authority or Performing Authority	
Max Life	24 hours	72 hours	72 hours	7 day	Review Annually	N/A
Senior signatory	Site Manager	Site Manager	Site Manager	Area Authority	Area Authority	Area Authority

Table 1 Permit to Work Validation Details

3.2 Application to Perform Work
An Application to Perform Work form is used in the case of a formal procedure or where no Permit to Work is required. Its completion by the Area Authority provides a written record that personnel performing the task have been authorised to do so without a Permit to Work.

3.3 Supplementary Certificates
Five supplementary certificates are provided for use where specialist activities have to be performed before a Permit to Work can be safely issued:

- Isolation Confirmation Certificate
- Confined Space Entry Certificate
- Plant Contamination Certificate
- Clearance for Excavation
- Clearance to Move Heavy Equipment.

Provision is made for cross referencing the Permits and their associated certificates. The relationships between the Permits, the certificates and other components of the system are shown in *Figure 5*.

3.4 Hot Work (Naked Flame) Permit (RED)

This permit is used for tasks involving the use of a naked flame or ignition source, including:

- welding / flame cutting
- electrical induction pre-heating / stress relieving
- use of heat shrink blowers
- grinding.

Note 1: A Hot Work (Naked Flame) Permit is not required for operations involving ignited gas flares or permanently mounted plant using an enclosed flame (boilers, inert gas generators, etc).

Note 2: It is Company policy to avoid hot work in hazardous areas wherever practicable. It is the role of engineers planning the work to minimise the need for hot work and provide cost effective alternatives by careful consideration during the design and planning phase.

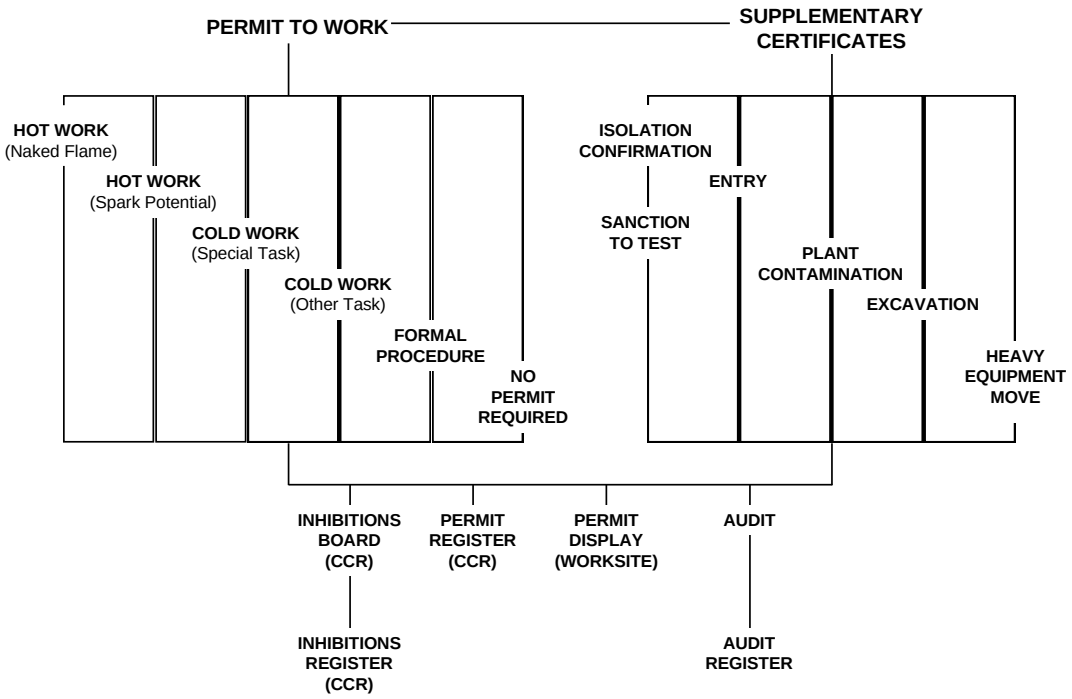

Figure 5 Relationship Between Permit to Work and Supporting Certification

3.5 Hot Work (Spark Potential) Permit (GREEN)

This permit shall be used if the task might produce or expose a possible source of ignition. For example:

- use of electrical / electronic equipment which has not been certified as suitable for use in flammable atmospheres
- opening live junction boxes
- use of air or hydraulic powered metal cutting, chipping or caulking tools
- use of electrical soldering irons
- use of explosives and perforating guns, including Slapper-Activated Firing Equipment

- use of powered steel wire brushes
- dry grit / shot blasting

3.6 Cold Work (Special Task) Permit (YELLOW)

This permit shall be used for a task which does not involve hot work but has a high risk potential. For example:

- actual or possible breaking of containment of systems under pressure or systems which contain substances which are flammable, toxic or corrosive
- any work affecting the integrity or availability of safety or emergency systems e.g., fire pumps, fire mains, shutdown systems, fire and gas detection
- pressure testing of plant and equipment

3.7 Cold Work (Other Task) Permit (BLUE)

This permit shall be used for tasks which do not fall into the preceding categories of Permit to Work but still require to be covered by a permit. For example:

- brush painting in Confined Space
- general maintenance
- erection and dismantling of scaffolds
- work on isolated electrical equipment

3.8 Formal Procedures and Standing Orders

Formal Procedures

Certain low risk residual tasks of a routine and continuous nature may be performed under a written formal procedure rather than a Permit to Work. The formal procedure shall identify the full scope of the task together with the hazards and precautions, and shall be authorised by the Site Manager.

Tasks performed under a formal procedure shall only be performed by suitably competent personnel.

Formal procedures shall only be used where any isolations fall within the scope of Personal Isolations (see *Section 4.1 Isolation Confirmation Certificate*) and they shall be reviewed at least annually. Examples include:

- fire and gas detector head checks and repairs
- public address system checks and repairs
- telephone system checks and repairs
- planned maintenance.

Standing Orders

Standing Orders, issued under the authority of the Site Manager, may be used to cover hot work tasks in workshops. Such orders shall specify the workshop concerned, the authorised use of only permanent facilities, the hazards involved and the precautions to be taken.

3.9 No Permit Required

The Area Authority may allow certain specific, routine, non-hazardous tasks to be performed in his area without the issue of a permit or a formal procedure provided that the tasks do not impact on another area.

The Area Authority shall satisfy himself that the risks are as low as reasonably practicable and that the tasks are performed by suitably competent personnel.

Many of the tasks that do not require a permit or the use of a formal procedure are themselves the subject of written procedures that have been risk assessed when originally produced. Such routines include:

- routine crane operations using fixed cranes, excluding heavy lifts and maintenance
- general cold work in workshops
- routine work in offices, and domestic activities.
- visual inspections, excluding Confined Spaces.

4 Supplementary Certificates

4.1 Isolation Confirmation Certificate

The Isolation Confirmation Certificate supports the Permit to Work by providing the means of:

- recording the isolations which are required before the task detailed on the associated Permit to Work can proceed
- confirming isolations have been made so that the task can proceed (subject to authorisation of other certificates e.g., Confined Space Entry)
- authorisation and recording of de-isolations and isolations which may be required to test equipment under a sanction to test
- authorisation and recording of de-isolation on completion of the task detailed on the associated Permit to Work.

Note: The Isolation Confirmation Certificate must be completed before the relevant Permit to Work can be authorised.

Under certain circumstances, e.g., for short duration low risk tasks, the Area Authority may authorise isolation by the Performing Authority (Personal Isolation/De-isolation). However, an Isolation Confirmation Certificate shall always be raised and details entered in the Isolation Certificate Register. The Isolation Certificate shall be displayed on the isolation certificate board in the control room.

For full details of the Isolation Confirmation Certificate see *Isolation Prosess Safety procedure*.

4.2 Confined Space Entry Certificate

A Confined Space Entry Certificate shall be raised when it is necessary for personnel to enter confined spaces as defined in *Confined Space Entry procedure*.

This certificate provides the means of:

- declaring that the confined space is isolated so that the Authorised Gas Tester can enter, subject to any special conditions
- authorizing entry by the Authorised Gas Tester
- recording the gas test and re-test results
- declaring the confined space safe for entry under a Permit to Work
- specifying whether or not Breathing Apparatus is required
- written communication between the Authorised Gas Tester and Area Authority.

4.3 Plant Contamination Certificate

A Plant Contamination Certificate shall be used to cover the handling or transport of equipment which is, or has been, contaminated.

The certificate provides the means of:

- declaring that a contaminated piece of equipment has been cleaned, specifying the method(s) used
- defining the substances with which a piece of equipment is contaminated if it has not been cleaned
- specifying the precautions to be taken when handling a piece of contaminated equipment.

The certificate shall be securely attached to the equipment and a copy included with the manifest if the equipment is to be transported from the installation / site.

4.4 Clearance for Excavation Certificate

A Clearance for Excavation Certificate shall be used where any excavation or stake driving is planned, on any site.

The certificate provides the means of:

- applying for permission to excavate as specified
- recording the consent of those engineers responsible for the technical integrity of any underground equipment or services, subject to any specified precautions
- recording the consent of the Area Authority, subject to the issue of a Permit to Work
- acceptance by the Performing Authority, and his undertaking to observe the required precautions and to obtain the necessary Permit to Work before starting excavation.

4.5 Clearance to Move Heavy Equipment

A Clearance to Move Heavy Equipment Certificate shall be used when it is planned to move heavy equipment.
The certificate provides the means of:

- applying for permission to move the heavy equipment as specified
- specifying the precautions to be taken to avoid damage to underground, overhead, surface and surface mounted services and facilities
- recording the consent of the Area Authority subject to the issue of a Permit to Work
- acceptance by the Performing Authority, and his undertaking to observe the required precautions and to obtain the necessary Permit to Work before starting the move.

5 The Permit to Work Process

The sequence of compiling a typical Permit to Work form is summarized in *Table 2*.

Section	Action by	Action to be Taken
1	Performing Authority	• Provides sufficient information for subsequent personnel to assess the task. Estimates duration and signs the section.
2	Area Authority	• Identifies the hazards in the task, work area and adjacent or associated work.
3	Area Authority	• Lists precautions he will take to control hazards identified in Section 2. • Notes any inhibits required. • Consults with Affected Area Authorities who sign this section.
4	Area Authority	• Specifies the protective clothing to be worn and equipment to be carried.
5	Area Authority	• Lists the precautions to be taken by the Performing Authority.
6	Area Authority	• Lists the Supplementary Certificates raised in connection with the Permit.
7	Site Manager	• Examines and signs to approve the Permit. • Satisfies himself that a Formal Risk Assessment is/is not required.
8	Gas Tester	• Gas tests equipment/work area where required. Logs and signs the results
9	Area Authority/Delegate & Performing Authority	• Formal hand over to Performing Authority, after specified work site inspection.
	Control Room Operator	• Permit entered into the Central Control Room Register and Permit numbered. Inhibits instituted.
10	Performing Authority	• Statement of completion or non-completion of task and work site inspection with Area Authority/Delegate.
	Area Authority/ Delegate	• Acceptance by Area Authority of state of completion and work site inspection. • Declares that systems can be returned to normal operation.
11	Control Room Operator	• Completes Central Control Room Register. Cancels Inhibits.

Table 2 Permit to Work Process

6 AUDIT

Each Contractor project shall:

- undertake self-regulatory audits of the operation of the Permit to Work System at each site
- maintain an Audit Register
- have in place a system for tracking recommendations through to close-out.

Use of a Standard Audit Checklist is recommended, to allow comparison with external audit results.

Appendix A - Definitions
List of Definitions

Confined Space Entry:	where there is inadequate ventilation to dispel injurious or flammable fumes, vapor or gas or to provide sufficient oxygen. Also includes areas where access / egress is restricted.
Hazard:	the potential for human injury or loss of life, damage to the environment or to material assets or a combination of these.
Hazardous Consequence:	the result when a hazard is realised.
Inhibition:	the isolation of the executive action of a protective system. Where practicable, this should not prevent the operation of the visual / audible warning system
Isolation:	• Process Isolation involves the closing and locking of valves. This may include depressurising, flushing and purging, e.g. single valve isolations. • A Positive Isolation involves the disconnection of plant, equipment and systems from sources of motive power, liquids and gases. • Electrical Isolation - The secure, disconnection and separation of a circuit, or item of equipment, from every source of electrical energy. This may involve electrical, instrument and communication isolations. • Long Term Isolation - An isolation that remains in place after permit cancellation, and recorded as “Long Term”.
Isolation Certificate Board:	a board used to display the status of Isolation Certificates, Isolation Certificate Continuation Sheets and Boundary Isolation Certificates, maintained by the Area Authority.
Isolation Certificate Register:	a register maintained in the control room identifying the status of all Isolation Certificates by the Control Room Operator-referenced to individual permits.
Likelihood:	the chance of occurrence of an event. Likelihood can be expressed as a probability, frequency, class, rank etc.
Permit::	an authorizing document approved by management, specifying the required precautions and conditions under which potentially hazardous or interacting activities can take place
Permit Display Board:	a board used to display the status of active and suspended permits.
Permit Register:	a register maintained in the control room identifying the status of all permits.
Risk	a combination of the likelihood of a hazardous event and the severity of the possible consequences of that hazardous event.
Risk Assessment:	the overall process of risk analysis and risk evaluation.
Risk Evaluation:	the process to support management decisions as to acceptability or risk reduction requirements by comparing the estimated risk against relevant criteria.
Safeguards:	steps taken to reduce either the likelihood or consequences, or both of a particular risk.

8.

8.8 Welding and Cutting Safety Procedure

1 Introduction
1.1 Document Purpose

This document provides the information necessary to ensure that welding, burning and associated activities are carried out in a safe and efficient manner, without harm to personnel or damage to equipment and the environment.

1.2 Document Scope

The activities covered by this document include the:

- storage and maintenance of welding and burning equipment
- preparations and precautions to prevent fire and explosion (including the safe storage and handling of equipment)
- preparations and precautions to be taken during specific welding and burning activities, e.g., welding in confined spaces, welding on tanks, etc.

1.3 Associated Procedures

Depending upon the nature and circumstances of the activity, this procedure should be used in conjunction with:

- *Permit to Work*
- *Confined Space Entry*.

Note: Welding, burning, grinding or any other operation that generates heat or sparks, e.g., abrasive cutting, shall be carried out under the control of the Permit to Work System.
The conditions laid down on the permit to Work will be adhered to at all times.

2 Responsibilities

2.1 Site Manager

Site Managers have overall responsibility for the safe use of welding and burning equipment on their sites and shall:

- use only welding and burning contractors who employ suitably competent and experienced personnel
- advise all welding and burning contractors with regard to flammable materials and hazardous conditions
- establish approved areas for burning and welding
- establish approval procedures for burning and welding.

2.2 Area Authority - Supervisor

The Area Authority is responsible for the safe execution of burning and welding within his area of authority and shall:

- inspect the work site before welding or burning is permitted and at least once per day during the work
- ensure that welding and burning equipment is maintained in satisfactory operating condition and in good repair
- ensure that welding and burning activities are carried out under the appropriate supervision.

2.3 Performing Authority

The Performing Authority is responsible for:

- the safe use of the burning or welding equipment
- determining the nature and quantity of combustible materials and hazardous areas present at the work site
- obtaining a Permit to Work from the Area Authority
- ensuring that fire protection and extinguishing equipment are properly located at the site
- ensuring fire watches are available at the site when required
- making a final check of the work site 30 minutes after the completion of burning or welding operations
- ensuring that combustibles are safe from ignition by:
- moving the work to a location free from dangerous combustibles

or...

- having the combustibles moved to a safe location

or...

- having the combustibles properly shielded against ignition
- ensuring wherever possible that any operation that might expose combustibles to the risk of ignition is not scheduled during burning or welding activities.

2.4 Welder

The Cutter and / or Welder shall:

- have approval by the Performing Authority before starting to cut or weld
- cut or weld only where conditions are safe
- stop working if conditions change from those under which the Permit to Work was granted
- after finishing work, ensure nothing is burning or smouldering near the work site.

2.5 Fire Watcher

A fire watch shall be maintained for at least 30 minutes after the completion of burning or welding operations, in order to detect and extinguish smouldering fires.

Fire Watchers shall:

- have fire extinguishing equipment readily available and be trained in its use (including practice on test fires)
- be familiar with the facilities and procedures for sounding an alarm in the event of a fire
- watch for fires in all exposed areas, and shall:
- try to extinguish them (only when obviously within the capacity of the equipment available)

and...

- sound the alarm immediately.

3 Gas Welding and Burning Equipment

3.1 Identification of Cylinders

Cylinder Markings

All cylinders shall be permanently and legibly labeled or stamped with the following:

- trade symbol of manufacturer
- serial number
- calculated quantity (tare) of empty mass
- manufacturing date (month, year)
- next inspection/test date, adjacent to the previous one (month, year)
- service pressure (psi/bar)
- test pressure (psi/bar)
- capacity (cubic feet/litres).

All markings shall be stamped on the shoulder of cylinders near valves.

Note: **Do not** remove or change any numbers or marks stamped on cylinders.

Cylinder Colour Coding

Compressed gas cylinders are painted in accordance with the National Color Coding System to properly identify their contents. The required color codes are listed in *Table 3*.

Note: Where the cylinders cannot be identified in accordance with this colour coding standard, they shall not be used, and shall be returned to the supplier.

Gas	Bottle Colour	Label Text	Label Colour
Propane	Red	PROPANE	White
Acetylene	White	ACETYLENE	Red
Butane	Red	BUTANE	White
Air	Black	COMPRESSED AIR	White
Oxygen	Blue	OXYGEN	Black
Carbon dioxide	Black	CARBON DIOXIDE	Yellow

Reference: *Regulation of "Structure (working principles) and Safe Operation of Pressure Vessels" – Moscow 1976*

Table 3 Compressed Gas Cylinder Identification

3.2 Cylinder Storage

All Cylinders

All cylinders **shall be stored** in a cool, well ventilated area preferably in the open air. They should be chained or otherwise secured and valve caps should be kept in place when cylinders are not in use.

Cylinders **should not be stored** in enclosed spaces such as workshops, accommodation.
All cylinders **shall be stored away from**:

- the direct rays of the sun or from radiant heat, e.g., flares
- locations where the temperature may exceed 45°C (113°F)
- locations exposed to adverse weather
  Note: Weather protection shall be provided if required
- possible sources of ignition
- flammable materials
- corrosive liquids
- any direct contact with soft or damp ground, or any other location where water can accumulate, thereby increasing exposure to the possible effects of corrosion.

Empty cylinders shall be marked with "EMPTY" or "MT", and stored separately from full cylinders.
Note: Regardless of whether or not cylinders have been marked, all cylinders shall be handled and treated as if they were full.

Oxygen Cylinders

Warning: Oils and greases are spontaneously combustible in the presence of oxygen.
Oxygen cylinders and their fittings, including hoses, **must not** be stored or used where they can come into contact with oil or grease. This includes handling the equipment with oily hands, gloves or rags.

Oxygen cylinders must be stored apart from fuel gas cylinders by a minimum distance of 3 metres (10 feet). Separation by using cylinders of non-flammable gases is acceptable. This separation must be maintained.
The preferred practice is to store oxygen cylinders vertically, valve end up. However, it is acceptable to store oxygen cylinders horizontally provided that:

- the stacks shall not exceed a maximum height of three cylinders
- the largest cylinders must be at the bottom
- the row must be securely wedged.

Acetylene and Propane Cylinders

Warning: Acetylene cylinders **must not** be stored or used in a horizontal position. All acetylene cylinders, full or empty, shall be stored and used in the vertical, valve end up position.

Damaged Cylinders

Cylinders that may have been damaged in any way shall be returned to the supplier.
Leaking cylinders shall immediately be moved to a freely ventilated area away from any source of ignition or places where leaking gas will become tapped.

Cylinders Exposed to Fire

In the event of gas cylinders being involved in a fire, they must be kept cool with water spray, e.g., a fog nozzle, and where possible, removed to a safe area. Such cylinders must be returned to the manufacturer for checking prior to re-use.
In the case of acetylene cylinders that have been so exposed, prolonged cooling is necessary for several hours after the incident to prevent exothermic decomposition.

3.3 Cylinder Handling

Lifting

If cylinders are lifted by crane, a suitable cradle or similar device should be used. If a trolley is used as a cradle during lifting, care should be taken to ensure that its base is strong enough to take the weight of the cylinders.
Cylinders **shall not** be lifted using:

- the cylinder valves
- chain or wire rope slings (these can allow the cylinder to slip during lifting).

Movement of Cylinders on Site

Note: Cylinders **shall not** be dropped, dragged, rolled, or used as supports. In addition, the cylinder valves must be protected from damage at all times.

Cylinders should be transferred to, and moved within, the working area on trolleys specifically designed for that purpose, or in suitable containers providing stable and secure positioning of the cylinders.

All valves must be closed before a cylinder is moved and, if the correct trolley is not being used, regulators and hoses should be detached from the cylinders.

Electric Cables

Cylinders and gas hoses shall not be allowed to come into contact with current carrying wires. Therefore:

- special attention should be paid to the places where electro-welding and gas burning of metals are carried out simultaneously
- the distance from oxygen or fuel gas cylinders to electro-welding cables shall be not less that 1 m.

3.4 Cylinder Fittings

Acetylene Fittings

Warning: Wherever copper comes into direct contact with acetylene, the explosive compound Copper Acetylide may be formed. Only approved alloys of less than 70% copper shall be used for acetylene fittings. Where approved fittings are silver soldered, the solder should contain no more than 40% silver and 20% copper.

Regulators

Only automatic pressure regulators and pressure gauges as recommended by the gas cylinder supplier shall be fitted to oxygen and fuel gas cylinders. These pressure regulators provide the following safety features:

- provision of a filtered supply of gas at a constant delivery pressure
- safety diaphragms that burst before the bonnet is blown off
- pressure gauges with safety backs that deflect the venting gas.

Note: The adjustable screw on the regulator must always be released before the cylinder is opened.

Valves

To avoid leaks and possible dangerous gas build-up, valves and fittings shall be kept scrupulously clean, and care taken to ensure that no grit or foreign matter is allowed to remain on them.

Note: The use of any kind of packing in the valve joints is strictly forbidden. Packing, particularly lead or copper, can easily be forced into the orifice, causing a blockage.

Valve Keys

Only standard valve keys shall be used, and cylinder valves shall always be opened slowly by gently tapping the key.

Keys with long leverage should never be employed to force a valve shut.

Blowpipes

Only high pressure blowpipes may be used with high pressure equipment.

All blowpipes shall be dismantled and cleaned internally at regular intervals. During use, accumulated slag should be frequently removed from the blowpipe tip during operation. To avoid severe blockage, care should be taken to avoid dipping the blowpipe tip into molten metal.

Only the manufacturer's recommended tip clear should be used for cleaning or altering the blowpipe tip.

Note: Hard metal reamers shall not be used to clear the blowpipe tip.

Hoses

Unnecessarily long lengths of hose should be avoided. Oxygen and fuel gas hoses should be the same length.

Only good quality hoses fitted with check valves (to prevent gas flowing back from the blowpipe) are acceptable for use. Faulty or damaged hoses **must not** be used.

Hoses are supplied with connections suitable for standard regulators and blowpipes. If required, hose lengths should be joined by the use of crimped connecting fittings, not hose clips.

In order to identify and / or prevent possible blockage, hoses should be blown through with air before being connected to regulators and blowpipes.

Warning: Under no circumstances shall oxygen be used for ventilation or to blow through acetylene hoses. Explosions can occur when acetylene gas is present in air in any proportion between 2.5% and 80% by volume.

When in use, hoses should be protected from damage, and laid out in such a manner as to avoid being a tripping hazard.

Flashback Arrestors

Flashback arrestors, which quench flashback flames and cut off the gas flow automatically, must be incorporated in all oxygen lines and fuel gas lines.

Damaged / Faulty Cylinders and Fittings

Cylinders with faulty outlet valve connections, e.g., damaged threads, seized valve spindles, etc., must be returned immediately to stores with a note stating the cylinder number, the nature of the fault and whether the cylinder is charged.

Note: Under no circumstances may the user of the cylinder attempt any repair whatsoever.

Cylinders with leaking valves that cannot be shut off must be removed to a safe area away from any possible source of ignition and drainage, where they shall be allowed to vent off slowly until empty. Stores shall be advised of the fault.

Note: Propane and Butane are heavier than air and may accumulate in dips and hollows.

4 Electric Arc welding and burning Equipment

4.1 Welding Sets

All welding sets must be maintained in good condition, and be of adequate capacity.

Where stationary transformers or generator sets are used, a suitable switch must be mounted adjacent to the equipment to provide isolation from the supply main.

Diesel driven welding sets shall not be used except with the formal agreement of the Site Manager for each occasion of use. If used, the sets must be approved for the area in which they are sited.

Note: The engine must not be refuelled whilst in operation.

In order to protect the trailing leads and the equipment, portable transformers or generator sets with trailing leads, must be provided with interlocked fused switch sockets and plugs.

Under no circumstances shall the welder:

- connect and disconnect the welding device from the electricity supply network when the connection is anything other than a plug and socket
- repair electro-welding machines (such repairs shall be carried out by a competent electrician only).

4.2 Cables and Connections

All cables, connectors and terminators must be maintained in good condition, and be of adequate capacity. To avoid long lengths of power cables the machine must be sited as close as possible to the workplace.

All supplies for welding equipment must be made of approved cables and connections, and must be controlled from a circuit which includes protection sensitive to earth fault currents.

Welding leads and returns shall comprise flexible, tough rubber covered cables, using approved cable couplers where necessary. Leads shall be properly terminated and cable couplers and terminations must be of adequate carrying capacity.

Welding leads must be inspected daily for any damage. In the case of worn or torn cable sheaths, or flattened or kinked cables, the affected part should be removed.

Welding return leads must always be used to prevent uncontrolled welding currents passing back from the work-site to the generator through the structure and/or plant items. This could give rise to sparks or cause damage to bearings in machines, etc. Particular attention should be paid to welding returns when welding on pedestal crane booms, so that currents cannot pass through main slew bearings.

Note: It is prohibited for the welder to commence or continue welding operations with faulty cables, starting devices or electrode holders.

4.3 Electrode Holders

Electrode holders shall be provided with a handle of tough, insulating non-ignitable material with a guard disc of similar material between the hand of the operator and the projecting line portion.
A fully insulated holder or hook should be provided for the live electrode holder when not in use.
Laying live electrode holders on gloves, face screens or handing them up by the electric cable where it could come in contact with other equipment etc., is discouraged.

Warning: Electrode holders under voltage **must not** be left unattended.

4.4 Earthing and Bonding

For all AC welding transformers, the transformer low voltage winding must not be earthed but the transformer case must be effectively bonded to an earthing system adjacent to the equipment.
The DC welding output of all AC driven DC welding generators must not be grounded. The machine frame must be effectively bonded to ground.
For engine driven DC welding generators, no earth connection must be applied to the generator output terminals.
The work piece must be bonded to earth by means of a heavy section conductor having suitable clamped or bolted connections.

5 Welding and Burning - Hazards and Precautions

5.1 Personal Protection Equipment

Personnel engaged in, or working in close proximity to, welding, burning, chipping and grinding operations must use the appropriate protective clothing/equipment, e.g., goggles, face shields, welding helmets, welding screens, gloves, leather aprons, etc.
The necessity for protective clothing against sparks and pieces of hot metal, depends upon the position of the arc in reference to the welder's body.
For some classes of welding, e.g., where the welder is standing at a bench, the head screen and gauntlets may well provide sufficient protection.
A thick apron of leather or other suitable material may be needed if the welder is sitting at his work position, where molten metal may fall upon his thighs and legs.
If the arc is above the level of his shoulders or overhead, complete protection for the head, arms and upper part of the body is necessary.

Welding Helmets, Welding Shields and Flip-Front Goggles

The specifications for welding helmets, welding shields and flip-front goggles shall comply with:

- *EN 169 "Specification for filters for PPE used in welding"*
- *EN 175 "PPE for eye and face during welding*"
- *EN 166 "Eye protection".*

Wide Vision Welding Goggles

The lenses of wide-vision welding goggles shall conform to *BS 679* and their frames to *BS 1542*.

Coveralls

Flame retardant welders coveralls shall be approved to:

- *BSEN 470*
- *BSEN 531*.

Gauntlets

Note: For gauntlets used for electric arc welding, see *Additional Protection for Electric Arc Welding* below.

Gauntlets used for welding, brazing and burning shall conform to:

- *BSEN 407*
- *BSEN 388* (*Mechanical Risk*)
- *BSEN 420* (*General Requirements*).

Additional Protection for Electric Arc Welding

Gloves or gauntlets made of non-ignitable material are required for shielding the hands and arms from sparks and heat radiation of the welding arc. Leather gloves and gauntlets give no protection against electrical hazards. In particular, for electric arc welding, oiled or greased clothes and gloves shall not be worn.
As well as normal protective clothing, while performing electric arc-welding in hazardous conditions (welding of wet structures) electric welders shall use:

- dielectric gloves (*BSEN 388*)
- overshoes (*BSEN 345*)
- rubber mats.

5.2 Fumes and Gas Risk

Welding, burning, and brazing operations, etc., can produce toxic fumes and gases, the composition of which depends on welding temperature, arc intensity, electrode material and the gas mixture being used. Therefore, it must be ensured that:

- any organic coatings are removed prior to any welding and burning
- gases/fumes are removed either by natural ventilation or forced mechanical ventilation
- a suitable respiratory system should be available as a back up if the ventilation system is inadequate.

Warning: Respiratory protection must be worn where the welding or burning of cadmium alloys or a cadmium-coated material takes place.

5.3 Fire and Explosion Prevention

Note: Welders and helpers must always be alert to the danger of fire and explosion.

Restrictions on Welding and Cutting

Cutting or welding is only permitted in areas that are fire safe.

Welding or burning shall not take place in restricted areas without a Hot Work (Naked Flame) Permit. In addition, the conditions laid down on that permit must be strictly observed.

Approved Welding and Cutting Areas

Within the confines of an operating plant or building, the burning and welding work area shall be either:

- a specific area designed or approved for such work, i.e., a maintenance shop

or...

- a detached outside location of non-combustible or fire-resistive construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas.

Where work cannot be moved practically, as in most construction work, the area shall be made fire safe by removing combustibles or protecting combustibles from ignition sources.

Area Preparation

Fully charged and operable fire extinguishers, appropriate for the type of possible fire, shall be available at the work area. Where hose lines are available, they shall be connected and ready for service.

Work must be screened to prevent sparks from flying outside the immediate welding area and all combustible material must be removed or covered with fire resistant material. Combustible materials such as paper clippings, wood shaving, or textile fibres on the floor shall be swept clean.

If welding is to be carried out on a metal wall, partition, ceiling, or roof, precautions shall be taken to prevent ignition of combustibles on the other side due to conduction or radiation. The preferred precaution is to relocate combustibles. However, where it is not possible for the combustibles to be relocated, a fire watch on the opposite side from the work shall be provided.

Any drains in the area must be plugged, gullies cleaned and if possible water filled and finally covered with fire blanket.

Openings or cracks in walls, floors, or ducts within 11m of the site shall be tightly covered to prevent the passage of sparks to adjacent areas.

Conveyor systems that might carry sparks to distant combustibles shall be protected.

Combustible floors shall be kept wet, covered with damp sand, or protected by fire-resistant shields.

Warning: **Do not** wet down floors where electric arc welding or burning equipment is to be used.

Removal of Slag

Slag shall not be cleaned from newly welded joints until it has had time to cool.

Safety goggles must be used for slag removal.

Welding on Tanks and Vessels

Note: Before welding on tanks and vessels may take place, inspection by the Area Authority will be necessary to decide on the precautions to be taken.

All tanks, vessels and equipment on which welding, cutting, burning, brazing and soldering work is carried out, must be either free from flammable gases and vapours and cleaned of all traces of liquid, wax or solid hydrocarbons, or provision made for excluding oxygen, e.g., filled with nitrogen, high expansion foam or similar product.

The space between double plates or wear plates, where flammable material may be found, must be considered. Work on a main deck forming the root of an in-deck tank must be given special consideration.
Before cutting the bottom plates of any tank, test holes must be drilled and a gas test taken, to ensure that conditions are safe under the tank floor.

Unattended Welding Equipment

Blowpipes and hoses, if not in use, must not be left in vessels or enclosed spaces. If blowpipes and hoses cannot be removed from the space, the connections must be disconnected at the cylinders.

Note: Closing the cylinder valves is not classified as a disconnection.

Whenever equipment is to be left unattended, gas cylinder valves shall be shut, hoses de-pressurised and disconnected.
Electrical power supply for welding machines shall be switched off and disconnected. Any diesel driven welding sets shall be shut down.

Work Using Scaffolding

Gas cutting or welding operations involving the use of scaffolding is allowed only after taking measures to prevent the scaffold boards from ignition and molten metal falling on people below.

Maximum height of gas cutting point above lower located tier (metres)	0	2	5	7	10
Radius of sparks scattering (metres)	6	8	10	12	14

Fire Watchers

An active fire watch shall comprise at least one nominated person, whose sole duty consists of fire watching. This person shall be provided with suitable portable fire extinguishing equipment. In addition fire blankets and a pressurised fire hose may be provided depending on location/site conditions.
The fire watch shall ensure that the areas are left in a safe condition by inspecting the work area and any adjacent areas that may be affected 30 minutes after welding or burning work ceases.
Trained and competent personnel to act as fire watch shall be required by the Area Authority whenever burning or welding is performed in locations where:

- fire and gas detection systems have been inhibited to permit burning or welding to take place
- appreciable combustible material in building construction or contents is closer than 11 metres to the point of operation
- appreciable combustible materials are more than 11 metres away but are easily ignited by sparks
- wall or floor openings are within an 11 metre radius and give access to combustible material in adjacent areas, including concealed spaces in walls or floors
- combustible materials are adjacent to the opposite side of metal partitions, walls, ceiling, or roofs and are likely to be ignited by conduction or radiation.

5.4 Confined Spaces

All personnel involved in welding and burning operations in confined spaces must comply with the requirements of this procedure and the requirements defined in:

- Permit to Work
- Confined Space Entry.

In particular, when welding or burning in a confined space:

- **forced ventilation** shall be maintained in the space at all times
- **organic coatings** shall be removed prior to any welding and burning
- **gas cylinders** shall not be taken into the space at any time; they shall be sited outside the space with the hoses laid through suitable transits and protected from damage
- **welding transformers** shall not be placed inside the space; they shall be sited outside the space with the cables laid through suitable transits and protected from damage
- where work in confined spaces takes place over several days, welding hoses and equipment shall be removed from the space overnight in case of gas build-up due to leakage

- **lighting** inside the confined space during welding operations shall be provided by mobile light fixtures with a voltage of no more than 25V. Lights shall be fitted with wire protection cages

5.5 Welding and Burning on Small Containers

Before any hot work is carried out on any container that may have been used to store petroleum products or other flammable or combustible materials the following guidelines must be followed, and the Safety Adviser must certify the container free of gas and chemicals.

1. Drain the container of all contents.
2. Steam out the container thoroughly **or** submerge the container in boiling water for at least one hour.

   Note: Compressed air purging or washing out with hot / cold water may not sufficiently clean the vessel of flammable materials and therefore **shall not** be used as methods of preparation for repair purposes.
3. Blow through the container with compressed air until the container is dry.

During repairs, air (**not oxygen**) must be blown through the vessel to prevent the build-up of unburned gases.

8.9 Compressed Gas Cylinders

1 Introduction

1.1 Document Purpose

This procedure specifies the requirements necessary for the safe handling, use, storage, and transportation of compressed gas cylinders.

1.2 Document Scope

Where necessary, this procedure should be used in conjunction with procedure *Welding and Cutting* which provides advice specifically for the storage and use of compressed gas cylinders for welding and cutting activities.

2 Responsibilities

2.1 Site Manager

Site Managers have overall responsibility for the safe storage and use of compressed gas cylinders on their sites and shall ensure that:

- compressed gas cylinder inspection procedures for receipt, safe use and storage, are established and observed on site
- compressed gas cylinders are stored in accordance with these guidelines
- inspection, storage and use of compressed gas cylinders are carried out by suitably competent and qualified personnel.

2.2 Area Authority - Supervisor

Area Authorities are responsible for ensuring that the contents of these guidelines are observed within their areas of authority.

3 Receipt of Cylinders on site

3.1 Cylinder Inspection

Compressed gas cylinders shipped to any BP site shall be thoroughly inspected by qualified and competent personnel before being accepted. Cylinders shall be inspected for corrosion, dents, general distortion, scorch marks, or any defect.

Note: Defective cylinders shall be returned to the supplier/manufacturer.

Cylinders with faulty outlet valve connections, e.g., damaged threads, seized valve spindles, etc., must be returned immediately to stores with a note stating the cylinder number, the nature of the fault and whether the cylinder is charged.

Note: Under no circumstances may the user of the cylinder attempt any repair.

3.2 Cylinder Identification

Compressed gas cylinders are painted in accordance with the National Color Coding System to properly identify their contents. The required color codes are listed in *Table 4*.

Note (01): If cylinders cannot be identified in accordance with this colour coding standard, they shall not be accepted or used on site, but shall be returned to the supplier.

Note (02): This colour coding system does not apply to Diving Gases which are covered under separate standards and practices applicable to diving and subsea operations.

	Gas	Bottle Colour	Label Text	Label Colour	Stripe Colour
1	**Nitrogen**	Black	NITROGEN	Yellow	Brown
2	**Ammonia**	Yellow	AMMONIA	Black	-
3	**Propane**	Red	PROPANE	White	-
4	**Technical Argon**	Black	TECHNICAL ARGON	Dark blue	Dark blue
5	**Acetylene**	White	ACETYLENE	Red	-
6	**Associated gas**	Grey	ASSOCIATED GAS	Red	-
7	**Butane**	Red	BUTANE	White	-
8	**Hydrogen**	Dark green	HYDROGEN	Red	-
9	**Air**	Black	COMPRESSED AIR	White	-
10	**Helium**	Brown	HELIUM	White	-
11	**Oxygen**	Blue	OXYGEN	Black	-
12	**Medical Oxygen**	Blue	MEDICAL OXYGEN	Black	-
13	**Hydrogen Sulfide**	White	HYDROGEN SULPHIDE	Red	Red
14	**Sulphur Dioxide**	Black	SULPHUR DIOXIDE	White	Yellow
15	**Carbon dioxide**	Black	CARBON DIOXIDE	Yellow	-
16	**Chlorine**	Khaki	CHLORINE	-	Green

Reference: *Regulation of "Structure (working principles) and Safe Operation of Pressure Vessels" – Moscow 1976*

Table 4 Compressed Gas Cylinder Identification

3.3 Cylinder Markings

All cylinders shall be permanently and legibly labeled or stamped with the following:

- trade symbol of manufacturer
- serial number
- calculated quantity (tare) of empty mass
- manufacturing date (month, year)
- next inspection/test date, adjacent to the previous one (month, year)
- service pressure (psi/bar)
- test pressure (psi/bar)
- capacity (cubic feet/litres).

All markings shall be stamped on the shoulder of cylinders near valves.

Note: **Do not** remove or change any numbers or marks stamped on cylinders. Any cylinders that do not comply with this system shall not be accepted or used on site but shall be returned to the manufacturer/supplier.

4 Cylinder Storage

4.1 All Cylinders

All cylinders **shall be stored** in a cool, well ventilated area preferably in the open air and at least 3 metres (10 feet) from combustible materials.
Cylinders should be chained or otherwise secured, with valves shut and valve caps in place when cylinders are not in use.
Cylinders **should not be stored** in enclosed spaces such as workshops, accommodations.
All cylinders **shall be stored away from**:

- the direct rays of the sun or from radiant heat, e.g., flares
- locations where the temperature may exceed 45°C (113°F)
- locations exposed to adverse weather
  Note: Weather protection shall be provided if required
- possible sources of ignition
- flammable materials
- corrosive liquids
- any direct contact with soft or damp ground, or any other location where water can accumulate, thereby increasing exposure to the possible effects of corrosion.

Cylinders containing different gases must be stored separately and in accordance with established spacing requirements. Oxygen cylinders shall be separated from the cylinders containing flammable gas by at least 3 meters or by non-combustible barrier at least 2 meters high.
Empty cylinders shall be marked with “EMPTY” or “MT”, and stored separately from full cylinders.
Leaking cylinders or cylinders with leaking valves that cannot be shut off must be removed to a safe area away from any possible source of ignition and drainage, where they shall be allowed to vent off slowly until empty. Stores shall be advised of the fault.

Note: Propane and Butane are heavier than air and may therefore accumulate in dips and hollows.

Note: Regardless of whether or not cylinders have been marked, all cylinders shall be handled and treated as if they were full.

4.2 Oxygen Cylinders

Warning: Oils and greases are spontaneously combustible in the presence of oxygen.
Oxygen cylinders and their fittings, including hoses, **must not** be stored or used where they can come into contact with oil or grease. This includes handling the equipment with oily hands, gloves or rags.

Oxygen cylinders must be stored apart from fuel gas cylinders by a minimum distance of 3 metres (10 feet). Separation by using cylinders of non-flammable gases is acceptable. This separation must be maintained.
The preferred practice is to store oxygen cylinders vertically, valve end up. However, it is acceptable to store oxygen cylinders horizontally provided that:

- the stacks shall not exceed a maximum height of three cylinders
- the largest cylinders must be at the bottom
- the row must be securely wedged.

4.3 Acetylene and Propane Cylinders

Warning: Acetylene cylinders **must not** be stored or used in a horizontal position. All acetylene cylinders, full or empty, shall be stored and used in the vertical, valve end up position.

4.4 Damaged Cylinders

Cylinders that may have been damaged in any way shall be returned to the supplier.
Leaking cylinders shall immediately be moved to a freely ventilated area away from any source of ignition or places where leaking gas will become tapped.

5 Cylinders Exposed to Fire

In the event of gas cylinders being involved in a fire, they must be kept cool with water spray, e.g., a fog nozzle, and where possible, removed to a safe area. Such cylinders must be returned to the manufacturer for checking prior to re-use.

In the case of acetylene cylinders that have been so exposed, prolonged cooling is necessary for several hours after the incident to prevent exothermic decomposition.

6 Cylinder Handling

6.1 Transport

Fit suitable protective valve caps and covers before transporting.
Ensure cylinders are securely stowed to prevent moving. Cylinders should be stowed in the upright position unless instructions for transport specifically say otherwise.
Do not let gas cylinders project beyond the sides or end of a vehicle.

6.2 Lifting

If cylinders are lifted by crane, a suitable cradle or similar device should be used. If a trolley is used as a cradle during lifting, care should be taken to ensure that its base is strong enough to take the weight of the cylinders.
Cylinders **shall not** be lifted using:

- the cylinder valves
- chain or wire rope slings (these can allow the cylinder to slip during lifting)
- lifting magnets.

6.3 Movement of Cylinders on Site

Note: Cylinders **shall not** be dropped, dragged, rolled, or used as supports, and **must be** protected from damage at all times.

Cylinder Trolleys

Cylinders should be transferred to, and moved within, the working area on trolleys specifically designed for that purpose, or in suitable containers providing stable and secure positioning of the cylinders.
All valves must be closed before a cylinder is moved and, if the correct trolley is not being used, regulators and hoses should be detached from the cylinders.

Electric Cables

Cylinders and gas hoses shall not be allowed to come into contact with current carrying wires. Therefore:

- special attention should be paid to the places where electro-welding and gas burning of metals are carried out simultaneously
- the distance from oxygen or fuel gas cylinders to electro-welding cables shall be not less that 1 m.

When in use, hoses should be protected from damage, and laid out in such a manner as to avoid being a tripping hazard.

7 Cylinder Use

Many of the specific uses of gases will vary from gas to gas but there are several points that apply to all of them:

- Keep the cylinders away from operations that create sparks, heat, fire and electrical circuits.
- Don’t use oil or grease on cylinders or handle them with oily hands or gloves. Don’t let oxygen spray on an oily or greasy surface, or on your clothes.
- Use cylinders in ventilated areas only.
- Keep cylinders secured upright in cylinder racks.
- Open valves by hand, not with a wrench or other tool. If they cannot be opened by hand, notify the supplier/manufacturer.
- Do not tamper with safety devices.
- If a cylinder has a leaky valve or fitting which cannot be stopped by closing the valve, the cylinder must be taken outdoors away from sources of ignition. Tag the cylinder as in bad order and promptly notify the supplier. Do not try to fix a leaking cylinder or valve. Dented cylinders should never be used.
- Ensure that hosing/tubing for use in oxygen service is completely degreased and dust free before each use

- Always open valves slowly. If a valve cannot be opened by hand with the key or hand wheel provided, the cylinder shall be returned to the supplier/manufacturer. Do not force the valve open using wrenches or other hand tools.

8.10 Lifting Operations Safety Procedure

1 Introduction

1.1 Document Purpose

This document is prepared for Safe Lifting Operations of Contractor Construction Projects.

1.2 Document Scope

The equipment to which this document applies includes, but is not limited to:

- pedestal cranes
- mobile cranes
- overhead gantry cranes
- loose lifting gear (chain hoists, lever hoists, slings, shackles, pendants etc)
- wireline masts
- lifts for persons or goods
- abseiling equipment
- sling-sets attached to containers or pieces of equipment
- runway beams and padeyes to which lifting equipment is anchored or fixed

The contents of this document apply to the above equipment regardless of whether it is new, existing, second-hand or leased.

2 Responsibilities

2.1 PROJECT MANAGER

The SITE MANAGER shall be responsible and accountable for the application of this procedure on his work site. In particular the SITE MANAGER shall ensure:

- that no lifting equipment is used or allowed on site unless it is accompanied by all relevant certification and in date test certificates
- that proper records are maintained for all lifting equipment, including certification and examination and test reports.

2.2 Competent Person

The term **Competent Person** is used to identify a number of different roles. In practical terms the competency of a person may be confirmed by formal, vocational qualification or through first hand knowledge of planning or supervising the lifting operations or using the equipment.
The Competent Person's responsibilities are described in each relevant section of this document.

2.3 Area Authority - Supervisor

The Area Authority shall be responsible for the application of this standard within his area of responsibility.

2.4 Personnel In Charge of Lifting Operations

Personnel in charge of lifting operations are responsible for ensuring:

- the immediate safety of all personnel involved in the lifting activity
- that all equipment used is suitable for the task and is within test date
- that the lifting operation has been risk assessed and planned
- that the activity is executed in accordance with the plan
- that lifting operations are halted if an unsafe situation occurs.

2.5 Subcontractors

Subcontractors providing lifting services for Contractor shall comply with the relevant sections of this procedure, according to their contractual conditions.

3 Positioning and Installation of Lifting Equipment

3.1 Permanent and Semi-permanent Lifting Equipment

All permanent and semi-permanent lifting equipment shall be designed, installed and positioned so that as far as reasonably practicable:

- the need to lift loads over people is minimised
- crushing is prevented at extreme operating positions; in particular, trapping points are prevented or access limited on travelling or slewing equipment
- loads are prevented from:
    - falling freely - through the fitting of suitable devices such as multiple ropes, safety gear or check valves
    - being unintentionally released during a loss of power to the lifting equipment or through the collision of equipment or their loads; for example, through the use of hooks with safety catches, motion limiting devices and safe systems of work
- loads moving along a fixed path (rails, runway beams, etc) are suitably protected to minimise the risk of the load or equipment striking a person

  Note: Drifting - runway beams should be level and tag lines used to control the movement of long or awkwardly shaped loads.
- personnel are prevented from falling down shafts or hoistways; for example, by the use of safety gates with interlocks

Overhead Gantry Cranes

Beneath the full travel of an overhead gantry crane, painted lines on the floor (where practicable) shall be used to delineate a path and indicate its width. This path shall be kept free of materials and stores. Warning notices shall be posted in prominent positions, especially at access points. An audible and visual warning device should operate automaticaly when an over-head crane is tracking.

3.2 Mobile Lifting Equipment

Mobile lifting equipment shall be subject to the same precautions as those listed for permanent and semi-permanent lifting equipment above. However, it shall be the specific responsibility of the person in charge of the lifting operation to ensure that these precautions are properly addressed throughout the lifting operation.

Wheeled Cranes

- Hooks must be properly secured whilst cranes are in transit, and the jib kept in the shutdown position.
- An audible and visual warning device should operate automatically when the crane is reversing.

4 Strength and Stability of Lifting Equipment

The strength and stability of fixed / permanent lifting equipment, for example platform cranes, gantry cranes, etc., is mainly dependent upon the design, construction and initial installation.
For temporary / mobile lifting equipment the strength and stability is dependent upon its installation, assembly and location.
However, the continuing strength and stability of all lifting equipment is dependent upon the purpose and method of use, and the application of a suitable sytem of regular examination, inspection and maintenance.

4.1 Design and Installation

All Lifting Equipment

During the design and installation stages for fixed lifting equipment it is necessary to:

- take account of the combination of forces which the equipment may be subjected to (including destabilising forces), for example, load, wind, frequency of use, etc
- ensure that the equipment is not susceptible to in-service failure modes (fracture, wear or fatigue), for example by choosing materials and components taking into account the combination of forces the equipment may be subjected to and by establishing an adequate maintenance and inspection routine

- where appropriate, lifting equipment shall be fitted with a Rated Capacity Indicator (previously known as a Safe Load Indicator)
- a table, showing the safe working load / radii limitations of the crane shall be fitted in every crane cab
- where the SWL changes with the operating radius of the equipment then a load-limiting device may need to be fitted to inhibit the equipment and provide visual and/or audible warnings
- build in an appropriate factor of safety against foreseeable failure modes
- provide rail mounted equipment with devices to prevent derailing
- lay rails so that they provide suitable support for rail mounted equipment.

Where there is a significant risk of overload, for example where lifting equipment may be used to offload a supply vessel onto a platform, the lifting equipment should be fitted with equipment which provides an audible and/or visual warning before an overload situation is reached.

Mobile Equipment
In addition to the factors listed for all lifting equipment, the initial strength and stability of mobile and semi-permanent lifting equipment is greatly depenent upon its positioning and its assembly.
In particular:

- mobile cranes shall only be used on flat and level ground
- when a wheeled crane with outriggers is used, the outriggers shall be extended and firmly jacked down upon a spread support before lifting operations commence
- the ground where spread supports are to be used shall be inspected by a Competent Person before deployment of the spread supports
- wheeled cranes shall only leave recognised roads under the authority of a Permit to Work

4.2 During Lifting

General Usage
During lifting operations:

- the lifting appliance shall not be loaded beyond the safe working load marked on it (except for the purpose of proof load testing by a Competent Person).
- the hoisting mechanism of a crane shall not be used for any purpose other than raising or lowering a load vertically.
- mobile cranes must not be used to transport loads, unless specifically designed for this purpose.

Load
The weight of all loads should be known and particular care must be taken when calculating the weight of any plant or equipment prior to lifting, especially when it may contain a liquid (for example, coiled tubing reels, heat exchangers, etc).
The crane driver/operator must be advised of the weight of each load to be lifted and shall operate within the limits dictated by the **safe working load / radius tables** displayed within the crane cab. It is the responsibility of the crane driver/operator not to lift, or continue to lift, a load which causes the Rated Capacity Indicators (formerly Safe Load Indicators) to alarm. In particular, crane drivers/operators must not use the load/radius alarms as an indication of working within safe limits.

Note: On any change of boom length, the safe working load/radius limitations table must be changed to show clearly the new SWL radius limitations.

Wind Speed
Cranes shall not be operated in wind speeds in excess of manufacturer's recommended limitations or Georgian Legislation (whichever wind speed is the lesser). Sites and installations may impose lower limits as a result of operating experience.
The operating limitations shall be clearly displayed in the crane cab.

4.3 Lifetime of Equipment

Certification, Examination and Testing

All lifting equipment shall be properly certified at regular intervals in accordance with these guidelines and with any required legislation. In addition all lifting equipment shall be subjected to regular examination and testing in accordance with *Paragraph 7 Certification, Examinations, and Inspections*.

Rated Capacity Indicators
Rated Capacity Indicators (formerly Safe Working Load Indicators), or any other alarms fitted to lifting appliances, shall not be disconnected or made unserviceable at any time whilst the equipment is in service. Wherever such warning devices have been disconnected or made unservicable, the lifting equipment shall be taken out of service immediately and remain so until the devices are reinstated.

4.4 Other Equipment
Gin Poles and Derricks

- Gin poles must be constructed of steel, with attachments at the head for suspending the load and guying, and be fitted with proper base plates.
- Guys for gin poles must be attached to "dead men", earth screws or substantial steel structures.
- Clearance for Excavation and the relevant Permit to Work must be obtained before driving stakes, etc. into the ground for gin poles.

4.5 Fork Lift Trucks

- Any fault affecting the safe operation of the fork lift truck prohibits its use until rectified.
- The fork lift truck must not be used to lift loads greater than the maximum Safe Working Load for which the equipment is rated. Only secure loads are allowed to be moved.

5 Lifting Equipment Markings

5.1 Safe Working Load
All Equipment
Where possible all lifting equipment should be hard stamped with the safe working load. Where it is not possible to hard stamp the safe working load directly onto the equipment the following alternatives are acceptable:

- hard stamp the safe working load on ferrules (for example, on wire slings)
- hard stamp the safe working load on a metal plate securely attached to equipment (for example, on chain hoists)
- paint the safe working load onto the equipment (for example, runway beams).

Note: Colour coding of lifting equipment alone might not meet the requirements of the *Lifting Operations and Lifting Equipment Regulations 1998*.

Variable Safe Working Load
If the safe working load is dependent upon the configuration of the equipment then the safe working load for each configuration shall either be marked on the equipment or the information kept with the equipment where it is readily available to the operator, for example on load-radius charts in crane cabs.

5.2 Lifting Accessories and Seperable Lifting Equipment Components
Any structural components of lifting equipment which can be separated from the equipment (boom section, slewring, etc.) shall be marked to indicate the equipment of which it is a part.
Where a number of accessories are brought together and not dismantled, for example a spreader beam with slings and shackles, the assembly should be marked to indicate its safety characteristics.
Lifting equipment and accessories should be marked with any relevant safety information such as the thickness of plates which may be lifted with a plate clamp.

5.3 Personnel Lifting Devices
General

Lifting equipment designed for lifting persons should be marked as such. The carrier should display the SWL and maximum number of persons which may be carried.

Winches

Where there is more than one winch, for example in a drilling derrick, it may be possible for a winch which has not been designated for man-riding to be used for lifting of persons. Where it is possible for this to occur, all winches shall be clearly marked as either suitable for lifting of persons or not.

6 Control of Lifting Operations

6.1 Personnel

Banksman

With the exception of overhead cranes that are designed to be operated from ground level, no lifting operation shall take place without an appointed and easily identifiable banksman. The banksman must be suitably trained and have adequate experience for his role.

Crane Driver / Operator

Cranes shall only be operated by properly trained and qualified personnel.

All crane drivers/operators must have good eyesight (corrected by spectacles if necessary) and good hearing. They must also have a sound working knowledge of safe slinging practices.

Contract crane drivers, in addition to the above, must hold a certificate of competence issued by their employer which shall be available for inspection.

Riggers and Slingers

All personnel who use rigging equipment must have completed a basic rigging/training course.

Operators of Industrial Power Trucks, Fork Lifts and Hydraulic Work Platforms

All drivers of industrial power trucks, fork lifts and operators of hydraulic work platforms must be properly trained in their use. Training should generally be in accordance with the United Kingdom Health and Safety Executive Code of Practice titled *The Basic Training of Operators of Counterbalanced and Reach Lift Trucks*.

Fork-lift drivers must undertake a course of training and testing generally in accordance with the approved code of practice and supplementary guidance: *Rider Operated Lift Trucks - Operator Training*. Drivers must provide evidence of having attended and successfully completed such a training course before driving any fork lift vehicle.

6.2 Risk Assessment and Planning

Risk Assessment

Non-routine lifting operations must undergo a risk assessment in accordance with Safe Systems of Work procedure *Risk Assessment*.

Routine lifting operations shall be reviewed on a regular basis to ensure that the original Risk Assessments remain valid.

For all lifting operations, the degree of risk identified during the Risk Assessment shall determine the level of supervision required for the operation and the required experience of the personnel involved. In particular, the Risk Assessment should account for:

- working under suspended loads
- attaching and detaching the load
- overloading
- overturning
- breakdown in comunication during lifting (especially blind lifting)
- the environment and location
- proximity hazards
- lifting personnel with non-dedicated equipment
- pre-use checks by the operator
- deterioration in the condition of lifting accessories
- the experience, competence and training of available personnel.

Planning

Following a Risk Assessment, and the preparation of a standard instruction or procedure, the person using the equipment can normally plan routine lifts on an individual basis. In any event, the

person planning the operation shall have adequate practical and theoretical knowledge and experience of planning lifting operations.
The degree of planning will vary depending upon the:

- type of lifting equipment
- complexity of the lifting operation
- degree of risk involved.

As a minimum, the plan shall address the risks identified and should identify all resources, procedures and responsibilities necessary to ensure a safe operation.

6.3 Control of Operations

Equipment Restrictions

- Crane activities shall stop (once the load has been made safe) in the event of a general alarm or emergency.
- No parts of the crane including the boom must be permitted to work within 9m (30 ft) of high voltage electrical lines on wooden poles or 15m (50 ft) on steel towers, unless the cables have been isolated electrically.
- Tracked cranes shall not travel within a width restricted area unless accompanied by a Banksman, whose duty it is to direct the Driver/Operator and other road users.

Personnel Restrictions

- Whilst the crane is in operation, the Crane Driver/Operator must not perform other work, and must not leave his position at the controls until the load has been safely landed.
- Man-riding on loads, hooks or buckets intended for general cargo movement is not permitted.

Note: It is strictly forbidden for anyone to ride on a fork lift truck as a passenger. Fork lifts are not to be used as elevated working platforms unless approved modifications have been carried out.

Load Restrictions

Pre-slung loads must not be accepted, unless the supplier/owner produces a current examination certificate for slinging arrangements, which will be monitored at supply base prior to shipping.

Operating Restrictions (Gantry Cranes and Crane Tracks)

Work which necessitates the presence of men closer than 6m (20 ft) to electrically driven overhead gantry cranes, or crane tracks, must not be started until the crane has been rendered inoperative by the removal of fuses or locking off of circuit breakers by an Authorised Electrical Isolating Authority. In addition, if practicable, the crane power supply switch must be padlocked in the open position.
Where work is carried out on or near the wheel tracks of a crane and it is required that the crane remains in operation, it is necessary to ensure that the crane does not approach too close to the area of work. A minimum separation distance of 6m (20 ft) shall be maintained in these circumstances. Stop blocks shall be used to ensure that this separation is maintained.

7 Certification, Examinations and Inspections

7.1 Lifting Equipment Certification and Examination Records

All lifting equipment supplied and used on the Project must be in possession of all relevant up to date certification and a valid thorough examination record. The Site Manager shall ensure that all necessary certification and examination records have been provided before accepting the equipment on site.
The Site Manager shall also ensure that all lifting equipment that requires thorough examination is identified and recorded.

Note: Lifting equipment testing is not mandatory under Lifting Operations and Lifting Equipment Regulations 1998 but may still be required as part of an examination scheme prepared by a Competent Person.

7.2 Scheme of Examination

For all equipment which requires examination, a Competent Person must prepare a scheme of examination which identifies:

- parts to be examined
- resources required
- parts requiring testing
- test and examination frequency.

The examination must be able to detect defects or weaknesses that would have an adverse effect on safety. This may involve strip-down, load testing or NDT of equipment.
In general a specialist service provider will be appointed to undertake the preparation of an equipment register and examination scheme.

Note: The examination should be carried out by a competent person who is impartial, although they need not necessarily be independent of the employer. In practice, however, the appointment of a specialist examination company would ensure impartiality. The body appointed to carry out examinations should be accredited by various types of bodies performing inspection.

7.3 Pre-Service Examinations and Inspections

A thorough examination must be carried out:

- before using lifting equipment on site for the first time, unless the equipment has not been used elsewhere before and is accompanied by the valid certificate not more than 12 months old
- if the safety of the lifting equipment is dependant upon installation or assembly conditions.

Inspections would include pre-operation visual checks and function tests and the equipment operator (particularly crane operators) are considered competent to perform such tasks.

7.4 In-Service Examination and Inspections

Frequency

All lifting equipment deteriorates in use and therefore a thorough examination must be carried out at specified intervals. The intervals between thorough examinations of lifting equipment and accessories are:

- every 6 months regardless of whether the equipment is used for lifting persons or otherwise
- every 12 months for fixed lifting equipment (runway beams, padeyes, etc).

These examination frequencies are more stringent than those specified in the Lifting Operations and Lifting Equipment Regulations.

Additional Examinations and Inspections

A thorough examination must be carried out following exceptional circumstances where the integrity of the equipment may have been jeopardised; for example, following an overload or changeout of a major load path item.
In addition to thorough examinations, inspections shall be carried out wherever user risks are identified. The inspections should include visual checks and function tests and shall only be carried out by a Competent Person.

Note: Equipment currently under a scheme of thorough examination need not be examined under this Practice until the next required under the existing scheme.

7.4 Examination Reports and Defects

Competent Person

The Competent Person carrying out the examination shall:

- immediately report any defects to the employer and equipment users if the defect could cause the equipment to become a danger to personnel
- complete an authenticated written report of examination and submit this within 28 days to the employer and equipment hirer (if applicable)
- forward a copy of the report to the relevant enforcing authority (the Safety Regulator of the country of origin of the equipment) if any equipment defects that could cause an imminent risk of serious personal injury.

PROJECT MANAGER

The SITE MANAGER shall:

- immediately withdraw the equipment from service if notified of a defect which poses an immediate threat to persons and not re-use it until the defect has been rectified
- if notified that a defect will become dangerous if not rectified within a specific period specified by the Competent Person:
    - withdraw the equipment form service if the necessary repairs are not completed within that period specified

and…

- not re-use the equipment until rectification is complete.

8 Records

8.1 Certificates of Conformity

Lifting equipment will be supplied with a certificate of conformity from the country from which it has been supplied and the employer must retain such records for so long as he uses the equipment.

8.2 Examination Reports

Pre-First Use

If lifting equipment has undergone a thorough examination prior to first use then a copy of this report must be kept until the employer ceases to use the lifting equipment.

Post-Installation/Assembly

Where a report of thorough examination has been issued following installation or assembly of lifting equipment a copy of this report must be retained until the equipment ceases to be used at that location.

8.3 Inspection Reports

Inspection reports must be retained until the next report is available.

8.4 Storage and Availability of Records

The SITE MANAGER shall ensure that the records are properly maintained and are in order. Normally, reports are stored at the location where equipment is being used. However, if this is not possible they can be kept elsewhere provided they are easily accessible.
Records may be kept in hard copy form, stored electronically or on computer disc. Computer systems should be able to provide written copy when necessary.
Certification, examination and inspection records and reports shall be readily available to inspectors, inspection authorities and enforcement authorities upon request.

Appendix A – Definitions

List of Definitions

Competent Person:	A person with appropriate practical and theoretical knowledge and experience
Examination scheme:	A suitable scheme drawn up by a **competent person** for such **thorough examination** of lifting equipment at such intervals as may be appropriate in accordance with these guidelines.
Lifting accessory:	Work equipment for attaching loads to machinery for lifting (eg., pendant, sling, shackle, etc). **Note:** An accessory is also an item of lifting equipment as far as application of the UK *Lifting Operations and Lifting Equipment Regulations* are concerned.
Lifting equipment:	Work equipment used for **lifting** or **lowering** loads, including any **attachments** for anchoring, fixing or supporting it.
Load:	Whatever is lifted or lowered by the lifting equipment and accessories, including any carrier used to hold materials, persons or animals.
Thorough examination:	A thorough examination by a **competent person** including such testing as is appropriate for the purpose

9 METHOD STATEMENTS HEALTH AND SAFETY CONTROLS

9.1 Safe Work Method Statement Form

SAFE WORK METHOD STATEMENT

Hierarchy of Controls

Eliminate – 'Design out' the hazard when new materials, equipment and work systems are being purchased for the workplace;
Substitute - Substitute less hazardous materials, equipment or substances and use smaller sized containers;
Isolate – separate the workers from hazards using barriers, enclosing noisy equipment and providing exhaust or ventilation systems;
Engineering – use engineering controls to reduce the risks such as guards on equipment, hoists or other lifting and moving equipment;
Administrative – Minimise the risk by adopting safe working practices or providing appropriate training, instruction or information.
Personal Protective Equipment – Make sure that appropriate PPE is available and used correctly.

SWMS FOR SITE PREPARATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**PPE and Equipment**	**Monitoring Devices**
Equipment/ Facility Set-up	Slips, Trips, Falls	Clear walkways work areas of equipment, tools, vegetation, excavated material and debris	Body harnesses / lanyard (elevated platforms)	
		Mark, identify, or barricade other obstructions		
		Evaluate fall hazards above 2 m.; use fall protection equipment (harness/lanyard), standard guardrails or other fall protection systems when working on elevated platforms above 2 m		
		Use heavy duty industrial (type IA) ladders		
		Install and inspect scaffolds according to manufacturers requirements		
		Only trained operators are permitted to use aerial lifts		
		Tie-off all straight/extension ladders or manually hold by co-worker at base		
		Anchorage points for fall arrest systems must support at least 2 400 kg for each worker		
		Halt roof, exterior scaffold work in high winds, severe weather		
	Struck By/ Against Heavy Equipment	Wear reflective warning vests when exposed to vehicular traffic	Warning vests, Hard hat, Safety glasses, Steel toe work boots	
		Isolate equipment swing areas		
		Make eye contact with operators before approaching equipment		
		Understand and review hand signals		
	Burns	Wear proper work gloves, face shield/safety goggles, and leather apron to protect workers from skin burns when welding, cutting, and burning	Tinted face shield	
		Inspect burning/welding equipment, lines, valves, hoses before using equipment		
		Post fire watch for remote locations		
	Sharp Objects	Wear cut resistant work gloves when lacerations or other injury may be caused by sharp edges or objects	Leather gloves	
		Maintain all hand and power tools in a safe condition		
		Keep guards in place during use		
		De-energize or shut off utility lines at their source before work begins		
		Use double insulated or properly grounded electric power-operated tools		
		Maintain tools in a safe condition		

SWMS FOR SITE PREPARATION				
Task Breakdown	**Potential Hazards**	**Critical Safety Practices**	**PPE and Equipment**	**Monitoring Devices**
	Operations of power clearing tools (brush saws, weed wackers)	Store flammable liquids in well ventilated areas, away from work areas	goggles, leather gloves, ear plugs, Steel toe work boots, chaps	
		Shut off equipment during re-fueling		
		Allow equipment to cool before re-fueling		
		Use funnels to avoid fuel spillage		
		Prohibit smoking while operating clearing equipment		
		Provide ABC (or equivalent) fire extinguishers for all work areas		
	High/Low Ambient Temperature	Monitor for Heat/Cold stress	Insulated Clothing (ambient	Meteorological Equipment
		Provide fluids to prevent worker dehydration		
		Establish work/rest		
EQUIPMENT TO BE USED		**INSPECTION REQUIREMENTS**	**TRAINING REQUIREMENTS**	
Brush saws, weed wackers, mowers		Inspect equipment and tools daily per manufacturers requirements	Proper use of equipment	
First-aid kit, insect repellant				
Fire extinguisher				
Personal protective equipment		Inspect all emergency equipment (i.e.: first aid kits, fire extinguishers)	Review JSA with all site personnel	
Hand tools				
	Underground/ Overhead Utilities	Identify all utilities around the site before work commences	Hard hat, safety glasses, steel toe work boots	
		Cease work immediately if unknown utility markers are uncovered		
		Use manual excavation within 1 meter of known utilities		
		Utility clearance shall conform with Excavation Safety Procedure		
		Construct diversion ditches or dikes to prevent surface water from entering excavation		
		Provide good drainage of area adjacent to excavation		
		Collect ground water/rain water from excavation and dispose of properly		
		Store excavated material at least 1 meter from the edge of the excavation; prevent excessive loading of the excavation face		
		Provide sufficient stairs, ladders, or ramps when workers enter excavations over 1,2 meter in depth		
		Place ladders no more than 7,5 meter apart laterally		
		Treat excavations over 1,2 meter deep as confined spaces		
		Complete confined space permit entry procedure		
		Monitor atmosphere for flammable/toxic vapors, and oxygen deficiency		
		Slope, bench, shore, or sheet excavations over 1,5 meter deep if worker entry is required		
		Assign a competent person to inspect, decide soil classification, proper sloping, the correct shoring, or sheeting		

10 COMMUNITY HEALTH AND SAFETY MANAGEMENT

10.1 Objectives

The objectives of this section of the plan are to:

- Continuously identify, evaluate and prioritise the risks and impacts of the Projects activities on the health, safety and security of local communities;
- Proactively prevent and avoid impacts to community health safety and security, and enhance any positive impacts related to community health, safety and security;
- Identify strategies that provide adequate health related information and prevention measures through which communities can manage their own health and safety in an optimum manner; and
- Implement security that protects employees, assets and business continuity in a manner that adheres to national legislation.

10.2 Purpose and Scope

The purpose of this section of the plan is to provide a clear set of actions and responsibilities for the control of impacts affecting the health and safety of the communities within the Project's area of influence.

The scope covers construction phase of the Project.

The plan includes measures to respond to the following potential impacts identified in the EIA:

- Changes to community health profile including exposure to disease, changes in availability and quality of water resources;
- Changes to livelihoods and income generating opportunities and subsequent effects on community access to social and physical infrastructure;
- Changes to community health and wellbeing including changes to social and cultural cohesion; and
- Changes to community safety profile related to traffic, emergency responses, unplanned events, crime and conflict.

Community health includes the concept of well-being, which looks beyond physical health or absence of disease, and incorporates a broader psycho- social concept of mental and social health. Wellbeing also considers the ability of an individual to realise their potential within society, work productively, build strong and positive relationships with others and contribute to their community. Factors such as self-esteem, coping mechanisms, resilience and stress response are important in determining an individual's wellbeing.

10.2 Management During Construction

Potential Impacts

The potential Impacts on the local community identified in the EIA include:

Safety - During the construction phase, the Project will be adding a mix of light, and heavy and slow-moving vehicles onto the road network. This will include vehicles transporting workers, trucks carrying heavy equipment between work areas and haul trucks moving spoil.

The potential impacts of Project construction include the increased risk of collisions and road transport accidents (potentially resulting in injury, death, or fuel or cargo spillage) and subsequent harm to animals, local shepherds and communities (including contamination of soils and groundwater).

In the Khada valley, there is currently very little traffic and any vehicles are not travelling at speed, thus the potential for collisions with livestock during construction is greater as the construction

access roads will be paved (enabling greater speeds) and will be frequented by a mix of heavy and light vehicles.
Potential areas where community safety could be affected during the construction phase are highlighted in the following figures.

Security - There is the potential that an improved road will bring greater crime due to improved accessibility to the area to people outside the valley. During the construction phase, this will include the presence of road construction workers, which could have a potential effect of increased crime in the Project area.

Management Actions

General

During construction this will include measures to:

- Avoid, minimise or compensate for the potential for community exposure to hazardous materials and substances during construction;
- Avoid, minimise or compensate for the potential for traffic related accidents;
- Avoid, minimise or compensate for the proposed Project's direct impacts on the local environment which may result in subsequent impacts to local income generating opportunities;
- Avoid, minimise or compensate for the potential for community exposure to communicable and other diseases;
- Avoid, minimise or compensate for a decline in the availability and / or quality of water resources available to local communities;
- Assist and collaborate with the local communities, local government, and other relevant partners, in their preparations to respond effectively to emergency situations; and
- Assess and manage risks and impacts posed by the Projects security arrangements to those within and outside the Project site.
- In achieving these objectives the Contractor will consider the differentiated exposure of different local communities to impacts and the higher sensitivity of vulnerable groups.

Specific

Hazardous Materials – An emergency response plan, spill management plan and waste management plan have been provided as part of the Project to manage this issue. In addition the following conditions will apply for the storage and use of hazardous materials (including bitumen):

- All hazardous materials will be stored (including within suitable sized bunds for liquids), handled and disposed of according to their Material Safety Data Sheet (MSDS).
- Copies of MSDS will be kept on site with all hazardous materials.
- A log of the type and volume of all hazardous wastes on site will be kept.
- A plan of site indicating where all hazardous materials are stored will be prepared and kept on site.

Income and Livelihoods – A Local Content Management Plan has been prepared by as part of the Project to address local income and livelihoods issues.
Traffic - The mitigation measures to be adopted for the Project's construction transport activities include the following, noting a degree of flexibility in the event of adverse weather or unforeseen circumstances:

- Stipulations that all driving is to occur during daytime hours where possible;
- Stipulations in regard to maximum driving hours per day and week;
- Strict adherence to speed limits;
- Strict adherence to spill response measures in the event of a spillage from a vehicle, particularly in the vicinity of the Khada River;
- Consultation with local households, community groups, police, and emergency services along the transport routes; and
- Driver training programs to ensure that Contractors staff are aware of community sensitivities, such as specific livestock movement periods.

Air Quality - The access roads will be paved to minimize dust affects to neighboring households and, indirectly, livestock through dust deposition on pasture.
Schools - The Contractor will provide a series of road safety awareness sessions for schools in the Project area. The sessions will be provided on a six-monthly basis throughout the construction

phase. As part of the awareness sessions children will be given reflective badges to fix to their coats and school bags.

Community Complaints
Ongoing community engagement will be required as well as the implementation of the grievance mechanism in order that any community or livestock safety issues are being adequately addressed and rectified.

APPENDIX A HEALTH & SAFETY CHECK LIST (HSCL)

Health & Safety Check List (HSCL)

The Employer	
The Consultant	
The Contractor	

Monitoring period/	Reporting date/
From/ *To/*	*Date/*
Reported by:	Checked by:
Position/ Environmental Expert/ *Name/* *Signature/*	*Position/* *Name/* *Signature/*
Date/ *Week No/*	*Date/* *Week No/*

1	**CONTRACTOR'S SITE ESTABLISHMENT**			
1. 1	Does an effective perimeter fence exists?			
1. 2	Are Health & Safety sign boards clearly displayed?			
1. 3	Is Health & Safety training taking place on a regular basis?			
1. 4	Have all workers been provided with the appropriate Personal Protective Equipment (PPE)?			
1. 5	All workers are wearing appropriate Personal Protective Equipment (PPE)?			*If 'No', assess the % of usage:*
1. 6	Are workers are using additional protective equipment for hazardous operations as required?			*If 'No', assess the % of usage:*
1.7	Are all working areas and trafficked areas effectively separated?			
1.8	Are all vehicles entering the site provided with a working audible reversing warning system?			
1.9	Are nominated Banksmen provided and trained / qualified?			*Name of Banksmen:*
	Are all vehicle movements involving manoeuvres on the highway or reversing in any location controlled by a Banksman?			
	Are Flagmen provided for all activities that could affect traffic, in a number and at locations to suit varying conditions of work?			
2	**TRAFFIC SAFETY & MANAGEMENT**			
2. 1	Is the correct temporary signage provided on the Highway at all locations?			*If No - record exceptions/*
2. 2	Area working areas and trafficked areas effectively separated?			
2. 3	Have traffic flows been unreasonably disrupted?			
2. 4	Have there been any collisions / accidents involving Contractor's equipment / materials?			
2. 5	Are all vehicles entering the site provided with a working audible reversing warning system?			

2. 6	Are all vehicle movements involving manoeuvres on the highway or reversing in any location controlled by a Banksman?			
2.7	Are Flagmen provided for all activities that could affect traffic, in a number and at locations to suit varying conditions of work?			
3	**CONTRACTOR'S SITE OPERATIONS**			
3.1	**General**			
3.1.1	Have all workers been provided with appropriate Personal Protective Equipment (PPE)?			
3.1.2	Are all workers wearing appropriate Personal Protective Equipment (PPE)?			*If 'No', assess the % of usage:*
3.1.3	Are workers using additional protective equipment for hazardous operations as required?			*If 'No', assess the % of usage:*
3.1.4	Are all vehicles entering the site provided with a working audible reversing warning system?			
3.1.5	Are all vehicle movements involving manoeuvres on the highway or reversing in any location controlled by a Banksman?			
3.1.6	Are Flagmen provided in a number and at locations to suit varying conditions of work for all activities that could affect traffic?			
3.2	**Excavations**			
3.2.1	Have existing underground utilities been located by means of trial holes and clearly identified on site? Have all utilities drawings have been checked by the Contractor's Engineer responsible for such works?			*Name of nominated person:*
	Have CAT Scans have been carried out?			
3.2.2	Are existing overhead cables protected by means of goal posts? Are any excavators working under power lines or within the restricted area of the goal posts?			
3.2.3	Within all current working areas, have goal posts been erected to protect Workers from danger, and prevent possible damage from, and to, the overhead power lines?			
3.2.4	For current working locations has the Contractor's nominated engineer contacted			*Name of nominated engineer/*

	the relevant utilities providers with regard to excavation and possible effects / precautions / notifications that the utility provider may require? Chainage: Chainage:			
3.2.5	Is excavation work being supervised by a competent person?			*Name of competent person/*
3.2.6	Are Excavator Drivers competent and qualified?			*Certificate No*
3.2.7	Are nominated Banksmen provided and trained / qualified?			*Name of Banksmen*
3.2.8	Are all trench excavations in poor ground conditions (where the sides will not stand up), supported?			*State the method of support/*
3.2.9	Are trench excavations greater than 1.2m deep supported (in any type of ground)?			*State the method of support /*
3.2.10	* Alternative methods of support for trench excavations: Examples: Drag Box / Trench Box / Bench Cut or Sloped Sides / Battered Back*			
3.2.11	Is spoil from trench excavations, or any 'imported' material, stockpiled at a safe distance from the trench?			*State distance from trench:*
3.2.12	Are plant / equipment movements along trench excavations kept to a minimum and at a safe distance from the edge of trench?			*State distance from trench:*
3.2.13	Is backfilling of trenches carried out within an acceptable time frame?			*State time frame:*
3.2.14	Are physical barriers and signage for trench excavations in place?			
3.2.15	Is there flow of water into trench excavations?			*If yes, how is the water being controlled:*
3.3	**Bridges** (Please Note: The default is that if 'Yes' is ticked it means that <u>all</u> bridges are OK)			
3.3.1	**General**			
3.3.1.1	Have all workers been provided with appropriate Personal Protective Equipment (PPE)?			
3.3.1.2	Are all workers wearing appropriate Personal Protective Equipment (PPE)?			*If 'No', assess the % of usage:*

3.3.1.3	Are workers using additional protective equipment for hazardous operations as required?			*If 'No', assess the % of usage:*
3.3.1.4	Are all vehicles entering the site provided with a working audible reversing warning system?			
3.3.1.5	Are all vehicle movements involving manoeuvres on the highway or reversing in any location controlled by a Banksman?			
3.3.1.6	Are Flagmen provided for all activities that could affect traffic, in a number and locations to suit varying conditions of work?			
3.3.2	**Excavations /**			
3.3.2.1	Have existing underground utilities been located by means of trial holes and clearly identified on site? All utilities drawings have been checked by the Contractor's Engineer responsible for such works?			*Name of nominated person:*
	Have CAT Scan been carried out?			
3.3.2.2	Are existing overhead cables protected by means of goal posts? Are any excavators working under power lines or within the restricted area of the goal posts?			
3.3.2.3	Within all current working areas, have goal posts been erected to protect Workers from danger, and prevent possible damage from, and to, the overhead power lines?			
3.3.2.4	Has the Contractor's nominated engineer contacted the relevant utilities providers with regard to excavation and possible effects / precautions / notifications that the utility provider may require? Bridge No. Bridge No.			*Name of nominated engineer:*
3.3.2.5	Is excavation being supervised by a competent person?			*Name of competent person:*
3.3.2.6	Is the excavator driver competent and qualified?			*Certificate No./*
3.3.2.7	Are nominated Banksmen provided and trained / qualified?			*Name(s) of Banksman/*

3.3.2.8	Are all trench excavations in poor ground conditions (where the sides will not stand up), supported?			*State the method of support *:*
3.3.2.9	Are trench excavations greater than 1.2m deep supported (in any type of ground)?			*State the method of support *:*
3.3.2.10	* Alternative methods of support for trench excavations: Examples: Drag Box / Trench Box / Bench Cut or Sloped Sides / Battered Back*			
3.3.2.11	Is spoil from trench excavations, or any 'imported' materials, stockpiled at a safe distance from the trench?			*State distance from trench:*
3.3.2.12	Are plant / equipment movements along trench excavations kept to a minimum and at a safe distance from the edge of trench?			*State distance from trench:*
3.3.2.13	Is backfilling of trenches carried out within an acceptable time frame?			*State time frame:*
3.3.2.14	Are physical barriers and signage for trench excavations in place?			
3.3.2.15	Is there flow of water into trench excavations?			*If yes, how is the water being controlled:*
3.3.3	**Scaffolding**			
3.3.3.1	Has all scaffolding been erected by a competent person?			*Name of competent person:*
3.3.3.2	Is all scaffolding approved for use by a competent person?			*Name of competent person:*
3.3.3.3	Is scaffold identification in place?			*Red Tag / Green Tag Basic International Procedure implemented*
3.3.3.4	Has all scaffolding been inspected and signed off by a competent person on a weekly basis (Register to be kept of inspections)?			*Name of competent person:*
3.3.3.5	Scaffold boards – have they checked for damage / missing / correct placement? Date of last check:			
3.3.3.6	Toe boards – have they been checked for damage / missing / correct placement? Date of last check:			

3.3.3.7	Hand rails – have they been checked for damage / missing / incorrect placement? Date of last check:			
3.3.3.8	Loading Bays – have they been checked for overloading, damage, scaffold boards, hand rails and guard protection all in place and in good working order? Date of last check:			
3.3.3.9	Are the ground conditions on which scaffolding has been erected satisfactory (level and stable)?			
3.3.3.10	Are base plates used (with or without screw jacks)?			
3.3.3.11	Is timber for load bearing placed under base plates?			
3.3.3.12	Have access ladders (and walkways) been checked for: suitable length, damage, missing rungs, etc. Are all parts tied and secured effectively? Date of last check:			
3.3.3.13	Are factory produced ladders in use?			
	If not, what is the construction/condition/safety of the ladders in use			
3.3.4	**Crane Lifting Operations**			
3.3.4.1	Do cranes have the required certification documentation?			*Certificate No./*
3.3.4.2	Are Crane Drivers qualified to operate the cranes?			*Qualification Ref. Nos.:*
3.3.4.3	Do lifting chains, slings, shackles have all the relevant SWL marked on them?			
3.3.4.4	Do lifting chains, slings, shackles have relevant Serial / Plant / ID numbers or references that can be checked against test certification documents?			
3.3.4.5	Are nominated Banksmen provided and trained / qualified?			*Name of Banksmen:*
3.3.4.6	Are any cranes operating with out-riggers fully extended?			
3.3.4.7	Are cranes set up on reasonably level and stable ground?			

3.3.4.8	Are cranes set up on soft unstable ground?			*If yes, what precautions are in place:*
3.3.4.9	Are cranes set up close to underground utilities?			*If yes, state which underground utility and the distance:*
3.3.4.10	If the answer is 'yes' to the above, is the location of the out-riggers directly above underground utilities?			*State the precautions taken/*
3.3.4.11	Does each crane driver have a 'Banksman' (who is trained / qualified) guiding him?			*Name of Banksman/*
3.3.4.12	Are any cranes slewing or operating over live traffic?			*State precautions taken/*
3.3.4.13	Are overhead power lines or any overhead utilities within the operating radius of the any crane? Location:			*State precautions taken/*
3.3.4.14	Are all personnel working within crane 'areas' wearing helmets and high visibility vests / jackets?			

Annex 10. Soil Disposal Assessment Template

Purpose

This assessment outlines the technical characteristics of the Spoil Disposal Site(s) that CONTRACTOR proposes for use for spoil disposal during construction of the XXX, Georgia.

The spoil disposal site will be considered as an associate facility by ADB and as such ADB are required to complete due diligence on the site to confirm that the site selected is appropriate and the level of assessment is sufficient to meet ADB safeguards requirements.

Therefore, this assessment, prepared by the CONTRACTOR, requires approval from the ADB and RD PIU prior to the application of licenses and approvals for the site and its subsequent use.

The CONTRACTOR shall ensure that the disposal of excess spoil material will be undertaken in a manner that verifiably minimises environmental and social risks.

2. Site Screening

Screening Summary

A screening assessment of potential sites for spoil disposal has been undertaken by the CONTRACTOR. The CONTRACTORs EcoW and a sub-contracted national environmental expert have undertaken the screening exercise.

The following table indicates the sites assessed.

Table 1: Sites Screened

#	Site Name	GPS Coordinates	Nearest Village

The following Figure indicates the location of each site.

Figure 1: Location of Screened Sites

The CONTRACTOR used the Rapid Environmental Assessment Checklist to summarise the potential impacts of the site. The completed checklists for each site are provided as **Appendix A**.

The following table summarises the findings of the checklists.

Table 1: Summary of Screening Activity

Site	Air quality Impacts	Hydrology Impacts	Topography Issues	Soils Impacts	Flora Impacts	Fauna Impacts	Protected Area Impacts	Access Issues	Impacts to Local Community, including compensations - resettlement	Safety Issues	Noise Impacts	Archaeology / PCR Issues

The results of the screening exercise indicate that the following sites were ***UNSUITABLE*** for use:
XXX
XXX
XXX
The results of the screening exercise indicate that the following sites are ***SUITABLE*** for use:
XXX
XXX
XXX

3. Site specific Environmental and Social Assessment

Following the rapid screening exercise, the locations considered for use as disposal site/s (including their access roads) have been inspected by CONTRACTOR personnel from project different disciplines, including:
Name / Position
Name / Position

The characteristic of the selected dump site is described in the following paragraphs

Name of Disposal Site

TO BE COMPLETED

Location/s

PROVIDE SITE COORDINATES

PROVIDE SITE BOUNDARY OVERLAID ON ORTHOPHOTO

PROVIDE ACCESS ROAD/S OVERLAID ON ORTHOPHOTO

PROVIDE FOR MULTIPLE SITES IF APPLICABLE

Cross sections of the sites (at 25 meter intervals) are provided in **Appendix B**.

A photographic record of the site pre-construction is provided by **Appendix C.**

3.1 Site Area And Estimated Volume Available

Estimated volume of material

Approximately XXX million cubic meters of material will be generated during the Project. The following table indicates the amount of material to be placed at each spoil disposal site and the volume of material allowed for disposal at each site according to their license.

Table 2: Available Site Areas

#	Site Name	Proposed Spoil Volume (m^2)	Volume Available According to License (m^2)

3.2 Social Issues

Access Arrangements, Route Selection and Traffic Management

The following figure/s provides the access routes for the site/s. These routes are also included in the CONTRACTORS Traffic Management Plan. No works shall start until the Traffic Management Plan and the access routes have been approved by the Engineer.

Figure 2: Access Roads

The route selection process was based on the following principles:

- Avoidance of natural hazards;
- Avoidance of populated areas; and
- No ban for travelling of HGV.

The route from the XXX to the spoil disposal site has a total length of XXX Km.

A summary condition survey of the access road has been undertaken and is included as **Appendix D**.

The route will pass through the following populated areas:
XXX
XXX

The following sensitive receptors were located along the route:

Table 3: Sensitive Sites

#	Type and Name	Coordinates	Distance to Route

The following upgrading works will be undertaken on the access road prior to its use:
XXX
XXX

Routine spraying of the access road with water will be undertaken during dry periods to limit dust impacts.

A speed limit of XXX has been set on the access roads.

Access to the site will be strictly controlled and will be fenced during the construction works to prohibit unauthorized access.

Warning signs will be places around the site to inform the local community of the safety issues.

3.3 Stakeholder Engagement

As part of the site selection process the CONTRACTOR has undertaken consultations with the local community regarding the use of the site and access roads.

The following table indicates the comments received during the consultations.

Table 4: Summary of Consultations

#	Village	Comment	Reply

A list of those present in the meeting is provided by **Appendix E**.

The attendees were informed during the meeting of the Grievance Redress Mechanism, and were provided a copy along with contact numbers for complaints.

3.4 Surface Water and Drainage and Groundwater

The following surface water features have been identified in the area:

Table 5: Surface Water Features

#	Name	Location

Outline if any crossings of these water courses will be necessary and if adequate crossing are available.

Outline here what site drainage will be installed, include designs, if relevant.

3.5 Reinstatement and Landscaping at Completion

The spoil disposal site shall be re-instated upon completion of works at the site.

Where practical, the site has been re-instated with similar species as those removed as part of the site clearance.

CONTRACTOR to provide full details of the reinstatement plan here, including area to be reinstated, schedule, types of plants and maintenance program.

Appendix F provides the profiles of the reinstated site.

3.6 Services Infrastructure & Plant On Site

The CONTRACTOR will use the following equipment on-site:

Table 6: Site Equipment

#	Type of Equipment	Number

XXX number of staff will be located at the site, they include:

Table 7: Staff

#	Staff Positions	Number

The site will be equipped with first aid facilities, mobile communications and toilets.

3.7 Biodiversity

A survey of flora and fauna was undertake at the site by a national specialist. The findings of the survey indicate that:
XXX
XXX

3.8. Archeology and PCR

A walkover survey of the site was undertake at the site by a national specialist. The findings of the survey indicate that:
XXX
XXX

3.9 Land Use

The spoil disposal sites, including access roads will affect the following
XXX Land Plots
XXX Productive Fruit Trees
XXX Residential Buildings
XXX Commercial Buildings
XXX Auxiliary Buildings
XXX Gates and Fences
XXX Businesses
XXX Fodder
XXX Agricultural Land

These features will be compensated by the RD per the conditions of the Project LARP

3.9 Proposed Preventive Measures

Appendix G provides the mitigation actions required for the operation and reinstatement of the site.

4. Conclusions & follow up actions

4.1 Conclusions

Based upon the results of this Assessment and on the basis that CONTRACTOR implements the mitigation measures under his responsibility and follow up actions identified, the following conclusions can be made with respect to proposed use of the disposal site assessed in this report:

- CONTRACTOR SEMP contains general mitigation measures to address the risks identified in this E&S Assessment;
- Where necessary, additional site-specific mitigation measures have been identified in this Assessment (see **Appendix G**), which provide further assurance to ADB that CONTRACTOR can meet its environmental and social Project Requirements;
- If implemented appropriately, the mitigation measures outlined in CONTRACTOR SEMP and this assessment will result in appropriate avoidance for reduction of impacts to an appropriate level;
- This assessment has taken into consideration all requirements of the EIA and EMP and CONTRACTOR SEMP;
- Where necessary, CONTRACTOR has highlighted additional actions to be undertaken, which will allow appropriate mitigation of environmental and social impacts (see **Appendix G**);
- CONTRACTOR will implement and monitor proposed use of the disposal site and amend mitigation measures as required to ensure they are effective.

4.2 Licenses and Approvals

Upon approval of this assessment by the ADB and the RD PIU, CONTRACTOR will complete his Spoil Disposal Plan. This plan shall be prepared in accordance with regulation N 424 on Approval the Rules for Removal, Storage and Use of Topsoil and Re-cultivation.

The CONTRACTOR shall also prepare and submit his EIA for the site which will be approved by MoEPA.

4.3 Follow-up

In addition to the implementation of those measures outlined in this report, the following Actions have been identified for addition to CONTRACTOR Action Tracking System, in order to close out issues identified in this PCS that require non-routine follow up action;

Table 8: Follow-up Actions

Action	Responsible

Periodic (Monthly) inspections/audits will be undertaken on the selected site to verify the respect of project requirements, as considered appropriate by the Engineer, the PIU and ADB	Contractor
Review of Grievance Reports relating to dump truck movements delivering spoil to the dump site. Address any grievances as required.	Contractor
Periodic inspections of dump truck movements on the approved route corridor to observe whether Project related vehicles are contributing to traffic delays, hold ups or incidents.	Contractor

LIST OF APPENDICES

APPENDIX A – SCREENING REPORTS

APPENDIX B – SITE CROSS SECTIONS

APPENDIX C – PHOTOGRAPHIC RECORD OF THE SITE/S

APPENDIC D – ACCESS ROAD CONDITION SURVEY

APPENDIX E – CONSULTATIONS

APPENDIX F – SITE PROFILES

APPENDIX G - PROPOSED MITIGATION MEASURES