Municipal Development Fund of Georgia

Asian Development Bank
FIGHING POVERTY IN ASIA AND THE PACIFIC

CONTRACT NO: SUTIP/C/QCBS-3

Detailed Design of Marshal Gelovani Avenue and Right Bank Intersection

Initial Environmental Examination

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ABBREVIATION AND ACRONYMS

ADB	-	Asian Development Bank
EIA	-	Environmental Impact Assessment
IEE	-	Initial Environmental Examination
MDF	-	Municipal Development Fund of Georgia
MoEPA	-	Ministry of Environmental Protection and Agriculture
MoESD	-	Ministry of Economic and Sustanable Development
NEA		National Environmental Agency

A. Executive Summary

Introduction

1. This Initial Environmental Assessment (IEE) is part of the process of compliance with the ADB Safeguard Policy Statement (2009) in relation to the construction of Marshal Gelovani Avenue and Mtkvari right bank, or more simply, the "Project".

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

1. Describes the existing socio-environmental conditions within the Project area;
2. Describes the extent, duration and severity of potential impacts;
3. Analyzes all significant impacts; and
4. Formulates the mitigation actions and presents it all in the form of an Environmental Management Plan (EMP).

3. Based on the existing ADB Environmental Safeguards Policy (2009), this Project falls under ADB's project Category B.

4. The procedures to provide an Environmental Impact Assessment (EIA), make relevant environmental decisions and for public participation and expertise during the implementation of various kinds of activities in Georgia are regulated in line with the requirements of the Environmental Assessment Code, the Georgian law adopted on June 1, 2017. The activities of different contents are prescribed in the I and II Annexes to the Code. The activities provided for by Annex I are subject to the EIA procedures, while those in Annex II must be subject to the screening procedure thus necessitating the EIA procedure.

5. The project considered in the present document is not among the activities under the Annex I. Following the above-mentioned, The Municipal Development Fund has addressed the Ministry of Environment and Agriculture to clarify if the project requires the preparation of an environmental impact assessment document or not. According the information from MEPA project not need preparation of EIA document.

6. The project design and construction process will be undertaken by the full observance of both, the Georgian legislation and requirements of the Asian Development Bank.

7. In an effort to improve transport infrastructure in Tbilisi, the Municipal Development Fund of Georgia (MDF) launched Consulting Services for Marshal Gelovani Avenue and Mtkvari River Right Bank Intersection. The Consulting services had been funded

by the Asian Development Bank (ADB) and the Municipal Development Fund of Georgia (MDF) is the project executing, implementing and disbursing agency.

Project Description

8. Development of a sustainable urban transport network is a key component for the development of urban areas in Georgia which can enhance the role of Tbilisi as an important business center in the South Caucasus region. Tbilisi is the capital of Georgia with a population of 1,114.6 thousands (source: National Statistics Office of Georgia, 2017) inhabitants. It is located strategically at the crossroads between Eastern Europe and Asia on both banks of the Mtkvari River and has a total area of 726km^2. The city elevation ranges from 380 ~ 770 meters above sea level and is surrounded by mountains, characteristics that influences the structure of the city.

9. Based on country development strategy and existing masterplans, the Government has prioritized the improvement of transport services in all towns and cities through the country, starting in areas of most urgent or strategic needs. The Government has already invested significantly during last decade, and further investments are on-going in order to: (i) meet the increasing demand and guarantee good mobility conditions for all citizens; (ii) improve inhabitant's quality of life, protect the environmental conditions, and support development of tourism; and (iii) provide world-class infrastructure to allow private companies and investors to find a convenient and efficient environment to thrive.

10. Within the scope of the project, two interchanges are planned to provide on the existing Highway what will allow canceling the traffic lights at Marshal Gelovani Avenue and Mtkvari right bank junction and avoid traffic jams along this road section. Under the project, the length of the planned underpasses will be 31.0 m and 51. m, respectively. For the scheme drawing of the project and location of the underpasses, see Fig. 1.

11. The Consultant prepare detailed engineering design documents for Marshal Gelovani Avenue and Mtkvari River Right Bank Intersection project. The design achieves the optimum combination of rehabilitation costs and road serviceability, using modern design methods and requirements. The product has a life of 50 years or more and be maintainable at reasonable costs and with locally available technology.

12. The Consultant make maximum use of available data, topographic, geological and seismic maps, road condition surveys, technical studies and documents available from MDF and other government agencies. The design complies with international codes of practice (AASHTO design standard) and standards for engineering works associated with roads construction. According to the AASHTO guideline, the minimume width of a lane isdecided as 3.5m.A Shoulder is the portion of the roadway contiguous with the traveled way that accommodates stopped vehicles, emergency use, and lateral

support of sub-base, base, and surface course. According to the AASHTO standard, the width of shoulder is determined considering the traffic demand and the classification of the road. The main technical parameters adopted in the detailed design are as follows:

- Design speed - 60 km/h;
- Number of traffic lanes – 2-5 lines;
- Width of traffic lane - 3.75 m;
- Width of each carriageway - 7.5 m;
- Width of paved shoulder (emergency lane) - 2.5 m;
- Width of verge – 1.0 m;
- Width of central reserve– from 9.00 to 14,5 m;

13. One of the major problems in the construction phase is the obstructions or temporal delays in traffic. As already mentioned, the project area is an highway, which connects Tbilisi with the highway of international importance. Besides, the given road section is on the territory of Tbilisi, it is the town center and one of the principal connecting mains to a number of remote districts of Tbilisi. Consequently, the traffic on his road is often overloaded and traffic jams are also common. At the given stage, a seven-phase plan for the construction stage is developed, which will allow mitigating the expected problem of traffic obstruction. The plan is developed in the way as to prevent delays in traffic along the given section.

14. Under the ground of the project area and in its adjacent area, which are located in the project zone, there are a number of infrastructural objects and communications. In the project implementation phase, they will be necessary to disassemble and/or relocate.

15. Some of the infrastructure (power transmission lines, lights, bus stop booths, advertising banners, overpass bridges, etc.) are visually seen, but some of the infrastructure are located under the project zone or in the ground adjacent to the project zone and their location can be fixed only by negotiating with their owners.

16. At the stage of the detailed design preparation, the locations of all units of infrastructure in the project area and adjacent to it are to be fixed and their possible contact with the project in the construction and operation phases must be identified. The degree of environmental impact during the disassembly and/or relocation of the said infrastructure must be identified in order to avoid or mitigate the degree of the expected negative impact.

17. Project implementation period is 1 year.

Description of the Environment (Baseline Data)

18. At the stage of study of the baseline data of the environment, which was

accomplished in April and May of 2018, no flora or fauna species included in the Red Book were identified in the project zone, except 4 walnut trees (*Juglans regia L.*), which grow along the carriageway. Under the developed preliminary design, none of the four trees will be cut down during the project implementation. The works of clearing the project area off the vegetation cover will be agreed with the relevant body.

19. There are no residential buildings adjacent to the project zone; rather, this area is so called an industrial zone. In the project preparation phase, the baseline noise and vibration were measured for the buildings and premises located adjacent to the project zone. Based on the obtained results, the analysis of impact of noise and vibration on the buildings in the project construction and operation phases have been done.

20. Vibration level in the project zone is 40 to 50 times1 less the admissible level and either in the construction, or in the operation phase, the level of vibration, which is caused by traffic, is not expected to have an impact on the said buildings. Within the scope of the project, German standard is concerned, and the vibration measurements were done within its scope (see the detailed information in document "Vibration Survey and Modeling").

21. During the day, the noise level at some points exceeds the admissible level, but it is within the norm at night what gives a purpose to consider that as a result of the heavy technique operation in the project zone during the construction works, the noise level may increase further. Within the scope of the project, the requirements of IFC and Georgian legislation will be used stipulating that the maximum admissible noise level for an industrial zone is 70 dB. as per the requirements of IFC, the noise level is admitted to exceed the baseline noise level by 3 dB.

22. One of the major problems in the construction phase is the obstructions or temporal delays in traffic. As already mentioned, the project area is an highway. Due to the absence of the bypass around the city of Tbilisi, this section is used by not only passenger cars, but also heavy vehicles for international shipments. Besides, the given road section is on the territory of Tbilisi, it is the town center and one of the principal connecting mains to a number of remote districts of Tbilisi. Consequently, the traffic on his road is often overloaded and traffic jams are also common.

23. There are urban improvement system and infrastructural objects found in the project zone. In the project implementation phase, it will be necessary to relocate or replace some infrastructural facilities. Due to the absence of information, the exact type(s) and volumes of waste expected to originate in the project implementation phase are not clear, particularly during the replacement or relocation of the underground infrastructure. Following the existing practice, there may be sites polluted with sewage waters within the area.

1. In accordance with DIN 4150-3

Anticipated Environmental Impacts

Construction Stage

24. By using the criteria developed within the scope of the project (**Annex 2**), the following major impacts, which will occur in the project implementation and operation phases, were identified.

25. **Air quality** - underpass construction involves the use of heavy machinery, bulldozers, excavators, graders needed for land clearance and other earthworks. The operation of heavy machinery result in fugitive emissions of carbon monoxide, NOx, SO_2, hydrocarbons, and particulate matter.

26. **Noise** - a problem of noise propagation in the construction phase is one of the most important issues. As the results of the accomplished measurements evidence (**Annex 3**), the level of baseline noise near the receptors of the project area exceeds the admissible standards during the day. As a result of using heavy techniques in the construction phase, the noise level is expected to increase further;

27**. Vibration baseline** measurements demonstrated that the on average, vibration indicator on the buildings and premises located near the project zone varies from 0.2 to 0.1 mm/sec what is much less the admissible level.

28. **Traffic** - the traffic impact is one of the most risky impacts. The given road section is not only a part of the Highway and transit road, but it also connects the city center to several big suburban areas of the city. Even one-day stop of the traffic along the road will cause jams all over the city. Consequently, in the project implementation phase, developing a traffic schedule is one of the most important and sensitive issues. The preliminary plan developed by the Consultant is not final and needs further elaboration.

29. The impacts on **flora and fauna** during implementation will be minor. It will be necessary to strip only green cover from the center mall of the Highway, where there grow the artificially planted bushes and small trees. Adjacent to the project zone, there are 4 walnut trees included in the Red Book, which are not planned to cut down within the scope of the project.

30**. Archaeology** - land clearance works, grading and excavations are associated with the risks of damaging underground archaeological remnants. However in the case of the proposed Project no archaeological monuments are expected to be touched during construction phase.

31. **Occupational Health and Safety** - Workers' rights including occupational health and safety need to be considered to avoid accidents and injuries, loss of man-hours,

labor abuses and to ensure fair treatment, remuneration and working and living conditions.

32**. Construction Camps** - Construction camps constitute a temporary land use change and raise issues related to activities such as impacts to air quality; poor sanitation arrangement and improper methods used for disposal of solid wastes and effluent;

33. **Waste** - Road construction will inevitably generate solid and liquid waste products including inert waste (e.g. concrete, wood, plastics, etc.) and hazardous waste (e.g. waste oils, batteries, etc.).In the construction phase, at the stage of dismantling and moving the underground infrastructure, there may be asbestos-containing pipes or other parts identified in the area.

34. **Inert waste** – In the course of the project, the volume of earthworks will not be great. Inert waste will be originated during the processes of the underpass excavation and slopes cut-down.The total cutting volume of soilswill be 86,389 cubic meter (m3). The total embanking volume of soils will be 72,315 cubic meter (m^3). Surplus soil volume is only 5,435 cubic meterwhich also will be used as a material for the greenery works to develop small hill or banking. If the Construction Contractor does not totally use all the inert waste originated in the construction phase and a certain amount of inert waste is needed to dispose, then due diligence report must be provided by the contractor and approved by the engineer. Under the legislation of Georgia, the prepared report of inert waste must be agreed with the local self-governing body.

35. Topsoil - The total amount of the topsoil planned to strip within the scope of the project is approximately 600 m^3.

36. The project will have an impact on 15 land parcels with the total area of 19 022 m^2. Of this area, the project will use 11 853 m^2, making 62.3% of the total area. 14 of the mentioned land parcels are owned by the state and their total area is 14 880 m^2. Of this area, the project will use 11 221 m^2. One land parcel is owned privately by two physical entities.

Operation Stage

37. No significant environmental impact is expected at the operation stage.

38. Air quality Following the project implementation, the traffic lights at Marshal Gelovani and Mtkvari right bank junction will be abolished giving the vehicles the possibility to travel freely along this section. Besides, there will be no jams. Consequently, the amount of emissions will be reduced.

39. The soil and surface water can be polluted only in case of accidents or during the maintenance works.

40. As a result of the project implementation, the number of vehicles along Marshal Gelovani Avenue will be decreased by 25-30% what will result in the reduced vibration and noise impact on small and medium businesses near the project zone. Consequently, the number of vehicles will be increased in Bakradze street, with no sensitive receptors (buildings and premises) found adjacent to it.

Mitigation Measures

Constraction stage

41. In the project construction phase, the Construction Contractor must undertake a number of mitigation measures to avoid or mitigate the negative impact on the environment. In addition to the standard actions typical to the process of construction, following the project specifics and location, certain additional measures to avoid high-risk impact will also be necessary.

42. Noise: The level of noise at some points exceeds the admissible standards even today. Consequently, the Construction Contractor, together with the generally accepted mitigation measures, must undertake certain additional actions to avoid any significant increase in the noise level. The Construction Contractor, prior to the onset of the construction works, must develop and submit the Supervision Consultant a Topic Specific Plan – Noise Management Plan for the construction phase.

43. The major source of noise is heavy techniques, which will operate in the project zone. The prepared Plan must necessarily incorporate all possible means and best practice to avoid any increase in the noise level or minimize the noise level in the construction phase.

44. Air Quality: In the operation phase, the vehicle emission will be reduced as a result of the realized structural changes. The traffic light will be abolished in the project zone, which was one of the causes of traffic jams. The vehicles will be able to travel at speeds helping to avoid vehicle concentration in the project zone. As a result of the above-mentioned, the vehicle emission in the project zone will be less following the implementation of the project.

45. Landscape – The following mitigation measures are proposed to reduce the visual impact of the Project; a) minimize disturbance to, or movement of, soil and vegetation; b) undertake landscaping after the completion of the activities to match in with surrounding landscape; and c) Reinstate vegetation.

46. Waste Management - The Contractor will be responsible for the safe collection and removal of all waste materials from his site. Accordingly, he shall prepare contracts with a suitably licensed waste management contractor for the removal of inert and hazardous wastes from his sites. The Contractor as proof of the shipment of these wastes shall also keep waste manifests.

47. Health and safety: Worker's and Community safety during construction is important. Health and safety at workplace and during execution of work should be among the Contractor's work policy.

48. Traffic: A preliminary 7-step plan of construction activities is developed by the Consulting Company. The main goal of the plan is to avoid any delays in traffic in the project zone of the Highway in the construction phase. Consequently, the Construction Contractor must be required under the tender proposal to hire a specialist with an international qualification, who will further elaborate the already prepared plan or develop a new plan. This plan must be agreed with the Municipal Development Fund (MDF), which, on its turn, will agree it with the traffic police. Without such a plan, the Construction Contractor must not be given the right to accomplish the construction works.

49. Drainage and Flooding - During the construction phase the Contractor will be required to construct, maintain, remove and reinstate as necessary temporary drainage works and take all other precautions necessary for the avoidance of damage to properties and land by flooding and silt washed down from the works

50. Relocation/replacement of the existing infrastructure: There is no accurate information about the location or physical state of the existing infrastructure. Consequently, in the project implementation phase, and during the underpass excavations first of all, the Construction Contractor must be cautious not to damage any infrastructure. In addition, polluted soil areas may be revealed during the earthworks. This is most of all expected in the areas adjacent to the sewage pipes. In such a case, the builders must stop works and call relevant service representatives.

Operation stage

51. Air quality - As a result of the works accomplished in the operation phase, the traffic lights will be removed in the project zone and the vehicles will travel without any hindrance. Consequently, no traffic jams are expected what is one of the causes of noise. As it is expected and as the modeling results have demonstrated, the noise level as compared to the baseline noise, though by little, but will reduce. Consequently, additional mitigation measures will not be necessary in the operation phase;

52. Hydrology - During the operational phase of the Project, the Tbilisi city hall will be responsible for monitoring drainage along the road to ensure that it does not result in increased run-off and flooding. The Tbilisi City hall will be responsible for rectifying this issue if it occurs.

53. Traffic – As a result of the works accomplished in the operation phase, the traffic lights will be removed in the project zone and the vehicles will travel without any hindrance

Monitoring

54. The Construction Contractor must undertake permanent noise monitoring at the buildings and premises located adjacent to the construction site (in the area with the ongoing construction activities). The results of the measurements must be registered and maintained. In case the noise level increases against the baseline level, the Construction Contractor must plan and realize additional mitigation measures.

55. An automated atmospheric air pollution monitoring station owned by the Environmental Agency of Georgia is located adjacent to the project zone (at 6, Marshal Gelovani street), which receives data every hour. The received data are uploaded on the Agency's web-site on a permanent basis. Consequently, the Construction Contractor is not obliged to accomplish additional monitoring of the degree of air pollution.

56. Traffic quality in the project zone must be monitored permanently. This process must involve Tbilisi police and relevant departments of the City Hall. In case of problems, corrective and warning actions must be prepared.

Awareness building and consultations

57. An information leaflet was developed within the scope of the project and the information about the project preparation stage was communicated to the owners and employees of small and medium businesses operating adjacent to the project zone.

58. Meetings with the owners of the communications and infrastructures in the project zone were held.

59. 3 additional public consultation meetings are planned to hold within the scope of project: (i) the Ministry of Environment Protection and Agriculture of Georgia will organize a public review of the Scoping Report prepared within the scope of the project, (ii) the Ministry of Environment Protection and Agriculture of Georgia will organize a public review of the Environmental Impact Assessment (EIA) Report prepared within the scope of the project, and (iii) MDF, jointly with the Consultant, will organize a public review of the prepared draft IEE document.

60. All environmental documents prepared within the scope of the project will be uploaded on the web-sites and will be made available at the offices of the Ministry of Environment Protection and Agriculture of Georgia, MDF and Consultant.

61. Consultant, will organize a public review of the prepared draft IEE document. All environmental documents prepared within the scope of the project will be uploaded on the web-sites and will be made available at the offices of the Ministry of Environment Protection and Agriculture of Georgia, MDF and Consultant.

Implementation

62. 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.

63. The Bid documents state that the Contractor will be responsible for the implementation of the requirements of the EMP through his own Site Specific Environmental Management Plan (SSEMP) which will adopt all of the conditions of the EMP and add site specific elements that are not currently known, such as the Contractors final list of borrow pit locations.

64. A grievance redress mechanism (GRM) has also been prepared as part of the Project. The GRM provides a structure for stakeholders to make complaints and a mechanism for the complaints to be resolved both locally and centrally.

Analysis of Alternatives

65. Three alternative was developed within the scope of the project including No-project Alternative. The signal system for intersection operates with five phases and the total traffic signal time is over 90 seconds. In spite of the signalized system, the police are supposed to present at the junction area to control and manage congested traffic volume during the morning and evening time Consequently, the No-project Alternative was refused right at the initial stage. Between two alternatives: (i) Modification for current traffic direction (2 way directions ⇒ 1 way direction), Operating without traffic signal and (ii) Keeping the current traffic direction (2 way directions ⇒ 2 way directions) 1 phase - traffic signal system, the Client and Consultant selected the option 1, signal free intersection, based on comparison matrix to decide the final configuration, alignment, structure, and other design fields.

Conclusionsand Recommendations:

66. The proposed project was assessed against the laws of Georgia and ADB's safeguard. At the stage of the document preparation, possible environmental impacts were identified and relevant mitigation measures were developed.

67. The noise level in the project zone is within the norm only at night, while during the day, it exceeds the admissible standards at most points. Presumably, following the project implementation, the baseline noise level will be reduced as the given road section will be distressed.

68. There are urban improvement system and infrastructural objects found in the project zone. inert waste. The compensation planting will be done by the Department

of Environment and Green Spacesof Tbilisi City Hall. The territory for the compensation planting will be selected by Tbilisi City Hall;

69. Following the project implementation, the traffic lights at Marshal Gelovani and Mtkvari right bank junction will be abolished giving the vehicles the possibility to travel freely along this section. Besides, there will be no jams. Following the above-mentioned, the baseline noise and vibration levels will reduce. Following the project implementation, the amount of exhaust will also be reduced in the project zone.

70. The EMP, its mitigation and monitoring programs, contained herewith will be included within the Bidding documents for project works for all Project components. The Bid documents state that the Contractor will be responsible for the implementation of the requirements of the EMP through his own SEMP

71. Prior to the commencement of the construction works, the Construction Contractor is obliged to prepare the following environmental plans: (i) Site-specific environmental plan: to be submitted to the Supervision Consultant for approval. (ii) Noise management plan: to be submitted to the Supervision Consultant for approval. (iii) Taxation of the trees to cut down: must be submitted to Tbilisi City Hall, who will specify the tree planting compensation fee. (iv) WasteAsbestos-ContainingMaterialManagementPlan will be prepared if the asbestos-containing materials are fixed present at the project implementation stage.

72. The Construction Contractor must undertake all mitigation measures to minimize the noise and other air emissions. In order to reduce the impact of noise emissions on the sensitive receptors.

73. In the project operation phase, permanent monitoring of noise level is necessary. If the noise level increases against the admissible standards, it will be necessary to develop and implement additional mitigation measures.

74. A grievance redress mechanism (GRM) has also been prepared as part of the Project. The GRM provides a structure for stakeholders to make complaints and a mechanism for the complaints to be resolved both locally and centrally.

75. The EMP and all its requirements will also be added to the Contractors 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, through routine monitoring by his national and international environmental specialists, note any non-conformance with the SEMP the Contractor can be held liable for breach of the contractual obligations of the EMP.

B. ENVIRONMENTAL LAWS, STANDARDSAND REGULATIONS

76. This chapter reviews the provisions for environmental protection in the laws of Georgia that are relevant to the proposed Project. It also discusses Environmental Regulations and Standards of Georgia and the potential implications of the international treaties to which the Republic of Georgia is a party. Finally, the administrative framework for environmental management is also described.

B.1 Environmental Policies and Laws of Georgia

77. **The Constitution of Georgia 1995 (last amended in 2017)**.The Constitution of Georgia is the supreme legal document establishing general principles concerning environmental protection. 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 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).

78. Also, the Constitution of Georgia states that the legislation of Georgia shall correspond to universally recognized principles and rules of international law. A treaty orinternationalagreement of Georgia, unless it comes into conflict with the Constitution or the Constitutional Agreementof Georgia, shall take precedence over domestic normative acts (change is added by the Constitutional Law of Georgia of 30 March 2001).

80. This means that conditions of the legal agreement between Georgia and ADB for the provision of Additional Financing for East West Highway Corridor Improvement Project prevail over the national legislation in case of contradiction.

81. **Environmental Assessment Code (EAC)2017.** The Code establishes a legal basis for regulating issues related to projects and strategic documents, implementation of which may have significant impact on the environment, human life and health. It regulates the procedures related to environmental impact assessment, strategic environmental assessment, public participation in decision-making, trans boundary environmental impact assessment; 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; describes procedures of issuing Environmental Decision; exemption rules. The law includes two annexes. Annex I lists activities subject to EIA, Annex II - lists activities/projects that require screening procedure. Screening is responsibility of MoEPA. Under the EAC construction of international and interstate roads; construction and operation of underpass and/or

bridges on the international and interstate roads belongs to activities subject to EIA. According to the document, the main stages of environmental impact assessment include:

1. Screening
2. Scoping procedure
3. Preparation of the EIA Report by the developer or the consultant
4. Ensuring public participation
5. 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;
6. Expertise procedure;
7. Implementation of transboundary environmental impact assessment procedure (weather appropriate);
8. Issuance of Environmental Decision or the decision on refusal to implement the project by the Minister.

82. **Law of Georgia on Licenses and Permits 2005 (Last amended on 23/12/2017)**.The Law regulates activities which may result in increased hazard to human life or health, involves interests of importance to the State or public, or connected to consumption of State resources.

83. The Law defines the full list of activities which require licenses and permits, and sets out the rules for granting, amending and abolishing licenses and permits. The law is generic and refers to the Environmental Assessment Code for details of environmental permitting (Environmental Decision) procedures. By using this law, the MDF identifies the Project category and the list of all documents and stages which are necessary to receive the ecological expertise.

84. **Law on Environmental Protection1996 (Last amended in 2017).** The Law 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, key players and principles of environmental management; 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).

85**. Law of Georgia on Water 1997 (Last amended in 2017).**The Law 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.

86. Under the current law requirements, no license is required for water abstraction from surface water. However, license is needed for abstraction of groundwater.

87. The law regulates the water intake and water discharge processes. In case of discharge of the water the developer by Environmental Impact Permit might be required to submit Maximum Permissible Discharge Documents calculating the volumes of the discharge and impact on environment.

88. In order to meet the requirements of the said law, the actions, which will help avoid, reduce or manage the pollution or strong negative impact on the river(s) in the project zone must be identified.

89. **Law of Georgia on Soil Protection 1994 (Last amended in 2017).**The Law aims at ensuring preservation of integrity and improvement of soil fertility. It defines the obligations and responsibility of land users and the State regarding the provision of soil protection conditions and ecologically safe production. The Law sets the maximum permissible concentrations of hazardous matter in soil and restricts the use of fertile soil for non-agricultural purposes, the execution of any activity without prior striping and preservation of top soil, open quarry processing without subsequent re-cultivation of the site, terracing without preliminary survey of the area and approved design, agricultural activities that could lead to overgrazing, wood cutting, damage of soil protection facilities, and any activity that could potential deteriorate soil quality (e.g. unauthorized chemicals/fertilizers, etc.).

90. The law sets general basis for the protection of soil from erosion, contamination, sedimentation, sanitization, secondary swamping, etc., regulation of the open extraction of natural resources and construction materials, impact from human

economic activity. The Law sets up norms and standards for allowable concentration limits of pollutants in the soil to ensure human health and better environment. The requirements of the said law regulate the rules of topsoil removal, storage andfurther management. 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.

91. **Law of Georgia on Protection of Atmospheric Air 1999 (Last amended in 2017).** 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): Pollution of environment with hazardous matter, Radiation pollution of atmospheric air. Pollution with microorganisms and biologically active matter of microbial origin, Noise, vibration, electromagnetic fields and other physical impact.

92. In compliance with the law (Clause 28), in order to restrict pollution from the stationary sources2 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.

93. **Law of Georgia 'On the system of the protected areas' 1996 (Last amended in 2017).** The Law defines the categories of 'protected areas' and specifies the frames of activities admissible in the given areas. The permitted actions aredefined by considering the designation of the areas and in accordance with the management plans and provisions of the international conventions and agreements to which Georgia is a party. It specifies ownership forms of land and other natural resources in protected areas, allowed and prohibited activities.

2Stationary 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.

94. According to the given Law, all kinds of economic and entrepreneurship activities are admissible in the support zone provided they do not hamper the functioning of the protected areas.

95**. Waste Management Code 2015 (Last amended in 2018) -** The purpose of this Code is to establish a legal framework in the field of waste management to implement measures that will facilitate waste prevention and its increased re-use as well as environmentally safe treatment of waste.

96. The objective of this Code is to protect the environment and human health through:

(a) The prevention or reduction of waste and its adverse impact;
(b) The establishment of effective mechanisms for waste management;
(c) The reduction of damage caused by the consumption and the more efficient use of resources.

97. In line with the requirements of the said law, the Construction Contractor must hire a duly qualified environmental manager who will be obliged to develop Waste Management Plan and submit it to MoEPA for approval. In line with the requirements of the Waste Code, the Construction Company is obliged to control the process of managing the originated waste through the final disposal of the waste. Article 18 defines special obligations for hazardous waste management and Article 29 considers obligations for keeping records and reporting on waste.

98. **Law on Compensation for Damage Arisen from the Use of Hazardous Materials 1999 (last amanded in 23/12/2017)** The Law specifies how charges for the use of and/or harmful impact on the environment are to be calculated and levied by the MoEPA.

99. **The Law on Wildlife 1996 (Last amended in 2017).**The law mandates the MoEPA to regulate wildlife use and protection overall territory of the country, including existing protected areas. The law empowers the MoEPA to issue hunting permits and licenses, declare hunting areas, control poaching, etc. 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. This law also determines activities on protected areas by the corresponding structural units. Potential poaching by the workers should be controlled also during construction works.

100. **The Law on Red List and Red Book of Georgia 2003 (Last amended in 2017).** The Law establishes the legal basis for the preparation and approval of the

Red List and Red Data Book to provide these instruments for the protection and restoration of threatened species of flora and fauna. The new **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 and is as such legally enforceable. The Red List is organized in accordance with the guidelines and principles of the International Union for the Conservation of Nature (IUCN). 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.

101. **Forest Code of Georgia 1999 (Last amended in 2018).** The Law establishes legal grounds for protection, restoration, and forth use of the Georgian Forest Fund and its resources. The Law defines property rights to the forests of Georgia, the principles for the protection and use of forest resources and establishes the procedures for their use and the requirement to obtain a license.

102. **Article 38** of the Forestry Code establishes the modes of protection of the state forest fund:

1. Aiming at protecting the present state of the state economic forest fund and its biodiversity, originality of intact forests and relict, endemic and other valuable plant species, the general or special mode of protection of the state economic forest fund has been introduced by considering the priority functionality, historical, cultural and other values of the forest
2. The mode of protection of the protected territories of Georgia is defined under the Georgian Law ‘On the system of protected territories’.

103. **Article 39** specifies the special limitations to certain types of activity defined by the special mode of protection:

1. The following activities are prohibited in the state economic forests and lands where a special mode of protection is applied:
1. Cutting of a principal use;
2. Activities of the first and second categories as defined by the Law of Georgia ‘On environmental permits’, except the programs for rehabilitation of the protected areas and founding the hunting firms.

104. In case if some area of the forest massif are to be cut down within the scope of the project, this process must be accomplished by full observance of the requirements of the Law. The territory needed by the project will be necessary to remove from the forest fund. In addition, the full inventory and other actions will be needed.

B.2 Laws and Regulations Related to Social Aspects and Land Ownership

105. **Law of Georgia on Privatization of State-owned Agricultural Land 2005 (Last amended in 2010).**This Law regulates the privatization of state-owned

agricultural land. On the basis of this law, either leased or unleased state-owned agricultural land can be subject to privatization. However, the categories of agricultural lands listed as follows are not subject to privatization: a. Grazing lands except grazing lands leased before enacting the law; b. Cattle-driving routes; c. First sub-zone (strict regime zone) for the sanitary protection zone of water supply bodies; d. Forest fund land used for agricultural purposes; e. Recreation lands; f. Lands allocated to historical, nature and religious monuments; g. Protected areas; h. Agricultural lands being used by budgetary institutions and legal entities of public law in the form of usufruct.

106. **The Law of Georgia on Recognition of the Property Ownership Rights Regarding the Land Plots Owned (Used) by Physical Persons or Legal entities; 2007 (Last amended in 2016).** The Law defines general terms and procedures for entitlement of the right to land ownership.

107. Although ownership rights cannot be bestowed onto the following lands: cattle-driving routes; cemetery and pantheon; water field (stock); sanitary and protection zones; protected areas; historical, nature and religious monuments; recreation parks, forest-parks, squares and others; land containing water reservoir, hydraulic works and sanitary-protection zones of these objects; lands of special purpose (allocated for defense and mobilization); lands accommodating community infrastructure units (transport and underground utilities, water-supply, sewage, communication and power-supply systems); land parcel of public use (playground, street, passage, road, pavement, shore) and recreation sites (park, forest-parks, squares, alley, protected area); lands accommodating state-owned objects, including parcels which contain state property not subjected to privatization according to Georgian Law on Privatization of State Property; lands allocated for construction and operation of oil and gas mains, as well as any associated over- and under-ground structures and facilities.

108. **The Law of Georgia on Public Registry 2008 (last amended in 2017).** The Law provides an organizational and legal basis for the registration of ownerships rights,encumbrance and mortgage on real estate, as well as the liabilities of the registration authority. Pursuant to this Law, ownership rights related to real property, mortgage, usufruct, servitude, lease, sub-lease, rent, sub-rent, lending are subject to registration in the Public Register.

109. **The Law of Georgia on Rules for Expropriation of Ownership for Necessary Public Needs 1999 (Last amended in 2013).** The Law defines terms, rules and procedures for the expropriation of assets necessary in the public interest. Expropriation requires the Presidential decree and a court decision. The decision of the court gives a detailed description of the appropriable property and due compensation to the owner. The Law states the public interests which allow expropriation of assets. These are the construction/installation of: a) Roads and

highways; b) Railways; c) oil, gas and oil product pipelines; d) Power transmission and distribution lines; e) Water supply, sewage and storm water drainage systems; f)Telephone lines; g) Premises and objects of public needs; h) Works required for national defense; i) Mining and reserve development. After issuance of the Presidential decree a person seeking for expropriator's right announces in the central and local printed media about the project, its scope, area coverage and brief description of the potentially appropriable property. All affected landowners also shall be informed about the dates of application to the court and action proceeding.

110. An expropriator should endeavor to obtain property in agreement with the owner. Prior to negotiation the expropriator evaluates the property and determines an estimated compensation sum or other property compensation according to fair market price. Agricultural lands are to be evaluated together with price of crops that could be yielded by the owner throughout the current agricultural year.

111. **Labor Legislation.** Applicable Labor Lawsare as follows:

1. Labor Code of Georgia (2006) governs the rights of the employees in all enterprises,
   institutions and organizations. This law establishes the requirements regarding human rights and creation of safe and healthy working environment including health and safety conditions, social security and insurance. However, there are no established norms and standards related to the workers accommodation.
2. Law of Georgia on Employment (2001) regulates the employment policy of Georgia, including protection of the unemployed in terms of economic, social and legal issues. For the protection of the unemployed, this law promotes employment programs.

112. **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.

113. **The 'Law of Georgia on Cultural Heritage' 2007 (Law amended in 2017) -** Was approved in May of 2007. Article 14 of the Law specifies the requirements for 'large- scale' construction works. According to this Article, a decision on career treatment and or extraction on the whole territory of Georgia, as well as on construction of an object of a special importance as it may be defined under the legislation of Georgia, is made by a body designated by the legislation of Georgia based on the positive decision of the Ministry of Culture and Monument Protection of Georgia. The basis for the conclusion is the archeological research of the proper territory to be carried out by the entity wishing to accomplish the ground works. The entity wishing to do the ground works is obliged to submit the Ministry the documentation about the archeological research of the territory in question. The

preliminary research should include field-research and laboratory works. In case of identifying an archeological object on the territory to study, the conclusion of the archeological research should contain the following information: (a) a thorough field study of the archeological layers and objects identified on the study territory by using modern methodologies, and (b) recommendations about the problem of conservation of the identified objects and planning of the construction activity on the design territory, on the basis of the archeological research.

B.3 Environmental Permitting Procedures

114. Since the draft of the EIA report for the planned development was disclosed before the entry into force of the new Environmental Assessment Code, permit application/issuance procedure follows the steps defined in the law on Environmental Impact Permit described below **Table 1**.

Table 1: Environmental impact permit issuance procedure (valid for the projects 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 include 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 ESIA report to the Ministry of Environment Protection and Agriculture (MoEPA))	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 ESIA 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 authorised to submit, within one year, an application

Step	Action	Comment	Timeframe
			to the permit issuing administrative body for a permit
4	Consideration of the documents by MoEPA 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.

115. After January 1, 2018, the 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 underpass and/or bridges on the international and interstate roads' belong to te 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 increase role of the MoEPA is the public consultations process.

116. The procedure described below (**Table 2**) will be applicable to all international/interstate road and construction and operation of underpass and/or bridges on the international and interstate roads disclosed after January 2018.

Table 2: 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: 1. EIA report; 2. 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. 3. Notification about a confidential part of a submitted application, if applicable; 4. Copy of the document evidencing payment of the fee (500 GEL) in accordance with the existing legislation. 5. 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 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
	the notice board of the relevant local authorities and/or representative bodies and upon request, provides paper copies of 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: 1. The content and brief description of the issue to be discussed, format of the discussion; 2. The time, place and rules of the public hearing; 3. 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 public authority, under the rule envisaged by Article 84 of General Administrative Code of Georgia.		
10	The Minister issues individual administrative legal act on		no less than 51 and no more

Step	Action	Comment	Timeframe
	issuance of the Environmental Decision or the decision on the refusal to implement the project		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.4 Licenses, Permits, and Approvals

117. 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 3**. The Law on Licences 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 3: Permits Register

Permit Required Activity	Permit Title	Issuing Authority	Implementing Law	Responsible Party for Obtaining License
Pre-construction				
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"	MDF
Construction activities	Environmental Decision	MoEPA	Law No.519 on Environmental Protection Law No 890-II Environmental Assessment Code	MDF
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	MDF

			Conditions of issuance of Construction Permit"	
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	MDF
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 licence	Ministry of Economy and Sustainable Development	Decree of the Government of Georgia N136 of August 11, 2005; Law N 946 "On Fees for Use of Natural Resources"	Contractor
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	Ministry of Economy and	Tax Code of Georgia; Decree of the Government	Contractor

	explosives	Sustainable Development	of Georgia N420; Law N2911 “On Control of Technical Hazard”; Order N 1-1/2502 of the Minister of Economy and Sustainable Development	

B.5 Construction Permits

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

119. 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.

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

1. Geological conclusions to be issued by National Environmental Agency;
2. Cultural heritage clearance to be issued by National Agency of Cultural Heritage;
3. Environmental Decision issued by MoEPA;
4. Project design approval to be issued by MoESD; and
5. Project’s registered rights to land.

B.6 International and National Environmental Standards and Norms

121. Project will be implemented in compliance with the national regulations and also in line with the ABD SPS 2009 requirements. Therefore, more stringent requirements of the two are applicable.

103. Georgia has a large set of specific standards that refer to emission, effluent, and noise standards, as well as standard to handle and dispose specific wastes ranging from sewage to hazardous wastes. The following summarizes these laws and standards along with IFC and EU standards.

B.6.1 Ambient Air Quality Standards

122. In accordance with the Law of Georgia on Public Health, the environmental qualitative norms are approved by Decrees of the Minister of Labor, Health and Social Affairs of Georgia (Decrees Nos. 297/N of 16.08.2001, including the changes made to it by further decrees of the Ministry Nos. 38/N of 02.24.2003, 251/N of 09.15.1006,

123. N of 12.17.2007). The quality of atmospheric air (pollution with hazardous matter) is also defined by the order of the Minister of Environment Protection and Natural

Resources (#89, 23 October 2001) on approval of the rule for calculation of index of pollution of atmospheric air with hazardous pollution.

124. Georgian and IFC guidelines for ambient air quality guidelines are presented in **Table 4** and **Table 5**.

Table 4: Georgian Standards for Ambient Air Quality

Parameter	**Maximum Permissible Concentration (MAC) mg/m^3 average time**
Nitrogen Dioxide	0.085/30 minetes
	0.04/24 hours
Sulphur Dioxide	0.5/30 minutes
	0.05/24 hours
Carbon oxide	5.0/30 minutes
	3.0/24 hours
Inorganic Dust	0.5

Table 5: IFC Ambient Air Quality Guidelines

Parameter	**Averaging Period**	**Guideline value in µmg/m^3**
Sulfur dioxide (SO_2)	24-hour 10 minute	125 (Interim target-1) 50 (Interim target-2) 20 (guideline) 500 (guideline)
Nitrogen dioxide (NO_2)	1-year 1-hour	40 (guideline) 200 (guideline)
Particulate Matter PM_{10}	1-year 24-hour	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $PM_{2.5}$	1-year 24-hour	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) 75 (Interim target-1 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Note: World Health Organization (WHO) Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile. Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

125. In general, Georgian standards for ambient air correspond to international IFC/WB standards, however in relation with particular substances there can be minor differences and in that case more stringent standards are applicable.

B.6.2 Surface Water Quality Standards

126. 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 6.** 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 6** below.

Table 6: 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

B.6.3. Groundwater Quality Standards

127. 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). Drinking water quality criteria is given in the **Table 7** below.

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.6.4. Noise Level Standards

128. Admissible noise standards of IFC and Georgian national standards for the residential areas are similar. The national standards about the noise are allowed according to the Decree # 297/N of the Ministry of Health, Labor and Social Affairs of Georgia on Affirmation the Qualitative Norms of the Environment, issued on August 16, 2001. There are defined as the admissible norms of noise as the maximum of the admissible norms for several zones of the territories. For the residential areas the standard requirements for noise are given in the **Table 8.**

129. For IFC noise impacts should not exceed the levels presented in **Table 9** or result in a maximum increase in background levels of 3 dB at the nearest receptor location off site. This project will comply with both IFC Guidelines and Georgian Standards. Note that Georgian standards refer to the allowable limits indoors, not at the building façade.

Table 8: Georgian Standards for Noise Levels

Time	The everage allowed size of noise (dbA)	The maximum allowed norms of noise (dbA)

7am-11pm	55	70
11pm- 7am	45	60

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

130. For workplace noise the following IFC standards are applicable.

Table 10: 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.6.5 Vibration Standards

131. The Georgian Standards for vibration are designed for human comfort. These are shown in **Table 11**. Note that no standards for building damage exist.

Table 11: 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	dB	$m/sec\ 10^{-4}$	dB
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.

132. DIN 4150-3 is the most widely applied standard internationally for measuring structural vibrations. The measurement procedure can be found in a similar form in other national standards, for example the Italian UNI 9916. The assessment parameter is the maximum value (Vi) of the three individual components (peak values) of vibration velocity at frequencies of 1 to 80 Hz.

133. The standard provides guide values for permissible vibration velocities for short time and sustained vibrations in three types of buildings (Notes from DIN 4150-3 about the guide values is given in **Table 12**).

Table 12: Guide values for transient vibration

Guide values for vibration velocity for analyzing the effects of transient vibration					
Building Type	**Foundation Frequency of the Significant Vibration**			**Upper ceiling**	
Frequency range	1 – 10 Hz	10 – 50 Hz	50 – 100 Hz	All frequencies	
Direction	X / Y / Z	X / Y / Z	X / Y / Z	X / Y	Z
Reinforced or framed structures. Industrial and heavy commercial buildings	20 mm/s	20 – 40 mm/s	40 – 50 mm/s	40 mm/s	20 mm/s
Unreinforced or light framed structures/ Residential or light commercial type buildings	5 mm/s	5 – 15 mm/s	15 – 20 mm/s	15 mm/s	20 mm/s
Delicate, listed buildings e.g. historical monuments	3 mm/s	3 – 8 mm/s	8 – 10 mm/s	8 mm/s	20 mm/s

Table 13: Guide values for continuous vibration

Guide values for vibration velocity v_i for analyzing the effects of continuous vibration		
Building Type	**Upper ceiling level, all Frequencies**	
Direction	X / Y (horizontal)	Z (vertical)
Reinforced or framed structures industrial and heavy commercial buildings	10 mm/s	10 mm/s
Unreinforced or light framed structures, residential or light commercial type buildings	5 mm/s	10 mm/s

B 4.6 Soil Quality

134. Soilquality 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 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.7 Asian Development Bank Safeguard Policies (SPS 2009)

135. The ADB has adopted a comprehensive Safeguard Policy Statement in 2009 (SPS, 2009). This Statement describes common objectives of ADB's safeguards, lays out policy principles, and outlines the delivery process for ADB's safeguard policy. It applies to all ADB-financed and administered projects, and their components including investment projects funded by a loan, grant or other means.

136. Aiming on promotion and sustainability of project outcomes by protecting the environment and people from projects' potential adverse impacts, the objectives of ADB's safeguards are to:

1. Avoid adverse impacts of projects on the environment and affected people, where possible;
2. Minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
3. Help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

137. The objective of environmental safeguards is to ensure the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision-making process. All ADB funded projects are screened at initial stages of preparation and categorized according to significance of the project's potential environmental impacts. Projects are assigned to one of the following three categories:

1. **Category A** - Projects likely to have significant adverse environmental impacts, which are irreversible, Diverse or unprecedented and may affect an area larger than the location subject to physical works. An Environmental Impact Assessment is required.
2. **Category B** –.Projects with adverse environmental impacts that are less significant than those of Category A projects, are site-specific, generally not irreversible, and in most cases can be mitigated more readily than for Category A projects. An Initial Environmental Examination (IEE) is required.
3. **Category C** - likely to have minimal or no adverse environmental impacts; EIA is not required.

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

139. **The Tbilisi Marchal Gelovani Avenue and Mtkvari River Right Bank Intersection Project** has been classified as environmental assessment category B. For Category B projects the Draft IEE report is reviewed by ADB's Operational Department (in this case Central & West Asia Department) and after addressing their comments, if any, the EA then officially submits the IEE reports to ADB. Completed reports are made available on the ADB website.

B. 8 Comparison of ADB and National Requirements

140. The environmental assessment of the Project will need to satisfy the requirements of both the GoG and ADB. A harmonized safeguard framework is developed for conducting IEE study of the Project. The framework is given below in **Table 15.**

Table 15: 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: 1. Environmental safeguards, 2. Involuntary resettlement safeguards, and 3. 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 carry 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 MOENRP.	The Project is Categorized as Category B.
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.

B.9 Administrative Framework

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

142. MoEPA is responsible for all environmental protection issues and agriculture in Georgia. The responsibilities of the Ministry as the competent authority are: a) to intermit, limit, or stop any activity having or likely to have adverse impact on the environment, b) to carry our screening of planned development, c) to implement scoping, d) to issue environmental decision for project subject to EIA procedure (ref. Environmental Assessment Code), c) to control the execution of mitigation measures by the developer, d) to organize public meetings and discussion of an estimation of influence on environment and prepares the documentation (the project of the order of the minister) to let out the permission to influence to environment.

143. **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 the Ministry of Environment and Natural Resources Protection and the Ministry of Energy the MoESD took over the functions of the latter, as well as part of the main functions of Ministry of Environment and Natural Resources Protection (viz. licencing activity).

144. **Municipal Development Fund of Georgia (MDF)** – The municipal Development Fund of Georgia is responsible for elaboration of policy and strategic plans related to construction, rehabilitation, reconstruction of hightway section. Thus, the MDF 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 MDF. Within the MDF there is Environmental Division dealing with the environmental issues. This division is supposed to review the EIAs and EMPs related to the MDF 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.

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

146. **The "National Service for the Foodstuffs Safety, Veterinary and Plant Protection" of the Ministry of Environmental Protection and Agriculture** - 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.

C. Description of the Project

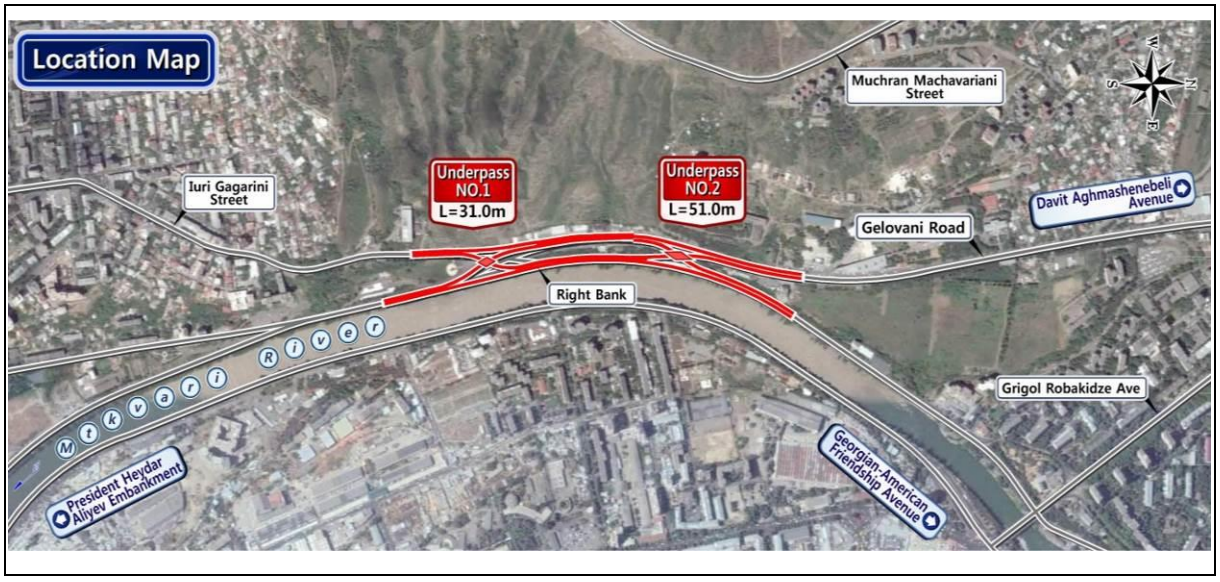
C.1 Background of the project

147. Development of a sustainable urban transport network is a key component for the development of urban areas in Georgia which can enhance the role of Tbilisi as an important business center in the South Caucasus region. Tbilisi is the capital of Georgia with a population of 1,114.6 thousands (source: National Statistics Office of Georgia, 2017) inhabitants. It is located strategically at the crossroads between Eastern Europe and Asia on both banks of the Mtkvari River and has a total area of 726km^2. The city elevation ranges from 380 ~ 770 meters above sea level and is surrounded by mountains, characteristics that influences the structure of the city.

148. Based on country development strategy and existing masterplans, the Government has prioritized the improvement of transport services in all towns and cities through the country, starting in areas of most urgent or strategic needs. The Government has already invested significantly during last decade, and further investments are on-going in order to: (i) meet the increasing demand and guarantee good mobility conditions for all citizens; (ii) improve inhabitant's quality of life, protect the environmental conditions, and support development of tourism; and (iii) provide world-class infrastructure to allow private companies and investors to find a convenient and efficient environment to thrive.

149. In an effort to improve transport infrastructure in Tbilisi, the Municipal Development Fund of Georgia (MDF) launched Consulting Services for Marshal Gelovani Avenue and Mtkvari River Right Bank Intersection. The Consulting services had been funded by the Asian Development Bank (ADB) and the Municipal Development Fund of Georgia (MDF) is the project executing, implementing and disbursing agency. Location of the Project is given in the **Figure 1** below.

Figure 1: Location of the Project Area



Right Bank Street	Gelovani Avenue	Mtkvari River
		

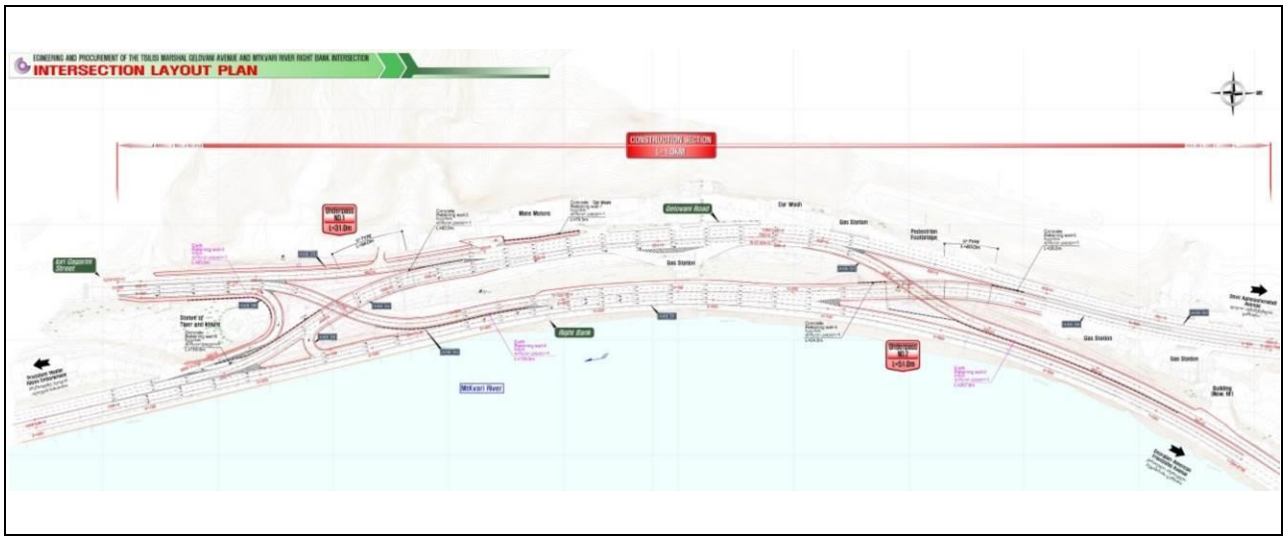
C.2 Description of the project

150. Traffic congestion in the Tbilisi city is fast growing issues due to a combination of poor road network, inadequate signal control at junction, and insufficient road capacity which is out of phase with the increasing traffic.Currently, Gelovani avenue and right bank intersection is in the grip of traffic congestion and even in the condition of potential traffic accident due to the growing traffic volume, dangerous sharp u- turn movement, and signalized traffic system. The signal system for intersection operates with five (5) phases and the total traffic signal time is over 90 seconds. In spite of the signalized system, the police are supposed to be junction area to control and manage congested traffic volume during the morning and evening time.

151. The detailed design of the Mtkvari Bridge and Right Bank Intersection as part of the sustainable urban transport investment program was prepared by joint venture of Pyunghwa Engineering Consultants Ltd (Korea) and Transproject Ltd (Georgia) in 2012. The consultancy firm is required to carry out signal free junction design including u-turn lanes at Gelovani and right bank junction. While implementing detailed design for Gelovani intersection, the consideration for previous Mtkvari bridge and ramp plan can be ignored.

152. The road and right bank junction to be re-designed are shown in **Figure 2** below. The consultancy firm is also required to minimize land acquisition and resettlement and ensure minimal impact on neighbouring areas. Most optimal intersection options in terms of cost effective, constructability, and etc. shall be proposed by the Consultant. It is expected that improved junction system can provide much better traffic circumstances and reduce traffic accidents around junction area.

Figure 2: Layout of the Gelovani Junction



153. The assignment will be carried out over a period of six (6) months including preparation of bidding documents.

C.3 Components of the project

154. The Consultant is required to carry out all works in detail and a summary of the tasks is as follows:

1. Prepare detailed engineering design including bill of quantities (BoQ) and take all necessary actions for getting required approvals and certifications for the prepared detailed engineering designs as prescribed by the Georgian legislation;
2. Prepare Due Diligence Report;
3. Prepare Financial and Economic Analyses Report;
4. Prepare the detailed Environmental Impact Assessment (EIA) and conduct the necessary consultations in compliance with ADB's Safeguards Policy Statement 2009 and the Environment Assessment and Review Framework (EARF) approved in 2010 between ADB and the Government of Georgia;
5. Prepare different type of environmental documentation, if necessary, as prescribed by Georgian Legislation, particularly by the new Code on Environmental Assessment;
6. Prepare a Land Acquisition and Resettlement Plan (LARP) fitting the ADB Safeguards Policy Statement (2009), the Land Acquisition and Resettlement Framework (LARF) approved for the Program in 2010 and relevant Georgian laws; assist the EA for LARP disclosure and for the hiring of an external monitoring agency.
7. Prepare terms of reference and bidding documents for the road construction (including prequalification documents if appropriate); and
8. Assist MDF on prequalification, tendering, bidding processes and contracting as necessary.

C. 4 Detailed Technical Criteria

155. The Consultant will prepare detailed engineering design and bidding documents for Marshal Gelovani Avenue and Mtkvari River Right Bank Intersection project. The design should achieve the optimum combination of rehabilitation costs and road serviceability, using modern design methods and requirements. The final product should have a life of 50 years or more and be maintainable at reasonable costs and with locally available technology.

156. The Consultant will make maximum use of available data, topographic, geological and seismic maps, road condition surveys, technical studies and documents available from MDF and other government agencies. The design shall comply with international codes of practice (AASHTO design standard) and standards for engineering works associated with roads construction.

157. Geometric parameters:

1. **Design Speed**

1. Gelovani Avenue: 60km/h
2. Right Bank Street: 60km/h

2. Length, Minimum Radius and Maximum Longitudinal Slope

Name of Axis	Length	Number of Lane	Minimum Radius	Maximum Slope
Axis 01	1.08km	2 Lanes	Rmin = 890.0m	Smax = 1.35%
Axis 02	0.44km	3 Lanes	Rmin = 393.0m	Smax = 1.11%
Axis 03	0.32km	2 Lanes	Rmin = 700.0m	Smax = 6.00%
Axis 04	0.67km	2 ~ 5 Lanes	Rmin = 242.0m	Smax = 5.97%
Axis 05	0.39km	2 Lanes	Rmin = 125.0m	Smax = 5.89%
Axis 06	0.62km	3 Lanes	Rmin = 300.0m	Smax = 6.90%
Axis 07	0.51km	2 Lanes	Rmin = 150.0m	Smax = 6.49%
Axis 08	0.21km	1 Lane	Rmin = 22.0m	Smax = 13.21%
Axis 09	0.18km	1 Lane	Rmin = 10.0m	Smax = 4.89%

Typical Cross Sections:

1. **Lane Width**

158. The lane width of a carriageway influences the comfort of driving, operational characteristics, and, the likelihood of crashesin some situations. Moreover, the lane width directly affect level of service of road. Narrow lanes force drivers to operate their vehicles closer to each other laterally than they would normally desire.According to the AASHTO guideline, the minimume width of a lane isdecided as 3.5m.

2. Shoulder Width

159. A Shoulder is the portion of the roadway contiguous with the traveled way that accommodates stopped vehicles, emergency use, and lateral support of sub-base, base, and surface course. According to the AASHTO standard, the width of shoulder is determined considering the traffic demand and the classification of the road. The typical road cross sections are shown in the following **Figures 3, 4, 5 and 6 6**below.

Figure 3: Typical Road Cross Section in Axis No.2

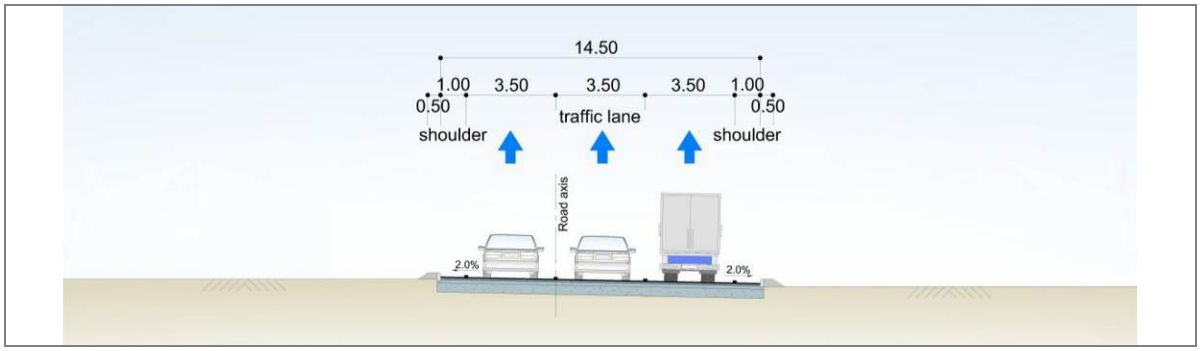


Figure 4: Typical Road Cross Section in Axis No.3, 5, 7

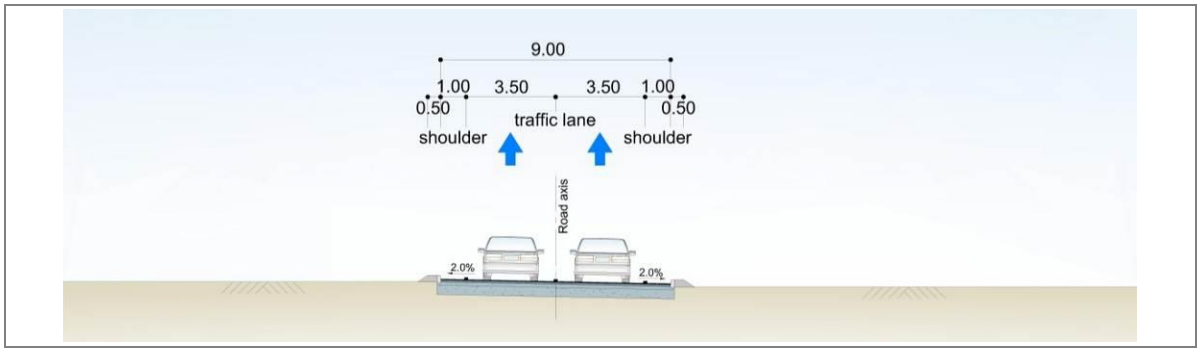


Figure 5: Typical Road Cross Section in Axis No.4,6

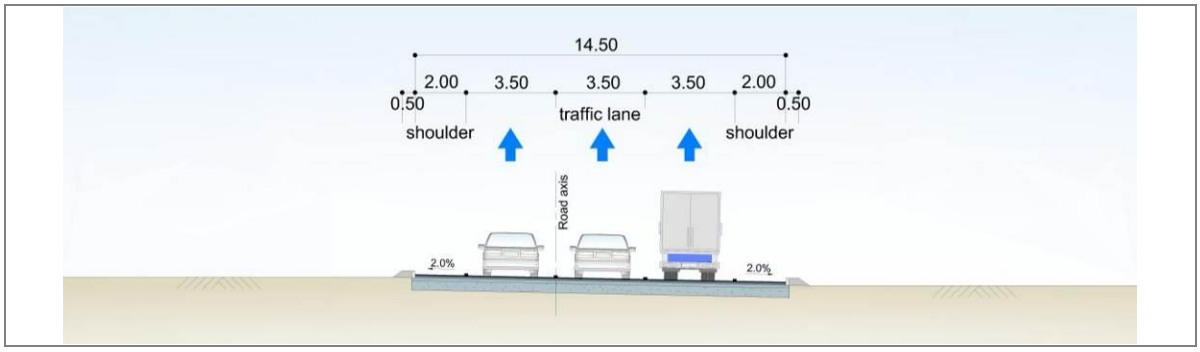
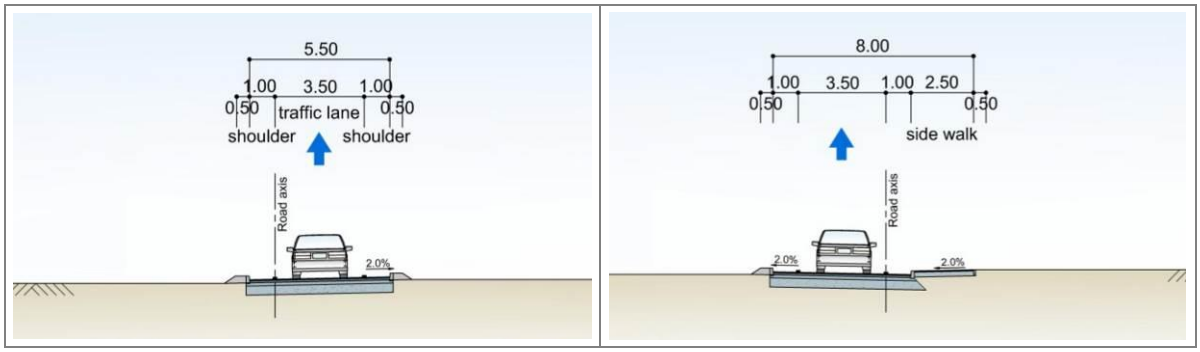


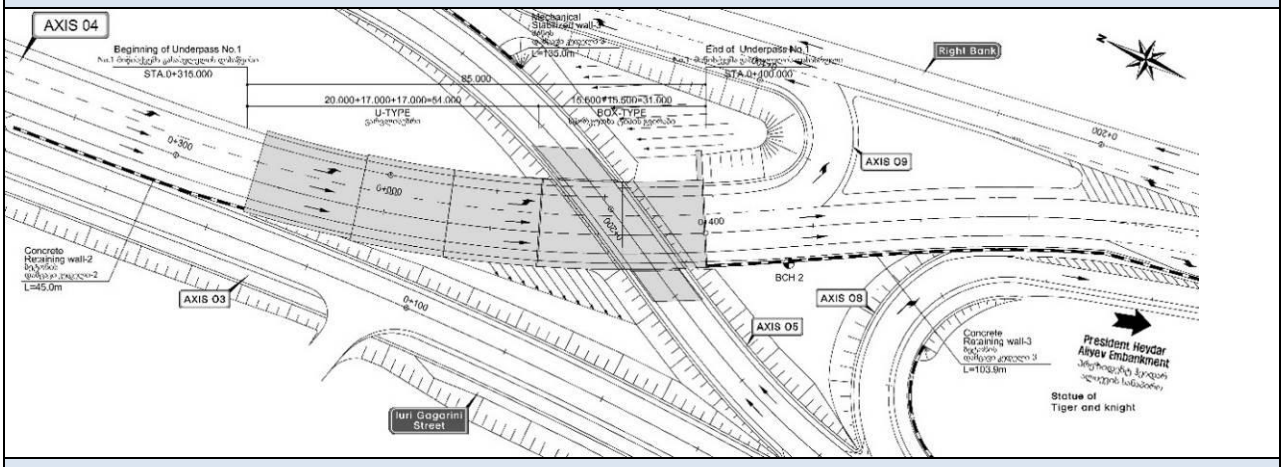
Figure 6: Typical Road Cross Section in Axis No.8, 9



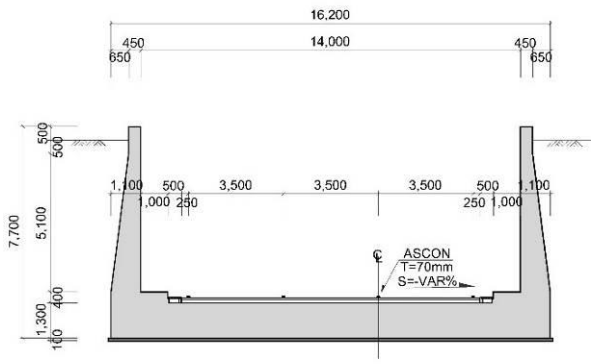
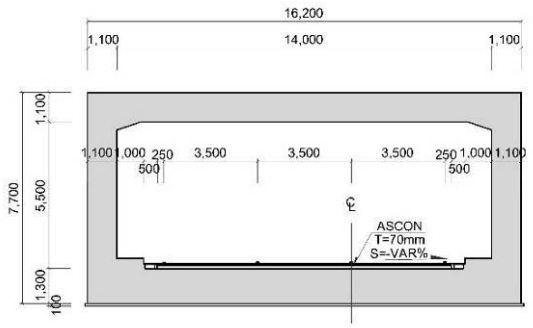
Structure design:

1. **Underpass No.1**

Layout

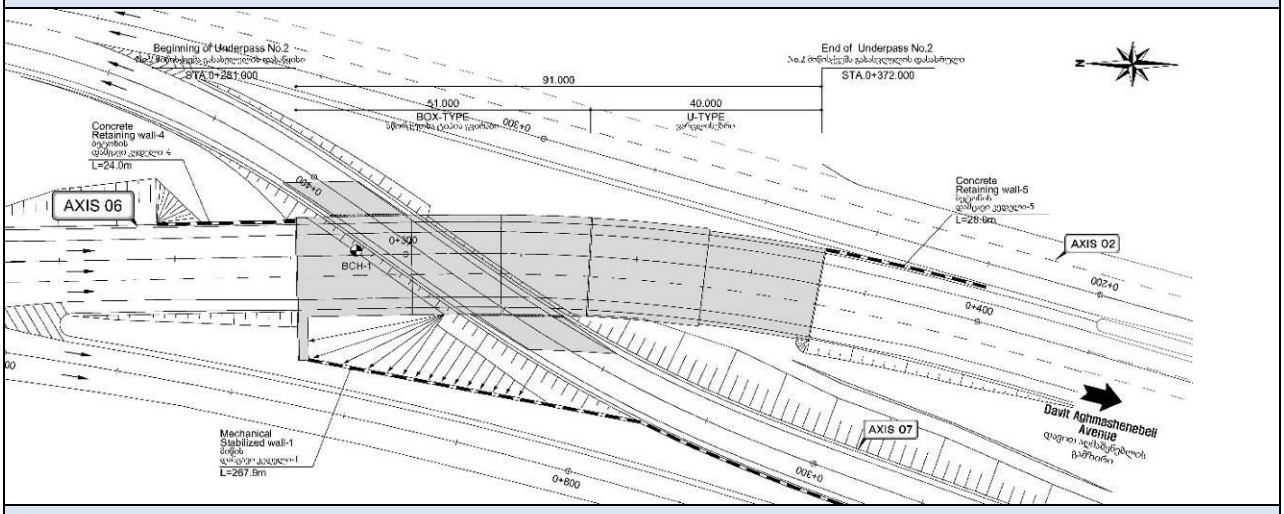


Section Detail

U-TYPE	BOX-TYPE
	

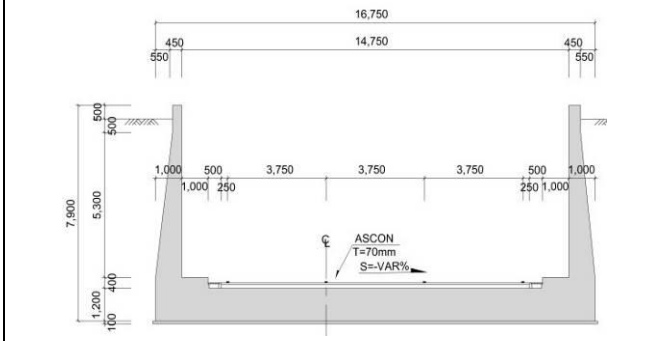
2. **Underpass No.2**

Layout

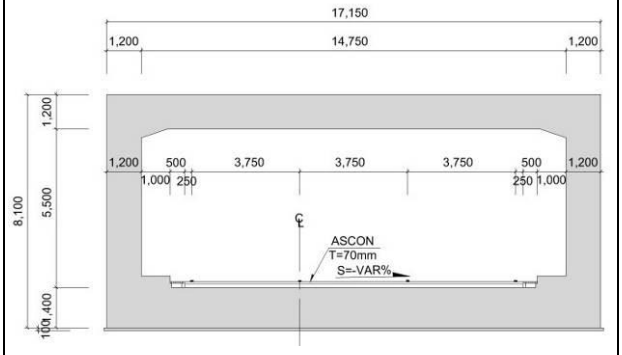


Section Detail

U-TYPE



BOX-TYPE



3. **Reinforced Concrete Retaining Wall**

No.	Location	TYPE	Length (m)	Height (m)
1	Sta.0+166.28~0+232.36 Right shoulder of Axis04	Reverse L-Shaped	L=70.5 m	H=4.0 m
2	Sta.0+250.00~0+315.00 Right shoulder of Axis04	Reverse L-Shaped	L=45.0 m	H=2.0/4.0/6.0 m
3	Sta.0+400.00~0+503.90 Right shoulder of Axis04	L-Shaped	L=103.9 m	H=2.0/4.0/6.0/8.0 m
4	Sta.0+257.00~0+281.00 Left shoulder of Axis06	Reverse T-Shaped	L=24.0 m	H=6.0/8.0 m
5	Sta.0+372.00~0+400.00 Left shoulder of Axis06	Reverse L-Shaped	L=28.0 m	H=2.0 m
SUM			L=271.4 m	

4. **Mechanical Stabilized Wall**

No.	Location	Length (m)
1	Sta.0+120.00~0+387.93 Right shoulder of Axis07	L=267.93 m
2	Sta.0+40.00~0+123.90 Right shoulder of Axis08	L=83.90 m
3	Sta.0+230.00~0+365.00 Right shoulder of Axis05	L=135.00 m
SUM		L=486.83 m

C.5 Traffic Management Scheme

160. One of the major problems in the construction phase is the obstructions or temporal delays in traffic. As already mentioned, the project area is an highway. Due to the absence of the bypass around the city of Tbilisi, this section is used by not only passenger cars, but also heavy vehicles for international shipments. Besides, the given road section is on the territory of Tbilisi, it is the town center and one of the principal connecting mains to a number of remote districts of Tbilisi. Consequently, the traffic on his road is often overloaded and traffic jams are also common.

161. Following the above-mentioned, narrowing the Highway in the construction phase will cause additional problems for traffic. At the given stage, a seven-phase plan for the construction stage is developed, which will allow mitigating the expected problem of traffic obstruction. The plan is developed in the way as to prevent delays in traffic along the given section.

162. This traffic management plan is for Contractor's guidance only: Detalled traffic management plans for each particular cases shall be developed by contractor in accordance with his proposed working methodology and submitted to the engineer for approval. Scheme is carried out in accordance with VSN 37-84. For detailed information see Annex 5.

C.6 Organization of construction

163. Prior to the onset of the core works, the organization and technical issues will be solved to provide a field of construction operations. Preparatory works envisage arranging a temporary infrastructure (construction camps) necessary for the highway construction works and mobilization of relevant construction machines/mechanisms (crusher and sorting plant, asphalt plant, etc.). An issue of water- and power-supply of temporary objects and this also be solved.

164. After the preparatory stage, the construction corridor will be prepared for construction

meaning the earthworks (including topsoil stripping and storage), cutting trees and plants, disassembly of the engineering facilities and communications in the ROW, preparing the roadbed and solving the topographic issues.

165. At the following stage, the road infrastructure will be provided. After the road construction is complete and underpasses are built, certain improvement works will be done, such as installation of the road signs, painting traffic lanes, etc. scheme of construction schedule see below.

Scheme of Construction Schedules																								
	2019 Year																							
	Jan		Feb		Mar		Apr		May		June		July		Aug		Sep		Oct		Nov		Dec	
I Step*																								
II Step																								
III Step																								
IV Step																								
V Step																								
VI Step																								
VII Step																								

- **Detalaid description of the steps see annex 5**

166. An important stage of the project implementation is the management of different types of waste originated in the course of the construction. After the construction works are complete, the construction camps and other temporary facilities will be demobilized, the cultivation works will be done and the landscape will be harmonized.

C.6.1 Construction camps

167. When identifying the sites for the construction camps, the following issues must be taken into account:

1. Near location of the highway to the construction corridor.
2. Availability of communications (water- and power-supply, existing roads, etc.).
3. Satisfactory natural conditions (plane relief, less vegetation, less soil cover).
4. Sufficient distance to the sensitive receptors (houses, protected areas, etc.) so that the expected impacts caused by noise, emissions and vibration are minimized.
5. Category of the site owner and land plot (state lands must be preferred; however, relevant agreements with private entities are also an option).

168. The care must be taken to ensure that the construction camps are not used for living. Warehouses, offices, parking area, plant and equipment needed for the construction works, etc. will be provided at the camps.

169. Following the project location and circumstances cited above, the project implementing agencies have no wide choice with the arrangement of construction camps.

Presently, the most suitable site for the construction camps is the area located near the Ltd “Mate Motors” plot (**Figure 7**) with approximate coordinates (corners):

1. 41.740899, 44.769516
2. 41.740610, 44.769544
3. 41.740614, 44.769285
4. 41.740938, 44.769302

Figure 7: Construction camp location

170. The said land parcel is already purchased from its owner and at present, is the property of Tbilisi City Hall.

171. The construction camp is not used by the workers for living purposes. This will be simply a storage area. This is a suggestion, and any contractor is authorized to select the territory for the camp on his own, but if the contractor selects another territory for the camp, the territory offered by us may be used for temporal disposal of inert waste.

C.6.2 Dumpsites

172. In the course of the project, the volume of earthworks will not be great. Inert waste will be originated during the processes of the underpass excavation and slopes cut-down. As the engineering calculations of the project evidence, the inert material originated at the stage of underpass excavation and slopes cut-down will be used to meet the project needs.

173. The total cutting volume of soilswill be 86,389 cubic meter (m^3).The total embanking

volume of soils will be 72,315 cubic meter (m^3).Surplus soil volume is only 5,435 cubic meter (m^3).

174. We consider the compaction factor (Cf); 86.389 X Cf(0.9)m^3 - 72,315m^3 = 5,435m^3.

175. The remained (surplus) soils also will be used as a material for the greenery works to develop small hill or banking. The remaining soil should be considered to disposal area or proposed some plans. But, our case is the very small amount and so the contractor or employer can find out the usage for remaining soil. One of the usages of remaining soil is for greenery works. It's because greenery mount can be embanked as much as the contractor wants.

176. If the Construction Contractor does not totally use all the inert waste originated in the construction phase and a certain amount of inert waste is needed to dispose, then due diligence report must be provided by the contractor and approved by the engineer. Under the legislation of Georgia, the prepared report of inert waste despozal plan must be agreed with the local self-governing body.

177. As already mentioned, in order to avoid traffic obstructions along the design road, a seven-phase construction plan was developed by a group of designers (the plan will be further improved by the Construction Contractor). The underpass excavation will result in the origination of inert material, which can be used for construction purposes after some time. Consequently, it will be necessary to temporarily store the inert material in the project zone. The amount of inert material will not be great. The project needs more inert materials than it is originated at the construction stage of the underpasses. Consequently, no final disposal of inert materials will be done within the scope of the project, but only temporal storage.

C.6.3 Quarries

179. The project region is quite rich in the construction materials of inert materials (sand-gravel). There are several tens of duly licensed quarries operating in the region. Most of them are located in the Mtkvari River bed. Therefore, it will not be necessary to transport the principal construction materials needed for the highway construction to far distances (the distance of transportation will mostly be 20-25 km maximum).

179. The nearest territory licensed areas to extract sand is the villages of Mtskheta Municipality (**Table 16**), which are distanced from the project zone by 20-25 km. Transportation of inert material to such distances is associated with high costs.

Table 16: Effective Licenses issued by the National Environmental Agency

№	Number and date of the resolution	Location of the licensed area, the kind and quantity of the resource	License holder	Term of validity
1.	Resolution №190/S February 14, 2017	Extraction of “Dzegvi” zeolite-containing tuffas in the area adjacent to village Dzegvi of Mtskheta Municipality (Darbazishevi district) with the total	“Heidelberg Cement” Ltd. (ID Code 230866435)	20 years

		volume of 993000 tons within the term of validity of the License.		
2.	License: 00041 10.04.2006	Extraction of sand and gravel from Tezami-2 sand-and-gravel quarry in Jugaura district on the left bank of the Tezami River (Mtskheta region)	"Lochini" Ltd.	20 years
3.	License: 0000120 21.12.10	Extraction of sandstone of "Khekordzi" (village Khekordzi, Mtskheta region)	JSC "Iberia Refreshments"	10 years

180. As of today, there are no quarries of construction materials nearer the project zone than that (20-25 km) (**Table 16**). However, there were precedents of issuing a license to extract building materials on the territory of Tbilisi (**Table 17**).

Table 17: Licenses to extract construction materials on the territory of Tbilisi

№	No and date of the resolution	Location of the licensed area, the kind and quantity of the resource	License holder	Term of validity
1.	License: 1002195 11.12.2014	Sand and gravel extraction south of the confluence of the rivers Mtkvari and Gldanula (Tbilisi, Gldani-Nadzaladevi district)	"Mshenebeli 999" Ltd.	Expired
2	License : 1002196 11.12.2014	"Avchala" sand and gravel extraction in the river Mtkvari (Tbilisi, near Avchala)	"Mshenebeli 999" Ltd.	Expired

181. As Article 7[4] of Resolution no. 136 of August 11, 2015, states: "By considering the state and public interests, based on the grounded mediation, an entity may be released from the obligation to hold the license to extract ore deposit only when accomplishing the projects financed by the state budget of Georgia or that of an autonomous republic or municipality, with the aim of managing construction works or bank-formation processes and/or river regulation, as well as when accomplishing a grant-funded educational projects." Under this Resolution, a license with the term of 3 months can be issued to extract inert material in the territory adjacent to the project zone.

182. In case a Construction Contractor decides to open a temporary quarry on the territory of Tbilisi, near the project zone, he will have the due legal basis to do so following the status of the project.

C.6.4. Infrastructure in the project zone

183. Under the ground of the Highway and in its adjacent area, which are located in the project zone, there are a number of infrastructural objects and communications. In the project implementation phase, they will be necessary to disassemble and/or relocate.

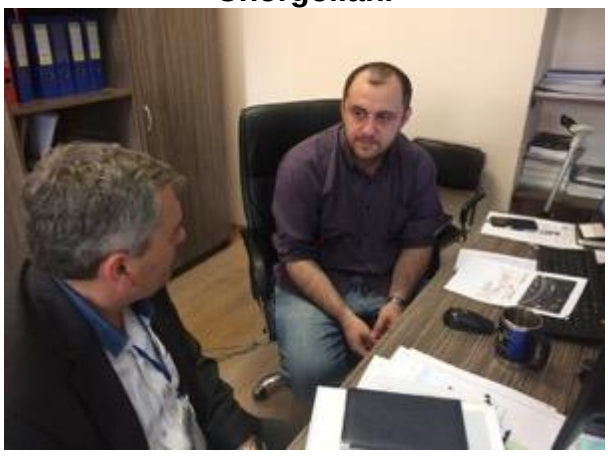
184. Some of the infrastructure (power transmission lines, lights, bus stop booths, advertising banners, overpass bridges, etc.) are visually seen, but some of the infrastructure are located under the project zone or in the ground adjacent to the project zone and their location can be fixed only by negotiating with their owners.

185. At the stage of the detailed design preparation, the locations of all units of infrastructure in the project area and adjacent to it are to be fixed and their possible contact with the project in the construction and operation phases must be identified. The degree of environmental impact during the disassembly and/or relocation of the said infrastructure must be identified in order to avoid or mitigate the degree of the expected negative impact.

186. With the aim of identifying the exact location of the infrastructure found in the project zone and physical state of the underground infrastructure, on May 12 of 2018, a meeting was held with Mr. Mikheil Chorgoliani, the Head Specialist of the Department of Infrastructural Projects Management and Designing of Saburtalo District Gamgeoba (**Figures 8 and 9**).

Figure 8: Meeting with Mikheil Chorgoliani

Figure 9:Meeting with Mikheil Chorgoliani



187. During the meeting, all the information about the locations of the infrastructural objects and means of communications in the project zone available to Mr. Mikheil Chorgoliani was obtained from him. It should be noted that as of today, a part of the information is lost. Besides, it is impossible to comment upon the state of the underground

infrastructure, which is at least 30-40 years old and with a great probability, no relocation of such underground infrastructure is possible following its physical state.

C.6.4.1. Water Drainage System

188. The water drainage channels found in the project zone are owned by the Department of Storm-water and drainage networks of "Tbilservice Group" Ltd. This Department is responsible for the maintenance and operation of these pipes. On May 13 of 2018, a meeting was held with the Head of the said Department, Mr. Nugzar Sikharulidze and his employees (**Figures10 and 11).**

Figure 10: Meeting with the employees of the Drainage Network Department

Figure 11: Meeting with the employees of the Drainage Network Department

189. Mr. Nugzar Sikharulidze, the Head of the Department of Storm-water and Drainage Networks of "Tbilservice Group" Ltd., provided us with the thorough information about the situation in the project zone.

190. There are dry gullies formed as a result of the water action on the slope south of the project zone, which, during the rains, are so called watersheds. In order to avoid the hazard of the Highway covering with water during the heavy rains, there were storm water pipes installed on all the dry gullies, which run under the existing alignment (road). There are total 5 such pipes installed in the project zone (**Figure 12).**

Figure 12: Intersection of the project zone with the storm water pipes

191. These pipes have a rectangular shape and have a reinforced concrete structure. The length of their side is 1,5 m. As of today, all drainage pipes are operable except one. No relocation of these pipes is expected.

C.6.4.2. Water Supply and Sewage System

192. The water-supply and sewerage systems installed in the project zone are owned by „Georgian Water and Power“. On May 13 of 2018, a meeting was held with the representatives of this company (**Figures 13 and 14**).

Figure 13: Meeting with the employees of „Georgian Water and Power“

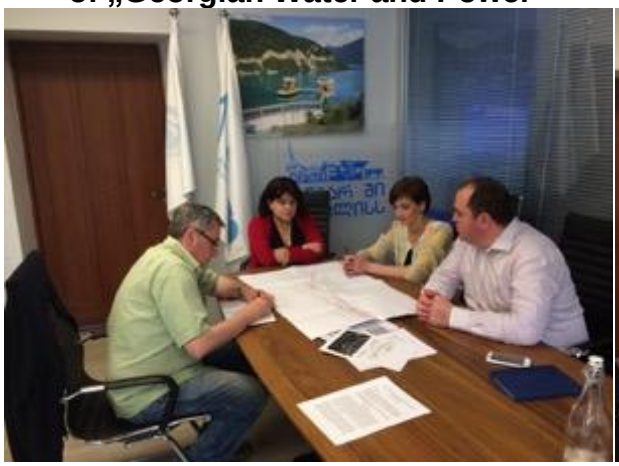


Figure 14: Meeting with the employees of „Georgian Water and Power“

193. The water-supply and sewerage systems of Tbilisi were made the property of „Georgian water and power“ in 2007. Together with the systems, the company received quite scarce information about the locations and physical coordination of the service infrastructure. Consequently, the company representatives have no thorough information about the locations and physical coordination of the pipes.

194. As they explained to us, there are both, sewerage and water-supply systems are found in the project zone.

195. Water sewage pipes are located 5 m deep in the ground and their diameter is approximately 900-1200 mm.

196. Water-supply pipes in the project zone are located both, horizontally and perpendicularly to the land surface. Their depth in the ground varies from 2 to 3 m. The diameter of the sewage pipes also varies from 900 to 1200 mm. Within the scope of the project, 900-mm-diameter pipes will be necessary to relocate or replace altogether. **Figures 15 and 16** show the locations of the water-supply and sewerage pipes as well as of power transmission lines in the project zone.

Figure 15: Locations of the water-supply and sewerage pipes, power transmission lines anlights in the project zone

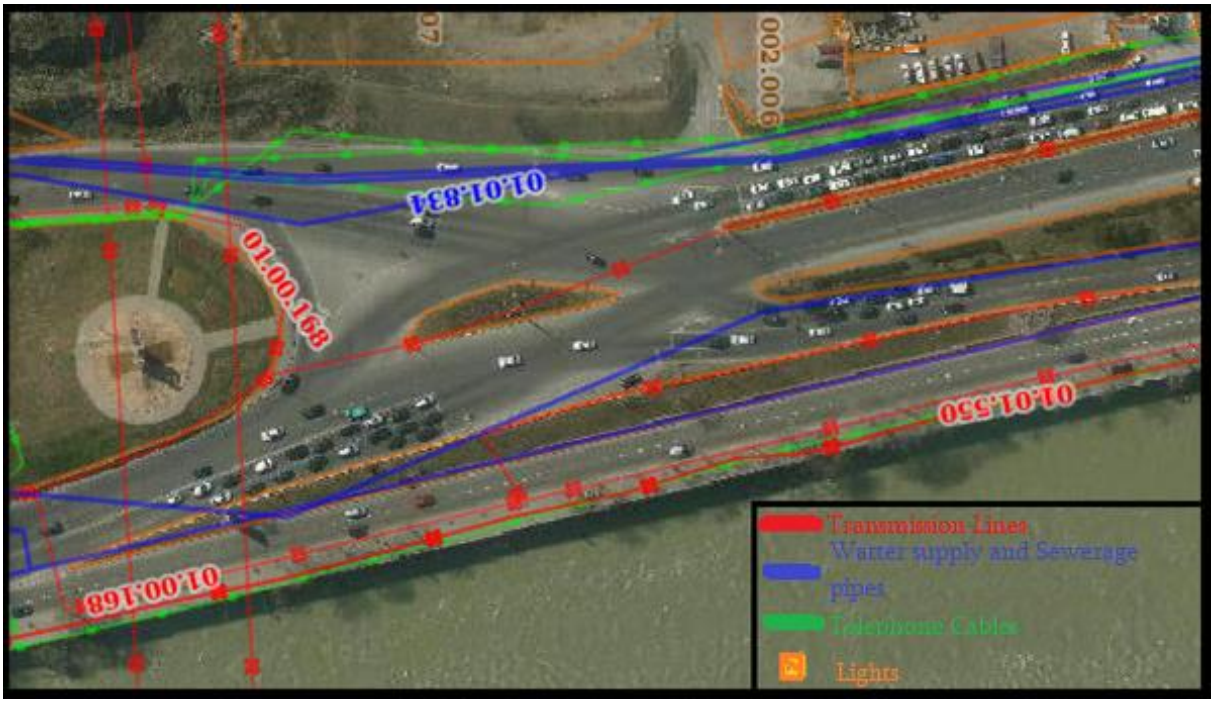


Figure 16: Locations of the water-supply and sewerage pipes, power transmission lines and lights in the project zone

C.6.4.3 Power transmission lines and lights (lampions)

197. In the project zone, there are lights along the central line and edges of the Highway. The lights are connected to one other with aerial power transmission lines. There are rows of the lights both, in Marshal Gelovani Avenue (**Figure 17**), along its central line and on the right bank of the Mtkvari River (**Figure 18**). The total number of the lights to be relocated in the project implementation phase is 66, with 26 of them located in Marshal Gelovani street and 30 of them located on the right bank of the Mtkvari River, while 10 other lights are located on the junctions of the two streets (**Figure 19**). Some lights are not only connected with the lights along the street with the power transmission lines, but also receive power from them by means of electrical wires, which cross two project roads in a perpendicular direction (**Figure 20**)

Figure 17: Row of lights in Marshal Gelovani street

Figure 18: Row of lights on the right bank of the River Mtkvari

Figure 19: Lights on the junction of the streets

Figure 20: Connections to the lights from other streets with electrical wires

C.6.4.4 Overpass bridge and bus stops

198. In the project zone, the aerial bridge in Marshal Gelovani Avenue (**Figures 21 and 22),** as well as the bus stops on the both sides of Marshal Gelovani Avenue with their infrastructure (**Figures 23 and 24**) will be subject to disassembly and relocation.

Figure 21: Bridge across the street

Figure 22: Bridge across the street

Figure 23: Bus stop

Figure 24: Bus stop

C.6.4.5 Banners

199. There are 4 advertisement banners in the project zone. All four banners are subject to disassembly and relocation. 3 of the 4 banners are located in Marshal Gelovani Avenue and one banner is located on the right bank of the Mtkvari River (**Figure 25).**2 banners in Marshal Gelovani Avenue are placed on the overpass bridge (**Figure 26 and 27),** on one side of it, and one banner is placed in the center mall of the road (**Figure 28)**

Figure 25: Banner on the right bank of the River Mtkvari

Figure 26: Banner in Marshal Gelovani Avenue

Figure 27: Banner on the overpass bridge

Figure 28: Banner on the overpass bridge

C.6.5 Road construction works

200. The highway construction process involves different types of activities, in particular:

1. Earthworks.
2. Providing and profiling exits and drainage canals and side drainage pipes/culvettes.

3. Supplying inert material to the roadway locations with trucks and profiling the layers to form the roadway and compacting it.
4. Stripping the soil to the required level and compacting it with heavy techniques on the ground stripping sites.
5. Following the placement of surface layer (with materials: sand, asphalt, gravel, concrete, etc.), placing the ready concrete with special vehicles to provide the road pavement.
6. Concrete works, building foundations and bridge structures.
7. Road construction and providing the marking compliant with the international standards.
8. Landscape harmonization/recultivation.

C.7. ANALYSIS OF ALTERNATIVES

201. The goal of the project is to alleviate the traffic on the intersection of Marshal Gelovani Avenue and right bank of the Mtkvari River. This road section is located on E60 highway; the design section is located on the territory of the city of Tbilisi and its length is 1.1 km. North of this section, there is a four-lane road, which continues the highway on the right bank of the Mtkvari River, and south of the road section, under the mountain slope, there are one- and two-storey buildings and premises. They shelter medium and small businesses.

202. Consequently, three alternative was developed within the scope of the project including No-project Alternative.

C.7.1 No-project Alternative

203. Traffic congestion in the city of Tbilisi is a fast growing issue due to a combination of poor road network, inadequate signal control at junction, and insufficient road capacity which is out of phase with the increasing traffic. Currently, Gelovani avenue and right bank intersection is in the grip of traffic congestion and even in the condition of potential traffic accident due to the growing traffic volume, dangerous sharp U-turn movement, and signalized traffic system. The signal system for intersection operates with five (5) phases and the total traffic signal time is over 90 seconds. In spite of the signalized system, the police are supposed to present at the junction area to control and manage congested traffic volume during the morning and evening time.

204. The number of passenger cars has doubled since 2001, and that of buses and mini-buses has tripled. As the global trends suggest, if not considering the possible changes in the policy, we can assume a double increase in the vehicle ownership in the next ten years.

205. Following the above-mentioned, the traffic may become disastrous in some years. At the same time, the given road section is the central route from Tbilisi to the western region of the country. Consequently, the No-project Alternative was refused right at the initial stage.

C.7.2 Selection of the Optimum Intersection Type

206. For the selection of an optimum intersection type, the concept design has been prepared taking advantage of previous topographical data. Preferentially, signal free intersection type requiring structure design such as underpass or overpass to intersect different roads without interference has been reviewed.

207. The overpass design was ruled out as there was a big difference in ground level between upper road (Marshal Gelovani Avenue, Luri Gagarini Street) and lower road (Right Bank Street). It needs much more structure facilities such as u-type wall and retaining wall to overcome level's difference if bridge design is applied.

208. On the other hands, simplified intersection type has also been prepared to compare competitiveness and efficiency of intersection. This intersection type entails one phase-

signal control for the direction between Luri Gagarini street and Right Bank Street, and the rest of directions can be flow without any interference by installation of underpass which enables main traffic (President Heydar Aliyev Embankment – Davit Aghmashenebeli Avenue) to flow freely.

209. The characteristics and functions for each intersection type are presented as shown in **Figure 29** and in **Table 19** respectively. These configurations and scope of works are not exhaustive but that it will be finalized based on actual survey data.

Figure 29: Layout for Signal Free Intersection and Simplified Intersection

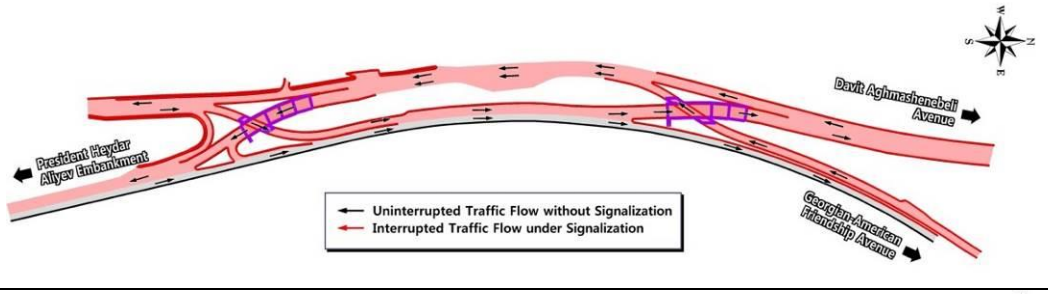
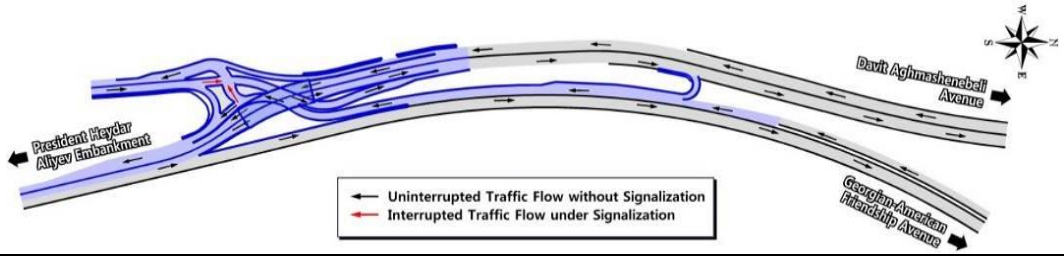
	Layout
Signal Free Intersection	
Simplified Intersection	

Table 18:Comparison between Signal Free Intersection and Simplified Intersection

	Signal Free Intersection, Option 1	Simplified Intersection, Option 2
Concept	• Modification for current traffic direction (2 way directions ⇒ 1 way direction) • Operating without traffic signal	• Keeping the current traffic direction (2 way directions ⇒ 2 way directions) • 1 phase - traffic signal system
Scope Of Work	• Project Length: 1.0km • Underpass - Underpass 1: 31.0m, 3 lanes - Underpass 2: 51.0m, 3 lanes • U-type Wall - At Underpass 1: 54.0m - At Underpass 2: 40.0m • Concrete Retaining Wall - Six (5) places ⇒ Total 271.4m • Mechanical stabilized earth Wall - Three (3) places ⇒ Total 486.8m	• Project Length: 0.8km • Underpass - Underpass 1: 80.0m, 4 lanes • U-type Wall - Before Underpass 1: 65.0m - After Underpass 1: 140.0m • Concrete Retaining Wall - Four (4) places ⇒ Total 355.0m • Mechanical stabilized earth Wall - One (1) place ⇒ Total 84.0m

Characteristics	• Simple intersection system in terms of traffic pattern • Preferable options in lights of Horizontal and Vertical Alignment • Maximum traffic capacity considering future traffic volume • Favorable traffic flow by planning two underpasses • Provision of U-turn lane for traffic flow coming from Gelovani avenue • Minimal collision with obstacles • Minimal Environmental Issues	• Complicated intersection system somewhat in terms of traffic pattern • Less preferable options in lights of Horizontal and Vertical Alignment • Normal traffic capacity considering future traffic volume • Less favorable traffic flow due to the traffic signal • No provision of U-turn lane for traffic flow coming from Gelovani avenue • Less collision with obstacles comparing to option 1 • Minimal Environmental Issues
Decision	Between two options, the Client and Consultant selected the option 1, signal free intersection, based on comparison matrix to decide the final configuration, alignment, structure, and other design fields.	

D. Description of the Environment (Baseline Data)

210. This section of the report discusses the existing environmental and social conditions within the Project area under the following headings:

1. Physical Resources (air quality, hydrology, Geology, etc.)
2. Ecological Resources (flora, fauna, protected areas)
3. Economic Resources (infrastructure, land use, etc.)
4. Social and Cultural Resources (health, education, noise, cultural resources, etc.)

211. The project zone is located on the intersection of Didube-Chugureti and Vake-Saburtalo districts. The major part of the project zone is located in Didube – Chugureti district in didube settlement.

212. The length of the project zone is 1 km and its width varies from 100 to 60 m at different points. Depending on the construction activities, the project can be divided into two parts, namely: (i) in the most part of the project, only the existing road cover will be removed and a new cover will be provided. The expected negative environmental impact of this activity will be minimal, (ii) in respect of environmental impact, the following two sections where the underpass is planned to provide are most important. Both, the earth works and construction activities are planned in this area. Besides, a construction camp is planned to arrange adjacent to the project zone.

213. There are following sensitive receptors adjacent to the project area:

1. Non-residential buildings and premises: Non-residential buildings and premises presently housing small and medium businesses run by legal entities. The buildings and premises are located adjacent to the project zone and are distanced from it by 5 to 50 m.
2. The Mtkvari River: the distance from the area where the only the existing road cover will be removed is 10-12 m. The distance from the Mtkvari River to the area where the underpass will be constructed is 20-40 m (2 underpasses are planned to construct in the project zone). As for the construction camp, it is located 110 m from the River.
3. Flora and fauna representatives not much spread in the project zone are found both, in the project zone and adjacent to it.
4. There is a “Tiger and Fellow” monument adjacent to the project zone and is distanced from other points of the project zone by 15-30 m.

214. The schematic location of the above-said receptors in relation to the project zone is given in Fig. 65.
.

D.1 Physical Resources

D.1.1 Climate

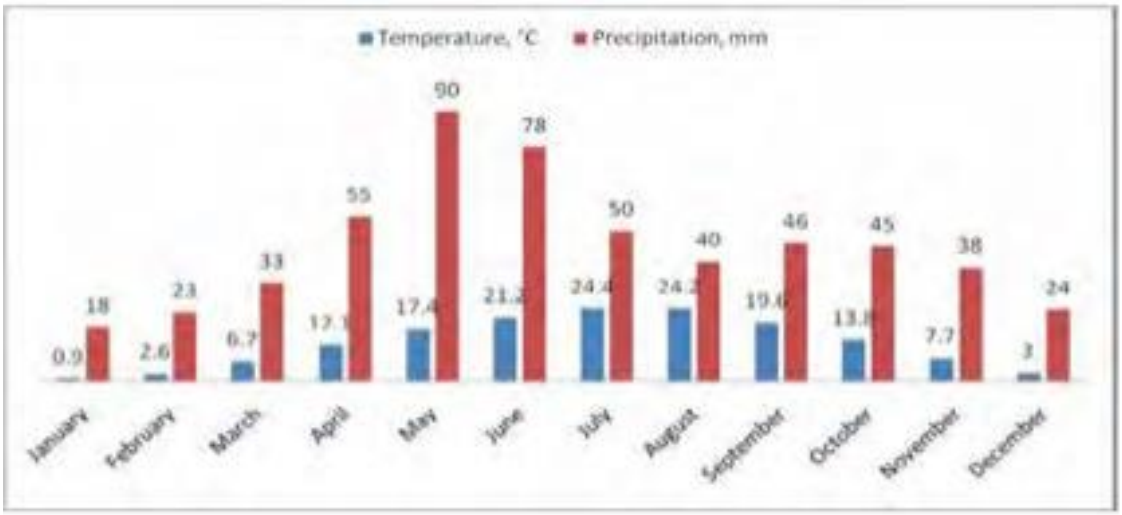
215. According to the climatic zoning, the city of Tbilisiare included in the moderately humid subtropical climatic zone. The territory of the design road is characterized by

moderately warm climate, transient from steppe to moderately humid (with hot summer and moderately cold winter). Below, we give the brief climatic description of the area:

216. Temperature: The average annual temperature is 12.70C. The temperature of the coldest month (January) is +0.90C and that of the hottest months (July-August) is +24.40C, while the absolute maximum is +400 . The soil freezing depth is 5 cm. 179. Atmospheric precipitations. The average and annual precipitations is 505 mm. The most rainy months and May and June, with the average precipitation amount of 86 mm and 72 mm, respectively. Average annual humidity is 66%. Snow cover appears on December 30 and disappears on March 1. The maximum of daily precipitations is 130 mm. Intense rains are frequent in Tbilisi with about 5 occasions a year on average.

217.The climatic characteristics of the Project area, in particular average monthly temperature and precipitation frequency in Tbilisi based on Construction Climatology (PN 01.05-08, Tbilisi 2009) are given below (**Figure 30**):

Figure 30: Average monthly temperature and precipitation frequency in Tbilisi



218.The main climatic characteristics are given in the **Tables20-36** below.

Table 19: Climatic data for Tbilisi

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Peak high °C	19.5	22.4	28.7	34.3	34.9	38.7	40.0	40.3	37.9	33.3	27.2	24.0	40.3
Average high °C	6.0	7.4	12.1	18.2	23.4	27.5	30.8	30.8	26.0	19.8	12.9	7.5	18.7
Average high °C	-2.2	-0.9	2.4	7.4	12.2	15.7	19.0	18.6	14.7	9.2	4.1	-0.2	8.4

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Peak low °C	-24.4	-14	-12	-4.8	1.0	6.3	9.3	8.9	0.8	-6.4	-7.1	-20.5	-24.4
Precipition Ns,mm	19	26	30	51	78	76	45	48	36	38	30	21	498

Table 20: Duration of sunshine (hours)

Months												Annual total
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
104	110	149	170	211	253	272	264	206	170	110	93	2112

Table 21: Air temperature °C

Months												Average annual	Annual amplitude
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
0.9	2.6	6.6	11.9	17.3	21.1	24.4	24.2	19.6	13.8	7.6	2.8	12.7	23.5

Table 22: Absolute minima of atmospheric temperatures °C

Months												Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
-23	-14	-13	-4	1	7	9	9	1	-5	-7	-19	-23

Table 23: Absolute maxima of atmospheric temperatures °C

Months												Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
18	22	29	32	35	38	40	40	38	33	27	22	40

Table 24: Soil surfase temperature°C

Months												Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
0	3	8	15	22	27	31	30	23	15	7	2	15

Table 25: Absolute maxima of soil surface temperatures°C

Months												Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
27	34	48	55	64	69	70	69	62	51	36	28	70

Table 26: Absolute minima of soil surface temperatures°C

Months												Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
-26	-16	-15	-6	-1	6	8	8	-1	-8	-13	-22	-26

Table 27: Annual repetition of wind directions

Cardinal points								
Nth	Nth/e	E	Sth/E	Sth	Sth/W	W	Nth/W	Calm
26	3	4	25	8	2	4	28	33

Table 28: Wind speed (m/sec)

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

Table 29: Mean number of strong wind days (≥15m/sec)

Months												Annual
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
2.0	2.2	2.9	2.5	1.4	1.1	1.0	1.1	1.0	1,0	1.2	1.3	19

Table 30: Average atmospheric precipitation (mm)

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

Table 31: Maximal atmospheric precipitation (mm)

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

Table 32: Minimalatmospheric precipitation (mm)

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

Table 33: Maximum daily precipitation

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

Table 34: Relative air humidity (%)

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

Table 35: Air absolute humidity (mb)

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

D.1.2 Air Quality Monitoring

219. An automated atmospheric air monitoring station owned by the Environmental Agency of Georgia is found in the project zone (at 6, Marshal Gelovani street), which permanently, in every hour, measures the air quality for 8 different components. **Table 37** gives the results of the latest 12 months obtained from the station.

220. The major source of air pollution and noise in the project zone is traffic. As the analysis of the noise level suggests, the highest level of noise is fixed at 1:00 pm (See Chapter D.1.1.3). Consequently, the air quality indices given in Table 34 were fixed at 1:00 pm (figures in the Table, which exceed the admissible norms under the Georgian legislation are marked in blue).

Table 36: Air quality indices

Month	Parameters (gr/m^3)							
	NOx	NO_2	NO	SO_2	PM10	PM2.5	O_3	CO
04.2017	0.078	0.044	0.034	0.017	0.048	0.02	0.079	-
05.2017	0.107	0.051	0.056	0.015	0.038	0.017	0.046	0.6
06.2017	0.14	0.077	0.063	0.027	0.049	0.02	0.043	-
08.2017	0.046	0.017	0.029	0.013	0.046	0.019	0.085	-
09.2017	0.133	0.069	0.064	0.028	0.024	0.015	0.008	0.9
10.2017	0.331	0.079	0.252	0.021	0.042	0.027	0.004	1.8
11.2017	0.047	0.031	0.016	0.022	0.036	0.022	0.023	0.4
12.2017	0.203	0.085	0.118	0.018	0.055	0.021	0.026	0.9
01.2018	0.163	0.056	0.107	0.027	0.107	0.047	0.014	1.2
02.2018	0.138	0.056	0.082	0.015	0.047	0.016	0.047	0.9
03.2018	0.098	0.047	0.051	0.007	0.046	0.017	0.053	0.6
04.2018	0.179	0.078	0.101	0.005	0.081	0.021	0.026	0.9
IFC standards		0.04	-	0.02	0.02	0.01	-	-
Georgia Standards		0.04	0.6	0.05	0.05	0.05	0.03	0.5

D.1.3. Results of the baseline noise measurements

221. From May 4 through May 11, 2018, the specialists of “Eco-Spectri” Ltd. measured the baseline noise level in 5 points of the project zone. The noise was measured continuously, for 24 hours and the data were taken in every second. Total 43000-44000 data were obtained from every point.

222. Sampling was done with American noise meter „REED 8080“. The noise meter was calibrated by the Georgian National Agency for Standards and Metrology on April 23, 2018. Calibration Certificate: GE/MI/07-00474-18 (See **Annex 1**).

223.**Table 38** shows the averaged index of the data taken at 5 points of the project zone in a 24-hour continuous mode in every 3 hours (the data in the Table exceeding the admissible norms under the Georgian legislation are marked blue).

Table 37: Average noise indicator with 3-hour intervals

N	Date	Coordinates	Average indicator of noise (dB)							
			12:00-15:00	15:00-18:00	18:00-21:00	21:00-24:00	24:00-03:00	03:00-06:00	06:00-09:00	09:00-12:00
1	04.05.2018 05.05.2018	41°44'50.81"N 44°46'13.91"E	71.2	69.9	69.8	70.9	67.9	64.6	67.7	72.2

2	05.05.2018 06.05.2018	41°44'50.85"N 44°46'15.77"E	70.7	72.1	71.2	69.8	67.5	61.0	60.3	68.1
3	06.05.2018 07.05.2018	41°44'46.09"N 44°46'12.32"E	75.1	74.6	73.9	72.9	70.9	64.6	66.3	74.8
4	09.05.2018 10.05.2018	41°44'34.97"N 44°46'10.27"E	75.6	75.6	74.9	73.6	70.4	64.6	66.8	75.1
5	10.05.2018 11.05.2018	41°44'36.26"N 44°46'18.61"E	75.2	75.9	73.7	74.1	70.7	63.7	67.6	75.3
Standards Requrements IFC/Georgia			70	70	70	70	70	70	70	70

224. Based on the data above, we may say that:

1. From 3:00AM to 9:00AM, the noise level is less than admissible in every point of measurement.
2. The noise level steadily exceeds the admissible standard in all points from 24:00 to 3:00 AM.
3. The noise level in points 3, 4 and 5 exceeds the admissible standard by 2-5 dB during the day and night except from 3:00AM to 9:00AM.

225. As the data evidence, the existing noise level, though insignificantly, but exceeds the admissible level. The detailed information about the measurements is given in **Annex 3.**

Figure 31: Noise measuring process

Figure 32: Noise measuring process hight time

Figure 33: Noise measuring process

Figure 34: Noise measuring process

226. As we mentioned, there are no residential houses located near the project zone. The closest residential building is located 150 meters away from the project zone. Within the framework of the project, the baseline noise level measurements were carried out during 6 hours near the residential building. Measurements were conducted during the day when the movement was most intensive on Marshal Gelovani Avenue.

Table 45[1]: 6 hour average noise indicator with 1 hour interval

I	Coordinates	Average indicator of voice (dB)					
1	La: 41°44'48.87"N Lo: 44°46'9.36"E	03.08.2018					
		09:00 - 10:00	10:00 - 11:00	11:00 - 12:00	12:00 - 13:00	13:00 - 14:00	14:00 - 15:00
		60.4	60.7	60.7	60.9	60.8	61.6

227. As the Table 41[1] shows noise level near the residential area is within the norm. As a result, there was no need for 24 hour noise measurements in the above mentioned point.

D.1.4 Vibration

228. On May 1-5 of 2018, the baseline measurements were accomplished in 11 buildings and premises located in the project zone to identify the degree of vibration of the buildings/structures caused by the road transport.

229. As the preliminary measurements at the buildings found in the project zone suggest, the value of baseline vibration is 40-50 times less the admissible level(According to the DIN standards requirements). All 11 structures found in the project zone have been built in the last 10 year, and as the results of the measurements of the baseline vibration evidence, we can assume that they are seismically solid. Following the solid state of the buildings in the project zone, additional mitigation measures in the construction phase to avoid or mitigate the vibration impact are not necessary.

230. The vibration baseline measurements demonstrated that the on average, vibration indicator on the buildings and premises located near the project zone varies from 0.2 to 0.1 mm/sec what is much less the admissible level. Following the implementation of the project, the vibration level will diminish further, as in Gelovani Avenue where the buildings and premises are located, the number of vehicles will reduce by 25% as compared to the present level. The number of vehicles will increase by 25% on the right bank of the Mtkvari River where there are no buildings and premises. The expected vibration level 20 years after the implementation of the project will reach its maximum 0,4-0,5 mm/sec.

D.1.5 Hydrology

231. This section presents an overview of catchment wide pressures that affect the ecological conditions in Mtkvari River.

232. The river Mtkvari is the major water artery of the eastern part of Southern Caucasus. It starts in Turkey at 2720 m above sea level and enters the Caspian Sea in Azerbaijan. The total length of the river is 1364 km, basin area is 188000 km^2. The length from the start of the river till Tbilisi is about 478 km.

233. Flow regime of the river has been studied by the several hydro-meteorological stations and by means of special observations at Tbilisi water measurement station. The river Mtkvari is fed by the mixture of sources. The snow, rain, ground and glacier waters are involved in its formation. The period of high water levels is the spring period (from March till April - 50-60% of annual flow). The summer flow is 20-30% and the winter is 10-14%. The spring flooding starts at the end of March, reaches its maximum at the beginning of May, sometimes it lasts till June. Decreasing of flow level lasts till the end of July, sometimes till the mid of August. In some years the flooding phase is disturbed by inundations causing the instability of summer low water level. The water level rise is observed in September-October, often the water level is high. The winter water level is relatively stable, for this period water level and discharge are characterized with minimum values. The river is characterized with instable freezing evens.

234. The observations over the Mtkvari River water by the National Environmental Agency were carried out for 14 sections, with the sections near Zahesi HPP and Vakhushti Bridge being the nearest to the project zone.

235. River Mtkvari, Zahesi: 12 samples were taken in the current year. Oxygen content was satisfactory. Biochemical consumption of oxygen (BCO) varied from 0.6 to 3.67 mg/l, and chemical oxygen demand (COD) varied within the limits of 3.92-10.78 mg/l. Mineralization varied within the limits of 210.9-462.3 mg/l. The maximum value of 462.3 mg/l was fixed in January. Ammonium nitrogen concentration exceeded MAC (maximum admissible concentration based on Georgian standards) in two samples only and its value varied from 0.025-0.43 mgN/l. Maximum value of 0.43 mgN/l (1.1 MAC) was fixed in January. Nitrate and nitrite nitrogen, phosphates, chlorides, magnesium, potassium,

sodium, calcium, sulphates, oil products, copper, lead, zinc, iron and manganese concentrations did not exceed MAC (maximum admissible concentration) values3.

236. River Mtkvari, Vakhushti Bridge: 12 samples were taken in the current year. Oxygen content was satisfactory. Biochemical consumption of oxygen (BCO) varied from 0.81 to 5.81 mg/l. Mineralization varied within the limits of 230.1-426.3 mg/l. The maximum value of 426,3 mg/l was fixed in December. Ammonium nitrogen concentration in most samples exceeded MAC (maximum admissible concentration) and varied from 0.001 to 1.213 mgN/l. Maximum value of 1.213 mgN/l (3.1 MAC) was fixed in November. Average annual concentration was 0.521 mgN/l (1.3 MAC). Nitrate and nitrite nitrogen, phosphates, chlorides, potassium, sodium, calcium, magnesium, sulphates, copper, lead, zinc, iron and manganese concentrations did not exceed MAC (maximum admissible concentration) value.

Table 38: Avarange concentration of some elements in Mtkvari river, August 2018 (Source NEA)

	Parameter	Result (during 2017 years)	Maximum Permissible concentration (IFC)	Maximum Permissible concentration (National/GEO standard)
	Biochemical Oxygen Demand (BOD)	0.81 to 5.81 mg/l.	30 mg/l	30 mg/l
	Mineralization	230.1-426.3 mg/l	-	1000 mg/l
	Total nitrogen	0.001 to 1.213 mgN/l	10 mgN/l	-

237. The water level in the Mtkvari River is regulated by means of Zahesi water reservoir located 8.4 km from it. Consequently, the water level and flow in the Mtkvari River are not natural.

338. The project zone is distanced from the Mtkvari River by 10 m from the area where the project envisages only removal of the road pavement and laying the new pavement. The River Mtkvari is distanced from the area where the underpass is planned to construct by 50-60 m.

D.1.6 Geology

239. The region, within which the surveyed site is located, in geotechnical terms is located in the north-eastern part of the Lesser Caucasus Mountains, within the eastern inundation

3 Source: Monthly biuleten prepared by National Environmental agency http://nea.gov.ge/ge/service/garemos-dabindzureba/7/biuleteni/

of Ajara-Trialeti anticline zone (Tbilisi sector). In terms of geology, the survey site and its 240. Adjacent area are structured with Mid- and Upper Oligocene (P^{2+3}) rocks. Rock lithology is represented by sandstones and mudstone, various thickness strata of which form benches containing their different ratios. Between sandstones and mudstone, siltstone interlayers are also found. Structurally, the rocks are developed in the axial part of the eastern inundation pericline of the Lisi anticline. Within the site, strata direction (dip azimuth) is south-western (120-145 degrees), while dip angle varies from 10 to 20 degrees.

241. Within location area of the project area, Oligocene hard rocks are overlaid by quaternary contemporary anthropogenic mounds and fill-up ground (tQ_{IV}).

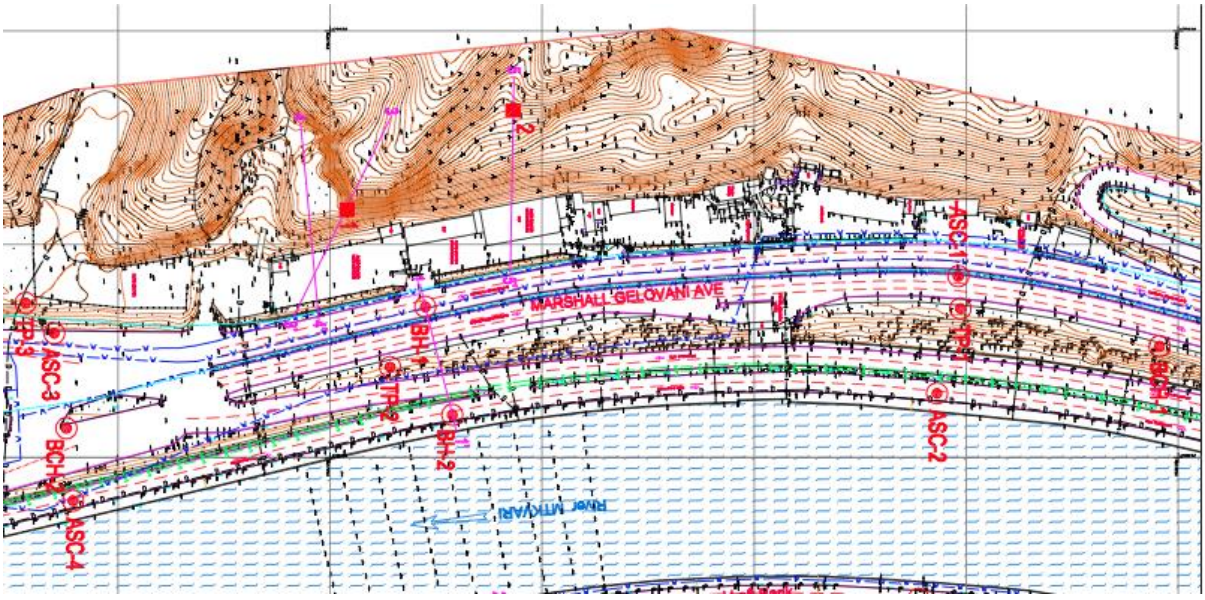
242. Within the discussed site or adjacent to it, according to the existing literature and archive materials, there are no seismic faults, though tectonic faults are registered in many outcrops along the Mtkvari embankment.

243. With the aim of conducting a detailed geological survey of the project area, the following works were accomplished in the project zone:

1. Two, 1,5 m-deep trial holes were excavated (TR);
2. Four boreholes were drilled: (i) BCH -1: 12 m-deep; (ii) BCH 2: 17-m-deep; (iii) BH-2: 7,5-m-deep and (iv) BH-1: 7.5-m-deep.
3. With the aim to study the existing road pavement, four 1.0-meter-deep pits were drilled (ASC).

244. The coordinates of the accomplished works are given in **Figure 35.**

Figure 35: Points of the geological surveys in the project zone



D.1.6.1 Soils and hard Rocks Investigation Results

245. Around the geological environment of the survey area, based on in-situ and laboratory test data, 4 soil and 2 hard rock varieties are distinguished. Description of the varieties and their depth ranges in the boreholes are given in **Table 45** below.

Table 39: Description of soils and rocks varieties, their distribution and stratum thickness (as per boreholes and outcrops)

Stratum	Description of Strata and Geological Index	Stratum depth, m thickness, m			
		BH-1	BH-2	BCH-1	BCH-2
1	Angular cobbles, boulders, angular gravel, loose (FILL)	Separated visually			
2	Crushed stone below asphalt cover (FILL)	0.1-0.5 0.4	0.3-0.5 0.2	-	03-08 0.5
3	Slightly moist, brown and grayish at some places, very stiff, slightly sandy, slightly gravely (22-47%), silty CLAY with some cobbles content, with household and construction debris content (FILL)	0.5-2.6 2.1 3.5-4.0 0.5	0.5-4.8 4.3	0.0-7.5 7.5	0.8-5.8 5.0
4	Saturated, grayish-brown, clayey, slightly sandy GRAVEL with cobbles and boulders content	2.6-3.5 0.9	4.8-10.0 5.2	-	5.8-12.0 6.2
5	Slightly weathered, gray, fissured, fine and medium grained, moderately strong, medium and thickly bedded (20-90cm) SANDSTONES with dark gray, moderately strong, thinly bedded (2-10cm) thin mudstones (5%) interlayers [P^{2+3}] 3	4.0-20.0 >16.0	10.0-40.0 30.0	9.1-12.0 2.9	-
6	Slightly weathered, gray, fissured, moderately strong, very thin and thinly bedded (2-20cm) SANDSTONES (60%) with dark gray, moderately strong, very thin and thinly bedded (2-10cm) thin mudstones (20%) and medium-bedded (25-30cm) strong sandstones interlayers [P^{2+3}]	–	–	7.5-9.1 1.6	12.0- 17.0>5.00

246. There are only technogenic varieties distinguished among the nonrocky soils represented here as planned arrangement of fills and fill grounds. Both clayey and coarse

grained sub-group soils can be distinguished among them. In the coarse grained soils, in its turn, there are 3 different varieties which are distinguished by their composition and condition. Coarse grained inclusions of different percentage can be observed here - angular gravel, gravel, angular cobbles and boulders.

247. Separate description of the layers (conditionally named as “Stratum”) of the project road line are given below. Geotechnical description of the strata is based on the field visual examination and on the results of testing of the samples taken from these strata:

STRATUM-1 – angular cobbles, boulders, angular gravel, loose. The stratum represents coarse grained soil which was cut and then thrown down from the upper part of the slope (tQIV). The statum was revealed just at small areas of the project area. There were neither boreholes nor trial pits arranged in this stratum. Therefore, this stratum was not tested in laboratory and its description and assessment is given according to the visual examination. Density value (bulk density - ρ) of the Stratum 1 can be accepted as 1.95 g/cm^3.

STRATUM-2 – Crushed stone. The stratum thickness in different boreholes varies from 0.2 to 1.1 m. The stratum represents fill of the road-base below the asphalt cover (tQIV). The stratum is dense. This stratum was also investigated using the shallow boreholes which were drilled at the project area specially for road-base and asphalt cover assessment.

STRATUM-3 – Slightly moist, brown and grayish at some places, very stiff, slightly sandy, slightly gravely (22-47%), silty CLAY with some cobbles content, with household and construction debris content. The stratum represents a soil which was placed at the project area at different times and the major portion of this soil represents road fill (tQIV). It is assumed that this fill was arranged here according to a plan, was compacted and is quite dense. Meanwhile, it should be mentioned that this fill was arranged a long time ago which stimulated its consolidation as well. Grain-size composition and physical properties were determined using 6 samples from different boreholes.

STRATUM-4 – Saturated, grayish-brown, clayey, slightly sandy GRAVEL with cobbles and boulders content. As well as the above Stratum 3, this stratum represents a soil which was places at the project are at different times for roads and other structures arrangement (tQIV). It is assumed that this fill was also arranged here according to a plan, was compacted and is quite dense. The grain-size composition and physical properties were determined using 2 samples from different boreholes.

Hard Rocks Investigation Results

248. Rock lithology is represented by sandstones and mudstone. The strata have different thicknesses and in the suite they form benches with different ratios of these rocks. Within the rock mass, in general, sandstones are prevalent. Individual sandstone strata differ from each other both, in thickness (their thickness varies from 1-2 cm to 70-80 cm) and in strength. It should be mentioned, that the strength of sandstone, with one exception, varies from 5 to 79 MPa. As for mudstone, in the sandstone they are represented by 1-5, sometimes 10 cm thick interlayers, and in these interlayers too fine, strong sandstone micro-layers are often found; therefore, while testing the mudstone, relatively high value of

strength, 5-25 MPa, is registered. It should be also noted, that by borehole, in the top part of sandstones and mudstone alternation suite, no significant weathering is observed. A weathered zone to 2-3 m is registered in the surface part of the mass denudated on the right and left embankments of the Mtkvari, where the weathering has been caused by the action of exogenous processes (temperature fluctuations, watering/drying, winter frosts, wind, etc) throughout a long period of time. Weathering mostly shows in the form of increased rock fissuring and decreased density of the mass. In this zone rock strength, including mudstone strength, is also lowered to some degree. From the weathered zone, as well as from the slightly weathered zone, on the steep artificial slopes there is constant stone fall due to fissuring, which means the requirement for their stabilization.

249. Based on the ratio of rock lithologies, on the site of the Project roads, two units are differentiated, in one of which thick-layered sandstones make up 95%, and in the other – up to 80%. Existence of such units is seen in borehole data as well as on the r. Mtkvari right slope, where the top part of lithologic section is well seen on the artificially cut down, high, steep slopes.

250. Hard rocks have been investigated in accordance with lithologies. Test samples have been taken from boreholes as well as from the outcrops on the slopes. It was possible to take samples of proper shape and size for unconfined strength test, while from mudstone it was only possible to take shapeless samples, which were tested by point load method. Point load test was also performed on sandstone samples too (**Table 46**).

Table 40: Results of Study of Existing Road Pavement

No. of Shallow Borehole	Location (coordinates)		Depth (m)	Lithological Description
	x	y		
ASC-1	*480814.93*	*4621396.25*	0.0-0.18	Asphalt concrete
			0.18-0.85	Slightly moist, sandy clayey gravel; the gravel is sub-angular and sub-rounded - Fill
			0.85-1.00	Slightly gravely clay; the gravel is angular and sub-rounded, up to 30%; the soil is intermediately plastic - Fill
ASC-2	*480869.87*	*4621386.21*	0.0-0.26	Asphalt concrete
			0.26-1.00	Slightly moist, sandy clayey gravel with a little cobbles inclusions - Fill
ASC-3	*480841.66*	*4620969.98*	0.0-0.27	Asphalt concrete
			0.27-1.00	Slightly moist, sandy clayey gravel with cobbles content; the gravel and cobbles are angular and sub-rounded - Fill
ASC-4	*480920.13*	*4620978.90*	0.0-0.20	Asphalt concrete
			0.20-0.60	Slightly moist, sandy clayey gravel with cobbles content; the gravel and cobbles are Sub-angular and sub-rounded- Fill

			0.60-1.00	Moist, stiff, slightly sandy, slightly gravely clay; the gravel is sub-angular, up to 10%; occasionally with construction debris inclusions (brick fragments); the soil is intermediately plastic - Fill

D.1.7 Seismic conditions

251. The study area is located in the environs of Tbilisi, which, under Annex #1 of the "Antiseismic construction" (PN 01.01.-09) of the effective Building Norms and Rules of Georgia, is in the 8-point earthquake zone (MSK 64 scale). The dimensionless coefficient of seismicity (A) of the region is 0,15 (Digomi village). Seismic zones of Georgia are presented in the **Figure 36** below.

Figure 36. Seismic zones of Georgia

D.1.8 Geomorphological Conditions

252. The survey segment of the river Mtkvari valley, which includes the surveyed site, has East- West direction. According to bulky land forms, it is located in the south-western sector of Tbilisi cauldron. Its southern part is confined with the northern branch of the Lisi ridge anticline morphological structure of the Trialeti mountain range. The valley is asymmetrical here. The left bank represents a widely-spread denudation-aggradation terrace II (Didube Terrace), while on the right bank, the steep slope of the Lisi ridge eastern end directly abuts the river bed. The river bed is roughly cut between the said terrace and the slope base. The river bed sinking from the left terrace surface is 10-12 meters. The eastern slope of the Lisi ridge is striated with erosion gullies and during considerable precipitation on the bottoms of some of these gullies temporary torrents are formed. On the project site and in its vicinity there are 3 such sharp erosion gullies. The naturally formed sides of the gully are steep. Steeper and almost vertical are the slopes on the sites where they are artificially cut down for location of different buildings and

structures. On some such sites there is a risk that slopes might collapse or large stones fall.

253. Before the embankment walls were arranged, the Mtkvari river-bed was wider and represented the flood land alluvial terrace. At present the river bed is restricted with bank walls. Behind the walls, the space is filled with man-made soil (mound) on both sides of which there are embankment motor roads located at 6-7 m height above the river bottom.

D.1.9 Main landscape

254. The physical-geographical sub-region of Tbilisi basin presents a combination of three types of landscapes, in particular:

1. Floodplain tugai forest landscape on the right bank of the River Mtkvari of the sub-region with a fragmental distribution of a floodplain forest landscape. It is developed south of Tbilisi, in the environs of Ortachala and on the right bank of the River Mtkvari, in Digomi Valley and Kvemo Avchala areas.
2. Plain beard-grass and beard-grass and feather-grass valley landscape developed on the terraced bay and brown soils. This type of landscape occupies the plain part of the basin: Digomi plain, Kvemo Avchala plain, Saburtalo and Delisi plains, etc.
3. Oriental hornbeam, oriental hornbeam-oak and shibliak landscape developed on a hilly-hillock piedmont forest Cinnamonic (and partially brown) soils. This kind of landscape covers quite a vast area of Tbilisi basin and is developed on eastern piedmonts of Trialeti Ridge and on the left side of the Mtkvari River, where it is clearly seen on the western slope of Gare Kakheti Plateau, but the piedmont landscapes are not so widely spread in this area.

255. There is a technogenic landscape presented in the project area as a result of the road construction works of the Highway.

D.2 Ecological Resources

D.2.1 Flora

256. The project zone is under a strong urban impact. In respect of flora, this is a less sensitive site. The results of the detailed studies accomplished within the scope of the project are given below.

Description N1:GPS Coodrinates: 317285/4675555. 310 m asl - A site of a minor sensitivity.

257. South of the road, near the bridge. A row of artificially grown pine trees (Pinus nigra Arn.) mixed with some poplar trees (Populus gracilis Grossh.) is presented along the road running downwards (which links to the main road).

Figure 37: A row of artificially grown pine trees (Pinus nigra Arn.) mixed with some poplar trees

Figure 38: A row of artificially grown pine trees (Pinus nigra Arn.) mixed with some poplar trees

Description N2:GPS Coodrinates: 480808/4021472 - 324 m asl - A site of a minor sensitivity.

258. South of the main road, neat Gulf fueling station. Here is a row of artificially grown cypress trees (Cupressus sempervirens L. var. pyramidalis Targ. – Tozz.) mixed with someailanthus (Ailanthus altissima (Mill.) Swingle), which are run wild. On the same side, in the direction of the “Tiger and fellow” monument, there are restaurants and shops along the road with artificial plantings between and in front of them, such as cypress trees, poplar trees, wild apricot trees (Armeniaca vulgaris Lam.) and thuja bushes (Tuja orientalis L.).The following species growin the artificial grass cover: Pterotheca sancta (L.) K. Koch, Erodium cicutarium (L.) L’Her., Senecio vernalis Waldst. Et Kit. , etc.

Figure 39: Gulf’s petrol station

Figure 40: cypress and poplar trees

Figure 41: Artificial plantings

Figure 42: Pterotheca sancta

Figure 43: Erodium cicutarium

Figure 44: Senecio vernalis

Description N3: GPS Coodrinates: 480833/4621099, 346 m asl - A site of an average sensitivity (owing to the walnut trees).

259. On the same (south) side of the road, there are two walnut trees (Juglans regia L.) growing along the road as a part of roadside landscaping. These trees are degraded (their perimeter at the height of a human breast is 100cm, and their height is 6-7 m). One Black Locust (Robinia pseudoacacia L.) also grows at this location.

Figure 45: Juglans regia

Figure 46: Juglans regia

Description N4:GPS Coodrinates: 480840/4620899,361 m asl:- A site of a little sensitivity.

260. South of the road, near the monument “Tiger and fellow”. There are ailanthus sprouts andsome individual young Black Locust trees growing at this location. Above the road, on a cliffy slope, there grows cliff (petrophilic) vegetation presented by the following species: Reseda lutea L., Fumaria schleicheri Soy. –Willem., Mathiola odoratissima (Bieb.) R. Br., Carduus seminudus Bieb., Parietaria judaica L., Astragalus sp. , etc. Of the bushes, spiraea (Spinaea hypericifolia L.), Christ’s thorn (Paliurus spina-christi Mill.) and colutea (Colutea orientalis L.) grow at this location.

Figure 47: Parietaria judaica

Figure 48: Mathiola odoratissima

Figure 49: Fumaria schleicheri

Figure 50: Carduus seminudus

Description N5:GPS Coodrinates: 480861/4620843, 387 m asl - A site of a minor sensitivity.

261. Northern edge of the (ascending) road, near the “Tiger and Fellow” monument. Artificially planted plane trees (Platanus orientalis L.) and naturally growing ailanthus sprouts (Ailanthus altissima (Mill.) Swingle) are seen at this location. Adjacent to the monument, there is a lawn with grassy and bushy plants. In the square in front of the monument, on the “island”, there grow lavender and juniper.

Figure 51: naturally growing ailanthus sprouts (Ailanthus altissima (Mill.)

Figure 52: grow lavender and juniper on the "island"

Description N6: GPS Coodrinates: 480870/4621065, 390 m asl - A site of a minor sensitivity.

262. Northern edge of the upper road. At the beginning of the road, near the square, there grows a mature Black Locust tree (Robinia pseudoacacia L.). Then, westwards, the road is followed by double rows of thuja (Tuja orientalis L.) lawn, including spiraea (Spinaea hypericifolia L.) bushes as well. On the same slope, between the lower and upper roads, there is an artificially grown pine forest (Pinus eldarica Medw.), mixed with mulberry (Morus sp.) and wild apricot trees (Armeniaca vulgaris Lam.).

Figure 53: Thuja lawn

Figure 54: Robinia pseudoacacia

Description N7: GPS Coodrinates: 480834/4621244**,**395 m asl - A site of a little sensitivity.

263. All along the upper road, in the middle of it, there grows a lawn of Tuja and other bushes.

Figure 55:Tuja and other bushes grows along the upper road

Figure 56: Tuja and other bushes grows along the upper road

Description N8: GPS Coodrinates: 480829/4621403**,** 399 m asl - A site of an average sensitivity (because of the walnut trees on the site).

264. Young degraded walnut trees (Juglans regia L.) with the height of 4-5 m grow along the northern edge of the road, continued with thuja lawn and artificial pine forest northwards, on the slope between the lower and the upper roads.

Figure 57: walnut trees (Juglans regia L.)with the height of 4-5 m

Figure 58: walnut trees (Juglans regia L.) with the height of 4-5 m

Description N9:GPS Coodrinates: 480852/4621527**,** 403 m asl - A site of a Minor sensitivity.

265. On the northern edge of the upper road, there are thuja lawn and artificial pine forest growing, with naturally mixed Black Locust (Robinia pseudoacacia L.), barberry (Berberis vulgaris L.), Spannish broom (Spartium junceum L.), Chinese wolfberry (Lycium barbarum L.) and fig trees (Ficus carica L.).

Figure 59: Thuja lawn, artificial pine forest and natural vegetation

Figure 60:Thuja lawn, artificial pine forest and natural vegetation

266. As the conducted studies evidence, there are four nut trees in the project zone, which are the species included in the Red Book (**Table 70**).

Table 41: Plants on the Red Book

No	Latin name	Georgian name	Category of state and protection status	Basis for inclusion in the Red Book	Verbal explanation of the basis for inclusion in the Red Book
1.	**Juglans regia L**	Nut tree	VU4	A2	Small fragmented area

Protected areas

267. The nearest protected area to the project zone is Tbilisi National Park. However, if considering the distance to it (15 km), any negative project impact on the National Park is virtually out of question.

D.2.2. Fauna

268. The report is based on the literary review, past field works, which are not published yet and results of the field surveys (held on April 18-19, 2017). The goal of the field works was to identify the important habitats of the animals found in the project-affected area and common animal species in the area.

269. The report makes a particular accent on the fauna species protected by the legislation of Georgia and international agreements (Red-Listed species, species protected by Bonne Convention, etc.).

4VU – (vulnerable) – vulnerable taxon

270. The impact of terrestrial fauna will not be significant, as the site of the underpass construction and road reconstruction has long been within the limits of Tbilisi and it is the highway from the central part of the city to Digomi and Avchala and to West Georgia. It is overloaded with traffic and creates a much disturbing factor: noise, dust, vibration and vehicle emissions in particular. Therefore, the animals try to avoid this location and their population is very little, both in respect of species and number of individuals.

271. Consequently, cutting down several tens of green plantings will not have a decisive impact on the species found in this area.

Species protected by the Georgian legislation and international conventions, which may appear in the study area

272. Based on the literary sources (Bukhnikashvili, 2004; Bukhnikashvili et al. 2008; Gurielidze, 1996; Janashvili, 1963; Bannikov et al., 1977; Tarkhnishvili 2013; Tarkhnishvili, Gokhelashvili 1999) and our and our colleagues' unpublished data, 58 species of mammals, 159 bird species (only nesting or wintering species), 24 species of reptiles and 7 species of amphibians, including 19 Georgian and international Red-Listed species, may appear in the study area.

273. Below is the list of the Georgian Red-Listed terrestrial vertebrates, which may inhabit Tbilisi and its environs.

274. All bat species spread in Georgia are included in Annex II to the Bonne Convention and are protected by the EUROBATS Convention. The presence of 25 bat species is confirmed in the construction area and near it. However, 3 other species are also probable, as they are identified in the areas adjoining the study areas, on Trialeti Ridge. Four cheiroptera species: Mediterranean horseshoe bat (*Rhinolophus euryale*), Mehely's Horseshoe Bat (*Rhinolophus mehelyi*), Greater Noctule Bat (*Nyctalus lasiopterus*) andWestern Barbastelle (*Barbastella barbastellus*) are on the Red List of Georgia and IUCN in the category of a vulnerable taxon (Red List of Georgia 2006; IUCN Red-Listed Endangered Species, 2017). The cheiroptera are one of the vulnerable groups of the terrestrial mammals found in the area of the underpass construction and road reconstruction in Marshal Gelovani Avenue and Akaki Bakradze street. It is difficult for the cheiroptera to find the shelters for their colonies. The areas suitable as shelters such as hollow trees and attics and basements of the buildings are very important for their wellbeing. By cutting down the hollow trees during the vegetation clearing works, the wintering and breeding areas of the bats may be destroyed.

275. No large key habitats of endangered bat species are found immediately in the construction area.

Endemic species

276. 4 endemic vertebrates may be in the impact area of the underpass construction and road reconstruction and exploitation. The exact number of endemic invertebrates in Tbilisi and its environs is hard to name, as no relevant studies have been undertaken so far. We can only mention the endemism of the protected invertebrate species (**Table 71**). As for the sub-species, most of them are Caucasian endems and some are Georgian endems.

Table 42: Endemic vertebrate animal species, which may appear in the construction works impact area

№	Latin name	Georgian name	Protection status
	Mammals		
	Talpa caucasica	Caucasian mole	LC
	Sorex volnuchini	Caucasian Pygmy Shrew	LC
	Reptiles		
	Darevskia derjugini	Derjugin's Lizard	LC
	Darevskia portschinskii	Kura-Felseidechse	LC

Table 43: Endemic invertebrate animal species protected by the law, which may appear in the construction works impact area

#	Latin name	Georgian name	Red List of Georgia
	Insects		
1	*Zygaena fraxini*	Burnet moth	VU
	Amphipods		
1	*Pontastacus pylzowi*	Thick-clawed Crayfish	VU

Field study results

277. The main goal of the field studies was to identify the animal species spread in the study area and evaluate the zoological significance of the impact area of the underpass construction and road reconstruction works in Marshal Gelovani Avenue and Akaki Bakradze street. The field study (of April 18-19, 2018) covered the area in Marshal Gelovani Avenue and Akaki Bakradze street covered with green plantings and slope in the southern part of Marshal Gelovani Avenue. This area is referred to as the study area in the following sections.

278. The important habitats and study area were marked by using the manual GPS device and were photographed. The principal methods used during the field works is walking along the route and local observations.

279. 1-km-long route was walked both, in Akaki Bakradze street on the opposite side of the Mtkvari River and both sides of Marshal Gelovani Avenue, as well as mountain slope south of the Avenue.

280. During the walks at midday and in the evening, only four bird species were identified: at N41.746706° E44.770525° / N41.7429740° E44.769670° in Akaki Bakradze street, two male Eurasian Blackbirds (*Turdus merula*) were identified on the small slope between Akaki Bakradze street and Marshal Gelovani Avenue. A Eurasian Blackbird and a flock of House Sparrows (*Passer domesticus*) (5 or 6 of them) were fixed on the slope south of Marshal Gelovani Avenue, at N41.744383° E44.769559°, as well as Great Tit (*Parus major*) at N41.743614° E44.767520°. A grass lizard (*Lacerta sp.*) was also seen at the same location, but its species could not be identified because it escaped swiftly. On the same side, but on the edge of the road, at coordinates N41.74554° E44.76947°, a nest of a Carrion Crow (*Corvus cornix)* was found (**Fig. 61 and 62**).

Figure 61: The crow's nest in the abele (far shot)

Figure 62: The crow's nest in the abele (close shot)

281. In the evening, two bat species were identified with an ultrasound detector (**Fig. 63**): Common Pipistrelle (*Pipistrellus pipistrellus*) and Kuhl's Pipistrelle (*Pipistrellus kuhlii*) at Gulf fueling station, at coordinates: N41.747005° E44.770593° and in small field, near the former Industrial College and Agrohub hypermarket, at N41.743614° E44.767520°. Kuhl''s Pipistrelle was identified at the pedestrian bridge in Marshal Gelovani Avenue, at coordinates: N41.745239° E44.765845° and in the small field near the former Industrial College and Agrohub hypermarket, as well as near an isolated house in Akaki Bakradze street, at coordinates: N41.747598° E44.768976°.

Figure 63: Observation with an ultrasound detector

282. In the study area, Common Swifts (*Apus apus*) and Armenian gulls (*Larus armenicus*) flew in the sky. No other animal species were identified in the study area.

Review

283. As the obtained data evidence, in April of 2018, 9 vertebrates including 2 mammals, 6 birds and one reptile, were fixed in the study area. By considering the site degradation and

disturbing factor, we can suppose the presence of 10 to 15 more species. Of mammals, Lesser White-toothed Shrew*(Crocidura gueldenstaedtii)*, mouse (*Mus musculus*), pygmy wood mouse (*Sylvaemus uralensis*), Steppe field mouse (*Sylvaemus fulvipectus*), brown rat (*Rattus norvegicus*); of birds: Caspian gull (*Larus cachinans*), Great Cormorant (*Phalacrocorax carbo*), common redstart(*Phoenicurus phoenicurus*), song thrush (*Turdus philomelos*), garden warbler (*Sylvia borin*); of reptiles: Caucasian emerald lizard (*Lacerta strigata*), sand lizard (*Lacerta agilis*), European cat snake (*Telescopus fallax*); of amphibians: Variable Green Toad (*Bufo variabilis*) - all of these species, except syntrophic house mouse and brown rat, as well as gulls and Great Cormorant, are common in the study area. Other species given in the annex either never appear in this area, or may appear extremely rarely, by chance.

Conclusion

284. As a conclusion we may say that the diversity of the vertebrate animals in the study area is very low. As for invertebrates, the given time of the year is too early to make observations over them. The most appropriate time to study them in Tbilisi is June and July. Intense construction works are better to accomplish in the nesting period, from the second half of July until the next spring so that additional disturbing factor should not have a negative impact on the habitats of the small number of birds found in the bushes and forest derivatives on the slope south of Marshal Gelovani Avenue.

Sensitive areas and hazards

285. There are no sensitive areas in the study area, as the number of animals spread here is very low. The only bird nest fixed by us was that of a crow, which mostly feeds from Tbilisi landfills.

D.2.3 Ichthyofauna

Regional Distribution of Fish Fauna

286. Investigation of ichthyofauna of Georgia began in 19th century. These include (Cuvier-1829; Eichwald-1831: Elanidze -1983 Filippi – 1863; Gunther-1866; Kamensky -1897;, Radde -1899; Gudimovich -1953).

The species in the Mtkvari River Basin

287. In the **Table 76** provides a list of fish species of the Mtkvari/Kura River along with their distribution, and conservation status.The fish survey was held in 2017 by the Ltd. "Hagler Bailly"within the scope of survey of Tbilisi-Rustavi road construction project. The study was attended by the representatives of ADB, Ministry of Environment and Agriculture, Tbilisi City Hall and Surveillance offices, who approved the study results.

Table 44: Fish species of the Mtkvari/Kura River

No	Scientific Name	Common Name	IUCN Red List	Family

			Status	
1	Rhodeus sericeus	Bitterling	Least Concern	Cyprinidae
2	Rhodeus colchicus	Georgian Bitterling	Least Concern	Cyprinidae
3	Barbus lacerta	Kura Barbel	Least Concern	Cyprinidae
4	Luciobarbus capito	Bulatmai Barbel	**Vulnerable**	Cyprinidae
5	Luciobarbus mursa	Mursa	Least Concern	Cyprinidae
6	Capoeta capoeta	Caucasian Scraper	Least Concern	Cyprinidae
7	Capoeta sieboldii	Nipple-lip Scraper	Least Concern	Cyprinidae
8	Carassius carassius	Crucian Carp	Least Concern	Cyprinidae
9	Carassius gibelio	Prussian Carp	Not Assessed	Cyprinidae
10	Romanogobio persus	Kura Gudgeon	Not Assessed	Cyprinidae
11	Romanogobio macropterus	South Caucasian Gudgeon	Least Concern	Cyprinidae
12	Abramis brama orientalis	Eastern Bream	Not Assessed	Cyprinidae
13	Ballerus sapa	Zope	Least Concern	Cyprinidae
14	Blicca bjoerkna transcaucasica	Transcaucasian Bream	Not Assessed	Cyprinidae
15	Alburnoides bipunctatus	Spirlin, Riffle Minnow	Not Assessed	Cyprinidae
16	Alburnus filippi	Kura Bleak	Not Assessed	Cyprinidae
17	Acanthalburnus microlepis	Blackbrow Bleak	Not Assessed	Cyprinidae
18	Chalcalburnus chalcoides	Danube Bleak, Caspian Shemaya	Not Assessed	Cyprinidae
19	Aspius aspius	ASP	Least Concern	Cyprinidae
20	Aspius aspius taeniatus	Caspian Asp	Not Assessed	Cyprinidae
21	Chondrostoma cyri	Kura Nase	Least Concern	Cyprinidae
22	Rutilus Rutilus kurensis	Kura Roach	Not Assessed	Cyprinidae
23	Squalius cephalus	European Chub	Least Concern	Cyprinidae
24	Cobitis satunini	Colchic Spined Loach	Least Concern	Cobitidae
25	Tinca tinca	Tench	Least Concern	Cyprinidae
26	Barbatula angorae	Angora Loach	Not Assessed	Balitoridae
27	Oxynoemacheilus brandtii	Caucasian Sportive Loach	Least Concern	Balitoridae
28	Orthrias brandti	Kura Loach	Data Deficient	Balitoridae
29	Salmo caspius	Caspian Trout	Not Assessed	Salmonida
30	Oncorhynchus mykiss	Rainbow Trout	Not Assessed	Salmonida
31	Salmo trutta		Lease Concern	Salmonida
32	Neogobius pallasi	Caspian Monkey	Least Concern	Gobiidae
33	Ponticola cyrius	Caspian Freshwater Goby	Least Concern	Gobiidae
34	Proterorhinus marmoratus	Tubenose Goby	Least Concern	Gobiidae

288. The ichthyofauna of the Mtkvari River adjacent to the project zone has not been studied for recent decades. The project zone is found near the section of the River Mtkvari where HPPs are located in the River Mtkvari upper and lower reaches. In 11km from the project zone, in the upper reaches of the Mtkvari River, there is Zahesi HPP and there is Ortachala HPP in the lower reaches of the Mtkvari River, 8.4 km from the project zone (**Figure 64).**

Figure 64: Location of HPPs in relation to the project zone

289. Based on anecdotal evidence, the section of the river adjacent to the project zone is used by local residents for recreational fishing activities. As the Mtkvari River is bordered by 2 HPPs, the river is considered modified and has limited value for fish. Hence, secondary data based on a recent study was presented in this report.

D.3 Economic Resources

D.3.1 Economic

290. With a GDP at basic prices of 12,147 Million Georgian lari in 2014, Tbilisi is the economic center of the country, generating almost 50 percent of Georgia's GDP. The service sector, including government services, is dominating and contributes 88 percent to GDP. Its GDP per capita of 10,336 Georgian Lari is exceeding the national average by more than 50 percent. The service sector itself is dominated by the wholesale and retail trade sector, reflecting the role of Tbilisi as transit and logistics hub for the country and the South Caucasus. The manufacturing sector contributes only 12 percent to Tbilisi's GDP, but is much larger, by employment and total value added, than the manufacturing sectors

in any other region of Georgia. The unemployment rate in Tbilisi is – with 22.5 percent – significantly higher in Tbilisi than in the regions

D.3.2 Transport infrastructure

291. The city of Tbilisi has a complex public traffic network, with two underground lines and bus network covering the major part of the city. Starting from 2006, the ecologically pure transport, the operating lines of trams and trolley-buses were closed in the city. The city also has an airport and railway. One of the most convenient means of rapid public transit is Tbilisi underground with 22 stations along 2 lines, Didube-Samgori and Saburtalo lines. The total length of the underground lines is 26,4 km. In the project area, from David Agmashenebeli Highway, there penetrates an asphalted road with an approximate length of 2 km. The local grounds roads in the study area are well developed.

Airport

292. Shota Rustaveli Tbilisi International Airport is Tbilisi's only airport, located about 17 kilometres (11 miles) southeast of the city center. Handling 1.85 million passengers in 2015, it is the busiest airport in Georgia and the twenty-fifth-busiest airport in the former Soviet Union. The airport has experienced rapid growth, having more than doubled passenger numbers from roughly 822,000 in 2010 to approximately 1,847,000 in 2015.Tbilisi International Airport in 2016 started to utilize solar energy and became the first "green airport" in the Caucasus region in 2008.

293. The airport is the base of the Georgian flag carrier Georgian Airways.Natakhtari Airfield located at 33 km of Tbilisi, is in the town of NatakhtariIt is used only for domestic flights to Mestia, Batumi and Kutaisi.

294. A new airport between Tbilisi and Mtskheta is under construction.

Metro

295. The Tbilisi Metro serves the city with rapid transit subway services. It was Soviet Union's fourth metro system. Construction began in 1952 and was finished in 1966. The system operates two lines, the Akhmeteli-Varketili Line and the Saburtalo Line. It has 23 stations and 186 metro cars. Most stations, characteristic to Soviet-built metro systems, are extravagantly decorated. Trains run from 6:00 am to midnight. Due to the uneven ground, the rail lines run above ground in some areas. Two of the stations are above ground.

Minibus

296. The most dominant form of transportation is the minibus. An elaborate minibus system has grown in Tbilisi over the recent years. In addition to the city, several lines also serve the surrounding countryside of Tbilisi. Throughout the city, a fixed price is paid regardless of the distance (80 or 50 tetri in 2018). For longer trips outside the city, higher fares are common. As of April 2018, there are no predefined stops for the minibus lines,

except 14 streets,they are hailed from the streets like taxis and each passenger can exit whenever he likes.

Municipal bus

297. The second largest form of transportation are the municipal buses which are operated by Tbilisi Transport Company. As of July 2016, 672 buses of various size were servicing the city, all of them were Ukrainian Bogdan A144 (148 buses) and A092 (524 buses) models. In accordance to the Tbilisi City Hall's 4-year-long renovation program for the municipal buses on July 13, 2016 was signed an agreement with MAN Truck & Bus company to purchase 143 new energy efficient buses MAN Lion's City. On October 6, 2016 first new 10 buses were put into service on route 61. As it is planned rest of the buses will be received till the end of March, 2017

D.3.3. Water Supply, Sewage and Drainage Systems

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

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

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

D.4 Social and Cultural Resources

D.4.1 Population

301. The project zone is located on the intersection of Didube-Chugureti and Vake-Saburtalo districts. The major part of the project zone is located in Didube – Chugureti district in didube settlement.

302. Approximately 30% of the population of Georgia lives in Tbilisi. **Table 77** gives the population statistics in Georgia and in Tbilisi for the last 7 years. As the Table shows, the population of Tbilisi has decreased by 5,5% in 2015 as a result of the outcomes of the general census held in 2014. The results of the census can be used to explain a 17.4% reduction of the population in Georgia in 2015 as compared to 2014.

Table 45: Statistical indicators of the population of Georgia and Tbilisi

	2011	2012	2013	2014	2015	2016	2017
Georgia	4 469.2	4 497.6	4 483.8	4 490.5	3 713.7	3 720.4	3 718.2
Tbilisi	1 162.4	1 172.7	1 171.2	1 175.2	1 108.9	1 113.0	1 114.6

303. **Table 78** gives the statistical data of the births and deaths in 2010-2016 in Georgia and Tbilisi. As the Table shows, the recent years were characterized by a growth of the population of Georgia. In this case, 30% of the newborns of Georgia were born in Tbilisi.

Table 46: statistical data of the births and deaths in 2010-2016 in Georgia and Tbilisi

Year	2010		2011		2012		2013		2014		2015		2016	
	Birth	Death	Birth	Death	Birth	Death	Birth	Death	Birth	Death	Birth	Death	Birth	Death
Georgia	62 585	47 864	58 014	49 818	57 031	49 348	57 878	48 553	60 635	49 087	59 249	49 121	56 569	50 771
Tbilisi	16 212	11 645	16 715	12 291	16 573	12 459	17 010	12 356	18 048	12 403	17 509	12 377	16 784	12 720
Natural increase	14 721		8 196		7 683		9 325		11 548		10 128		5 798	

304. In 2010-2016, average 30918 marriages were registered in Georgia and the number of divorces in the same period was 7653 making 24,7% of the total marriage index.
289. As for Tbilisi, the number of registered marriages in the capital of the country in 2010-2016 was 8080 and that of divorces was 3050. The percentage value in this case is 37.7% exceeding the average country-level value (**Table 79**).

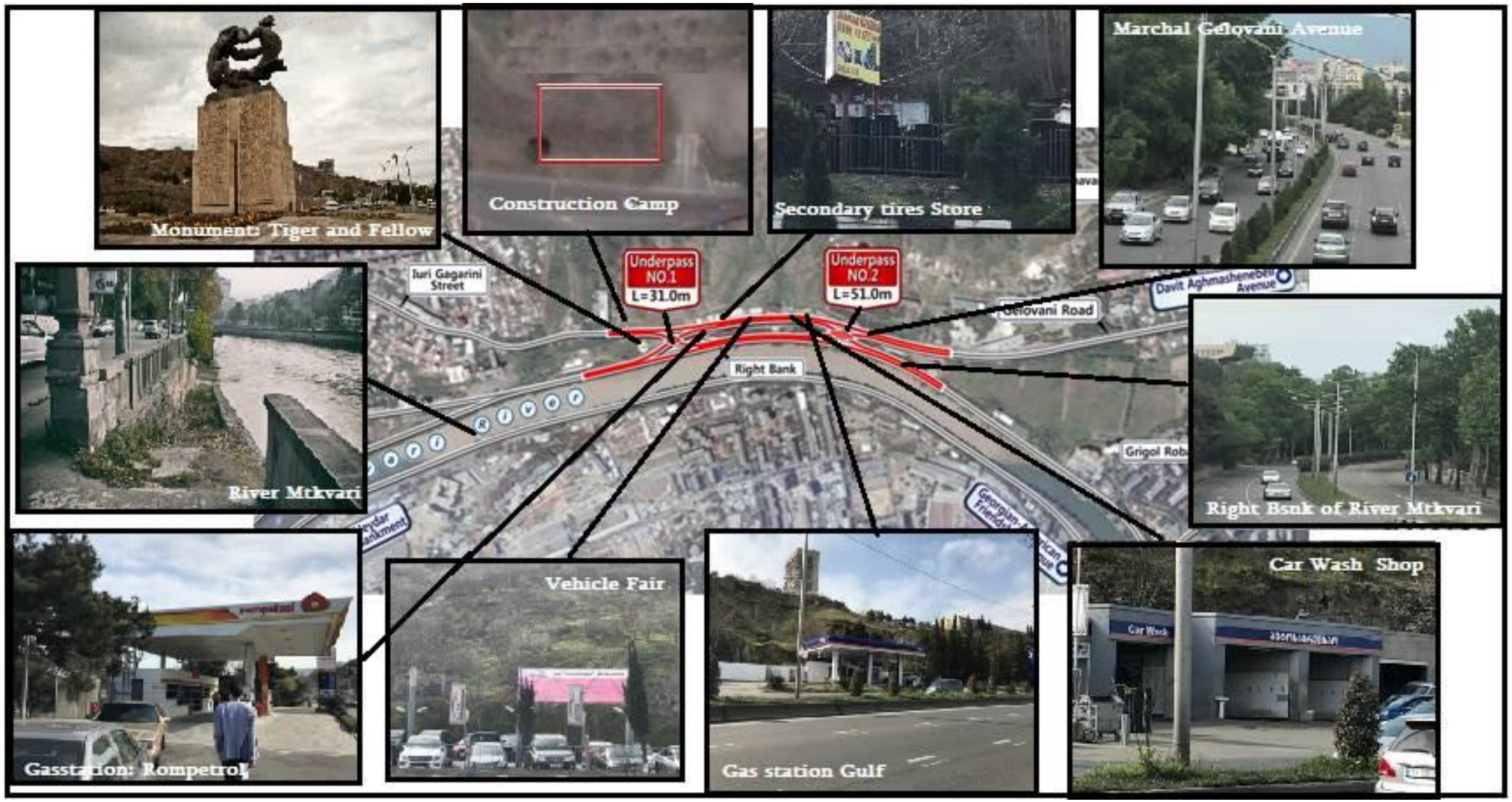
Table 47: Officials statistics of marriage and divorce

Year	2010	2011	2012	2013	2014	2015	2016

	Registered marriage	Divorce	Registered marriage	Divorce	Registered marriage	Divorce	Registered marriage	Divorce	Registered marriage	Divorce	Registered marriage	Divorce	Registered marriage	Divorce
Georgia	34 675	4 726	30 863	5 850	30 412	7 136	34 693	8 089	31 526	9 119	29 157	9 112	25 101	9 539
Tbilisi	8 333	2 242	7 895	2 528	7 669	2 883	8 571	3 063	8 541	3 346	8 249	3 601	7 304	3 688

305. There are 7 non-residential buildings located adjacent to the project zone,which are used for small and medium business activities such as: (i) two gas stations, (ii) a small market, which is located at one of the gas stations, (iii) oil store, located at the same gas station, (iv) car-washing area located at the same gas station, (v) vehicle fair and (vi) secondary tires store. The project will not have an impact on these buildings and premises either in the construction, or operation phases (Figure 65).

Figure 65: Sensitive reseptors



D.4.2 Demographics

306. As a multicultural city, Tbilisi is home to more than 100 ethnic groups. Around 89% of the population consists of ethnic Georgians, with significant populations of other ethnic groups such as Armenianss, Russianss, and Azerbaijaniss. Along with the above-mentioned groups, Tbilisi is home to other ethnic groups including Osetianss, Abkhazianss, Ukrainianss, Greekss, Germanss, Jewss, Estonianss, Kurdss, Assyrianss & yazidiss and others.

307. More than 95% of the residents of Tbilisi practise forms of Christianity (the most predominant of which is the Georgian Orthodox Church). The Russian Orthodox Church, which is in Full communion with the Georgian, and the Armenian Apostolic Church have significant followings within the city as well. A minority of the population (around 1.5%) practises Islam (mainly Shia Islam), while about 0.1% of Tbilisi's population practises Judaism. There is also Roman Catholic church and the Yazidi Sultan Ezid Temple.

D.4.3 Education

308.Tbilisi is home to several major institutions of higher education including the Tbilisi State Medical University and the Petre Shotadze Tbilisi Medical Academy, famous for their internationally recognised medical education system. The biggest Georgian university is Tbilisi State University which was established on 8 February 1918. TSU is the oldest university in the whole Caucasus region. Over 35,000 students are enrolled and the number of faculty and staff (collaborators) is approximately 5,000. Tbilisi is also home to the largest medical university in Caucasus region — Tbilisi State Medical University, which was founded as Tbilisi Medical Institute in 1918 and became the Faculty of Medicine within the Tbilisi State University (TSU) in 1930. Tbilisi State Medical Institute was renamed to Medical University in 1992. Since that university operates as an independent educational institution, TSMU became one of the high-ranking state-supported institutions of higher education in the Caucasus region. Currently, there are almost 5000 undergraduate and 203 postgraduate students at the university of whom 10% come from foreign countries.

309. Georgia's main and largest technical university, Georgian Technical University, is in Tbilisi. Georgian Technical University was founded in 1922 as a polytechnic faculty of the Tbilisi State University. The first lecture was read by the world-famous Georgian mathematician Professor Andria Razmadze. It achieved University status by 1990. The three most popular private higher educational institution in Georgia —The University of Georgia (Tbilisi), Caucasus University, and the Free University of Tbilisi — are in Tbilisi.

D.4.4 Cultural heritage

310. The archaeological excavations evidence that the territory of Tbilisi was settled as far back as in the IV c. B.C., with the earliest written evidence dated by the second half of the IV century when a fortress was built in this area during the reign of King Varaz-Bakuri. There are numerous archaeological sites on the territory of Tbilisi, but they are concentrated in the districts of Mamadaviti, Metekhi and Abanotubani and more westwards. There is Lochini site of ancient village 4 km from the area of the design alignment, which is an archaeological monument of an Early Feudal Age (IV-VI cc.) on the left bank of the Lochini River, on the territory of village Gamarjveba, 28 km from Tbilisi.

311. The site was named after its location where it was discovered. In 1952, a part of the site of ancient village was excavated. The monument is located on a low hill. It is bordered by a gully from the west and is reinforced with a 2-meter-deep artificial trench from three sides. The excavations revealed farming and residential premises and a underpass between them. Based on the literary data and results of the visual audit, there are no cultural or archaeological sites in the project zone. Monument "Tiger and Fellow" is located adjacent to the project and will not be affected by the project during the construction phase. The monument is found 15-20 m from the project zone, from the site where the project envisages the replacement of the road pavement.

E. Anticipated Environmental Impacts and Mitigation Measures

E.1 Introduction

312. During the initial stage of the IEE process, several potential environmental and social impacts of the project were identified. The baseline surveys were conducted keeping in consideration the potential impacts. In this chapter, the potential environmental and social impacts are evaluated. The impacts have been identified based on consideration of the information presented in previous chapters.

313. Present IEE included identification and weighting of positive and negative environmental, social, and cultural impacts at the construction and operation phases. It was based on the background information, design documents, and pre-defined quantitative and qualitative criteria of assessment.

E.2 Impact Assessment Methodology

314. The IEE process consisted of the six main activities that are common for similar studies conducted according to the international standards:

1. Collection of baseline data describing biophysical and social environment within the study area; desk studies and field surveys to address identified gaps in the existing data; update of information on topics and areas where significant negative impacts are expected.
2. Identification of the expected positive and negative impacts of the proposed works on the highway and of its operation thereafter; assessment of the likelihood and significance of the potential negative impacts; and development of mitigation measures.
3. Analysis of alternatives in terms of location, technology, design and operation, including the "no-project" alternative.
4. Development of the Environmental Management Plan.
5. Drafting of the IEE report.
6. Information disclosure and stakeholder consultation

E.2.1 Identification of Significant Environmental Aspects

315. The description of each impact will have the following features: (i) Type of activities (ii) scale of activities; and (iii) project area.

316.The general methodology used for impact assessment is described in **Annex 2**. It describes the process of impact identification and definition, significance rating, the mitigation, management and good practice measures. 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.

317. The following mitigation hierarchy will be utilized in selecting practical mitigation measures for unacceptable impacts as follows (in order of preference):

(i) Avoid the impact wherever possible by removing the cause(s).
(ii) Reduce the impact as far as possible by limiting the cause(s).
(iii) Ameliorate the impact by protecting the receptor from the cause(s) of the impact.
(iv) Providing compensatory measures to offset the impact, particularly where an impact is of high significance and none of the above are appropriate.

318. Based on the impact assessment methodology discussed in **Annex 2**, **Table 81** presents the possible impacts of the proposed Project. Each impact is discussed further in this chapter.

Table 48: Impact Screening

Aspect	Phase	Impact	Receptors	No. of Receptors Affected	Sensitivity of Receptors	Level of Public Concern	Timeframe	Consequence	Probability	Significance
Air Quality	Con.	Exhaust Emissions from construction vehicles	Nearby Businesses	**L**	**M**	**M**	**N/F**	**Med**	**Def**	**Med**
	Con	Dust from the movement of vehicles, stockpiles, etc.	Nearby Businesses	**L**	**M**	**M**	**N/F**	**Med**	**Def**	**Med**
	Oper	Vehicle Emissions from traffic using the road.	Nearby Businesses	**L**	**M**	**M**	**N/F**	**Med**	**Def**	**Med**
Noise	Con	Elevated noise levels from construction equipment.	Nearby Businesses	**L**	**M**	**H**	**N/F**	**High**	**Def**	**High**
	C/O	Elevated noise levels from vehicles using the road.	Nearby Businesses	**L**	**M**	**H**	**N/F**	**Med**	**Def**	**High**
Vibration	Con	Damage to properties caused during	Nearby Businesses	**L**	**L**	**L**	**N/F**	**Low**	**Def**	**Low**

		Construction activities								
	C/O	Damage to properties from vehicle movement vibration.	Nearby Businesses	**L**	**L**	**L**	**N/F**	**Low**	**Def**	**Low**
Soils	Con	Soil erosion on unstable slopes caused by poor construction works.	Nearby Businesses/ Water bodies	**M**	**L**	**M**	**N/F**	**Low**	**Poss**	**Med**
	Op	Soil erosion caused by poorly designed erosion protection measures, drainage, etc.	Nearby Businesses/ Water bodies	**M**	**L**	**M**	**N/F**	**Low**	**Poss**	**Low**
	Con	Soil contamination via spills and leaks of hazardous liquids from construction camps.	Nearby Businesses/ Water bodies	**M**	**M**	**M**	**N/F**	**Low**	**Poss**	**Low**
	Ope	Soil contamination via spills and leaks of hazardous liquids vehicle movement	Nearby Businesses/ Water bodies	**M**	**M**	**M**	**N/F**	**Low**	**Poss**	**Low**
Flora and Fauna	Con	Degradation/ fragmentation of habitat caused during site clearing	Flora	**M**	**L**	**M**	**N/F**	**Med**	**Def**	**Med**
	C/O	Degradation of aquatic habitat	Ikhtiofauna	**M**	**M**	**M**	**N/F**	**Med**	**Poss**	**Low**
	Con	Tree cutting.	Flora	**M**	**M**	**M**	**N/F**	**Med**	**Def**	**Med**
	Con	Physical damage (road kills, accident, loss of roosts/nesting sites, etc.)	Fauna	**M**	**M**	**M**	**N/F**	**Med**	**Poss**	**Low**

	Con	Noise, emissions, light pollution	Fauna	**M**						**Med**
Infrastructure and Transport	Con	Traffic delays due to road works.	Nearby Businesses	**H**	**N**	**H**	**H/F**	**H**	**Def**	**High**
	Con	Limited accessibility to properties as road works block access.	Nearby Businesses	**H**	**H**	**H**	**N/F**	**H**	**Poss**	**High**
	Con	Temporary disruption to utilities while they are removed to make way for construction works.	Nearby Businesses	**M**	**M**	**M**	**N/F**	**H**	**Def**	**Med**
Waste	Con	Pollution from hazardous waste from construction camps, etc.	Nearby Businesses	**M**	**M**	**M**	**N/F**	**Med**	**Poss**	**Med**
	Con	Pollution from inert waste from construction camps, etc.	Nearby Businesses	**L**	**L**	**M**	**N/F**	**Med**	**Poss**	**Med**
	Con	embankment spoil	Workers	**M**	**M**	**M**	**N/F**	**Med**	**Poss**	**Med**
OHS / Community Health and Safety	**Con**	Accidents and injuries during the construction phase.	Workers	**M**	**M**	**M**	**N/F**	**Low**	**Poss**	**Med**
Emergencies	**Con**	Fires, explosions, etc, at site.	Nearby Businesses	**M**	**M**	**M**	**N/F**	**H**	**Poss**	**Med**
Landscape visual change	**Con**	Visual change	Nearby Businesses	**M**	**M**	**M**	**H/F**	**Med**	**Def**	**Med**
	Ope	Visual change		**L**	**L**	**M**	**H/F**	**Med**	**Poss**	**Low**
Land Use and businesses	**Con**	Loss of land and property due to the new road.	Nearby Businesses Land plot owners	**M**	**M**	**M**	**N/F**	**Med**	**Def**	**Med**
	C/O	Reduced income for businesses no longer	Nearby Businesses	**M**	**M**	**M**	**N/F**	**H**	**Posss**	**Low**

		located by the road.								
Employment and accessibility	**Con**	Temporary employment for local community	Local population	**M**	**M**	**M**	**H/F**	**Med**	**Def**	**Med**

Key: H: High / M: Medium / L: Low / MAJ: Major / MOD: Moderate / MIN: Minimum / H/F: High Frequency / M/F: Low Frequency / L/F: Low Frequency / MED: Medium / DEF: Definitely / POSS: Possible: / UNLIKE: Unlikely.

319. Prior to the commencement of the construction works, the Construction Contractor is obliged to prepare the following environmental plans:

1. Site-specific environmental plan: to be submitted to the Supervision Consultant for approval.
2. Traffic management plan: to be submitted to the Supervision Consultant and traffic police for approval.
3. Noise management plan: to be submitted to the Supervision Consultant for approval.
4. Taxation of the trees to cut down: must be submitted to Tbilisi City Hall, who will specify the tree planting compensation fee.
5. Waste Managemen plan - The plan must be submitted to the Ministry of Environment and Agriculture of Georgia in an electronic format
6. WasteAsbestos-ContainingMaterialManagementPlan will be prepared if the asbestos-containing materials are fixed present at the project implementation stage.

E.2.2 Impact on the atmospheric air quality

320. Underpassconstruction involves the use of heavy machinery, bulldozers, excavators, graders needed for land clearance and other earthworks, vehicles and equipment to transport construction materials, workers, remove debris from the work area. The operation of heavy machinery, vehicles and other construction equipment result in fugitive emissions of carbon monoxide, NOx, SO_2, hydrocarbons, and particulate matter.

321. Dust generation during the construction works is associated with:

1. Earthworks, including topsoil stripping, excavations in cuts;
2. Transportation and storage of excavated ground (topsoil and subsoil to the storage locations; spoil to the disposal sites);
3. Transportation of fine materials (sand, gravel, cement etc.) from supplier sites, borrow pits and quarries;
4. Storage of construction materials.

322. Exhaust emissions are associated with the operations of vehicles and heavy equipment, like buldozers, excavators, cranes etc.

323. Emissions and dust generation may affect duildings located close to the construction sites (on both sides of the road) and residential areas along the material transportation routes. The vehicle and equipment emissions and dust are typical for any construction activities. The main receptor are SME representatives offices and shops located on the

both sides of the road. A distance of 10-20 m from the border of construction site. This impact is temporary and is estimated to be medium scale if not properly mitigated. In case of application of good construction practices the impacts could be minimized to minor and acceptable level.

324. It must also be considered that as the quality monitoring results for the last one year suggest, the indices of a number of components in the project zone exceed the admissible levels.

Mitigation

325. The Business area is not affected significantly by the construction related emissions. However, emissions of heavy machinery involved in the construction should be managed by proper engine maintenance practice and usage of good quality fuel. The work of engines in a no-operation mode should be excluded.

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

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

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

329. Mitigation measures will include:

1. Damping down using water bowsers with spray bars or other technical means;
2. 1 browser will be required for that purpose. However, the constructing contractor should not be limited by this figure, and if required additional browsers should be engaged;
3. Materials transported to site will be covered/ wetted down to reduce dust. The construction site will be watered as appropriate. Protective equipment will be provided to workers as necessary. All vehicles will be checked and repaired in case of need to eliminate increased emission due to damaged parts;
4. Sheeting of construction materials and storage piles; and
5. Use of defined haulage routes and reductions in vehicle speed where required. Materials will be transported to site in off peak hours;
6. The construction works are to be prohibited from 8:00 pm to 8:00 am

330. Materials transported to site will be covered/ wetted down to reduce dust. The construction sitwill be watered as appropriate. Protective equipment will be provided to workers as necessary. All will be checked and repaired in case of need to eliminate increased emission due to damaged parts.In the operation phase, the vehicle emission will be reduced as a result of the realized structural changes. The traffic light will be abolished in the project zone, which was one of the causes of traffic jams. The vehicles will be able

to travel at speeds helping to avoid vehicle concentration in the project zone. As a result of the above-mentioned, the vehicle emission in the project zone will be less following the implementation of the project.

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

Operation Phase

332. As a result of the works accomplished in the operation phase, the traffic lights will be removed in the project zone and the vehicles will travel without any hindrance. Consequently, no traffic jams are expected what is one of the causes of air emissions.

333. Following the world trends and rapid growth of technologies, air pollution after 20 years with vehicles exhaust is less suspected. Even today, the number of hybrid and electrical-powered vehicles is increasing drastically. The state has developed a number of legislative acts what supports the renewal of the car fleet of Georgia and its shift to cleaner energy. It is hard to imagine this trend changing. On its hand, the changes envisaged by the project helps decrease emissions in the project zone.

E.2.3 Vibration

334. Vibrations produce damaging stress waves that quickly reach building foundations, causing them to vibrate. Several factors may contribute to vibration levels, including: road condition, vehicle speed, vehicle weight, soil conditions, building characteristics, vehicle suspension system, season of the year, and distance between the structure and the road. When a large vehicle strikes an irregularity, an impact load, as well as an oscillating load due to the “axle hop” of the vehicle are generated. The impact load generates ground vibrations that are predominant at the natural vibration frequencies of the soil, whereas the axle hop generates vibrations at the hop frequency, which is a characteristic of the vehicle’s suspension system. Vibrations can be amplified if the natural frequency of the building coincides with the natural frequency of the soil.

335. Soil type and stratification can influence the level of vibration greatly. Vibration levels increase as soil stiffness and damping decrease. Traffic vibrations appear worst in areas underlain by a soft silty clay layer between 7 meters and 15 meters deep. The natural frequencies of the soil may coincide with the natural frequency of the structures at these locations. Seasonal variations and the moisture content of the soil are also a consideration when measuring vibrations. In locations where the topsoil freezes, vibration levels can be less than half those in other seasons.

336. Vibration sources such as construction activities and road traffic, are among the sources considered potentially dangerous to buildings and structures. In general, structural damages to buildings are extremely rare and are in general caused by other sources. Structural damages occur when the permissive levels of vibration are exceeded. Degrees of damage are methodologically defined and vary from those that do not affect the

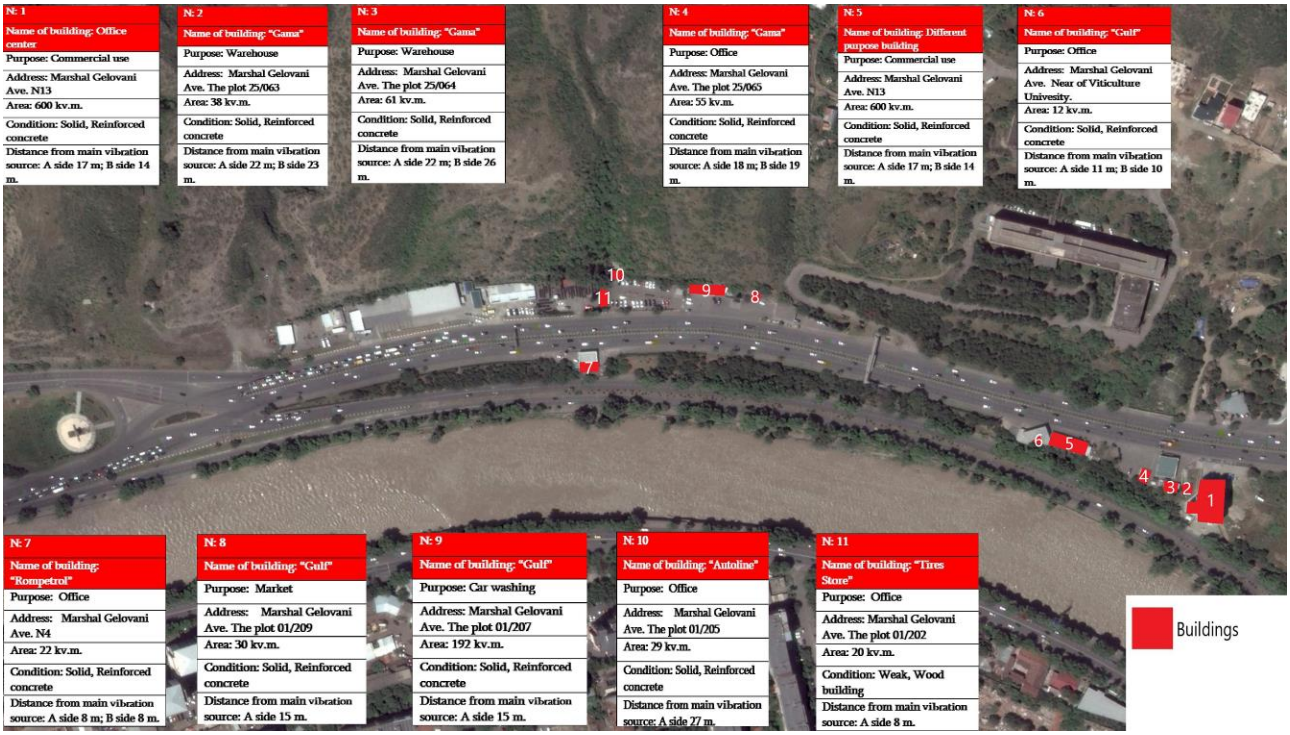
structural safety of the buildings but affect the value of assets – e.g. formation of cracks in the plaster, increase in existing cracks, damage of architectural elements etc.

337. Vibration study in the project area was carried out to estimate vibration induced in the receptors (i.e. buildings) and to evaluate its effects in terms of damage to buildings (DIN 4150-3), analyzing three different configurations:

a) Vibration coming by operation of the existing roads;
b) Vibration caused by works of new road construction;
C) Vibration coming from the operation of the new roads.

338. The principal source of vibration in the project zone is the city transport. For buildings 1 to 7, there are two sources of vibration from urban transport. From both sides of these buildings there are motorway road. As for the buildings 8-11, the vibration from city transport arising from only one side (**Figure 66**).

Figure 66: Location of studied buildings



339. In line with the requirements of DIN 45669-2 standard, preliminary 15-minute-long measurements were done in all 11 buildings. As 10 buildings in the project zone are one-story and one building is nine-story, the total number of measurements was 12.

340. The day measurements for one-story buildings were done in the center of one of the rooms so that the floor of the structure was not higher than 50 cm than the ground. As for the 9-story building, two 15-minute-long measurements were done: one on the first floor and another on the last, the ninth floor.

341. In line with the Standards requirements, the primary 15-minute-long measurements

must be done in the center of the rooms of all buildings, and if the vibration level is higher or close to the admissible level, the night measurements will be done as required by DIN 45669-2 standard: from 10:00 pm to 6:00 am as night measurements. Even though that vibration results were 50 times less then permitted, additional night time measuring for 4 buildings were conducted.

342. A full report about the accomplished studies and obtained results is given in document „VibrationSurveyandModeling“ prepared separately by the Consultant.

343. For convenience, a summary of the results obtained by the numerical simulations are reported in **Table 82.**

Table 49: Summary Table of All Findings

Building Code	Minimum Distance from the Road (m)	RECEIVER LEVEL VIBRATION (Construction Phase)		RECEIVER LEVEL 5VIBRATION TRAFFIC	STRANDARD THRESHOLD DIN 4150-3 /9916. impact on buildings			
					long - duration (dB)		short duration (dB)	
		roller compactor main building	pneumatic hammer main building		1 category	2 Category	1 Category	2 Category
1	A side: 17 m; B side: 14 m.	80	78	69.11	111.0	–	151.0	–
2	A side: 22 m; B side: 23 m.	76	73	65.27	111.0	–	151.0	–
3	A side: 22 m; B side: 26 m.	76	73	65.27	111.0	–	151.0	–
4	A side: 18 m; B side: 19 m.	78	75	67.14	–	105.0	–	130.0
5	A side: 17 m; B side: 14 m.	80	78	70.15	111.0	–	151.0	–
6	A side: 11 m; B side: 10 m.	81	79	70.41	111.0	–	151.0	–
7	A side: 8 m; B side: 8	83	80	70.94	111.0	–	151.0	–

	m.							
8	A side: 15 m.	79	77	68.61	111.0	–	151.0	–
9	A side: 15 m.	79	77	68.61	111.0	–	151.0	–
10	A side: 27 m.	74	71	62.94	111.0	–	151.0	–
11	A side: 8 m.	83	80	70.94	111.0	–	151.0	–

344. As a conclusion, it can be said that:

1. There are no residential houses or buildings or premises with a historical value in the project zone. Consequently, all buildings and structural premises, under DIN 45669-2standard, belong to the first category;
2. As the preliminary measurements at the buildings found in the project zone suggest, the value of baseline vibration is 40-50 times less the admissible level;
3. In the present work the effects of vibration in terms of nuisance/annoyance to people are not considered, and only the potential damage to structures are evaluated. In case if vibration is expected to persist for some time at a location (but below the threshold) then mitigation in the surrounding properties could be suggested in terms of regular consultations and disseminating information leaflets consisting of construction activities schedule.
4. All 11 structures found in the project zone have been built in the last 10 year, and as the results of the measurements of the baseline vibration evidence, we can assume that they are seismically solid.
5. The ground layer within the scope of the study area is presented by the embankments of the roads. The embankment is made according to plan, is compacted and is quite dense. The ground is not water-bearing. Only detritus and grit are spread in the area, containing blocks at some locations, and clay-loamy soil and gravel are also commonly spread. Consequently, the onset of the process of water intrusion process of soil is not expected as a result of the vibration impact.
6. Following the solid state of the buildings in the project zone, additional mitigation measures in the construction phase to avoid or mitigate the vibration impact are not necessary.
7. As a result of the project implementation, it is supposed that the level of the long-term vibration occurring as a result of the vehicle traffic, will reduce further, as: (i) a new road pavement will be made and (ii) the traffic jams will be reduced.
8. As a conclusion, it may be said that at the present stage, there is no need for the additional long-term studies to evaluate the impact of vibration on the buildings and premises in the project zone. The long-term vibration occurring due to the building

activities or vehicle movement in the construction and operation phases will not have any impact on the buildings and premises.

345. A full report about the accomplished studies and obtained results is given in document „Vibration Survey and Modeling“.

E.2.4 Noise

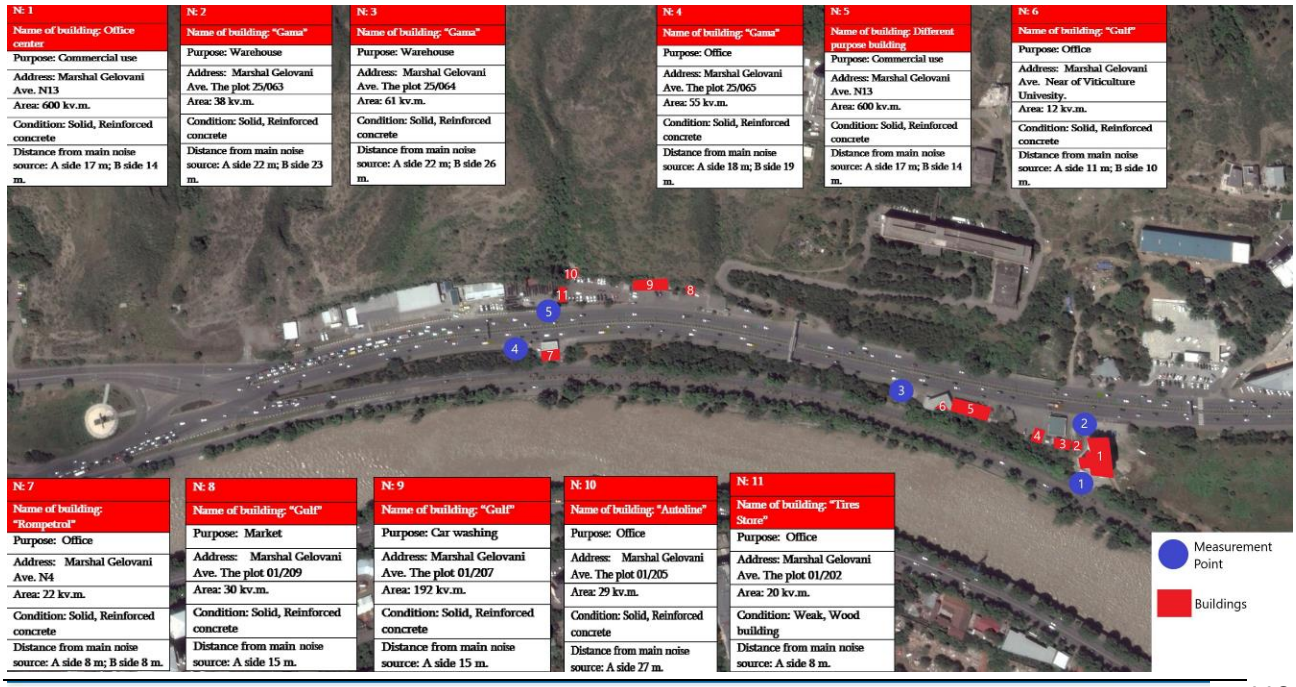
347. A problem of noise propagation in the construction phase is one of the most important issues. As the results of the accomplished measurements evidence (Annex 3), the level of baseline noise near the receptors of the project area exceeds the admissible standards during the day. As a result of using heavy techniques in the construction phase, the noise level is expected to increase further. Consequently, a number of mitigation measures must be developed and realized to avoid an increase in the noise level in the project zone.

Noise Modeling

Modeling the existing situation

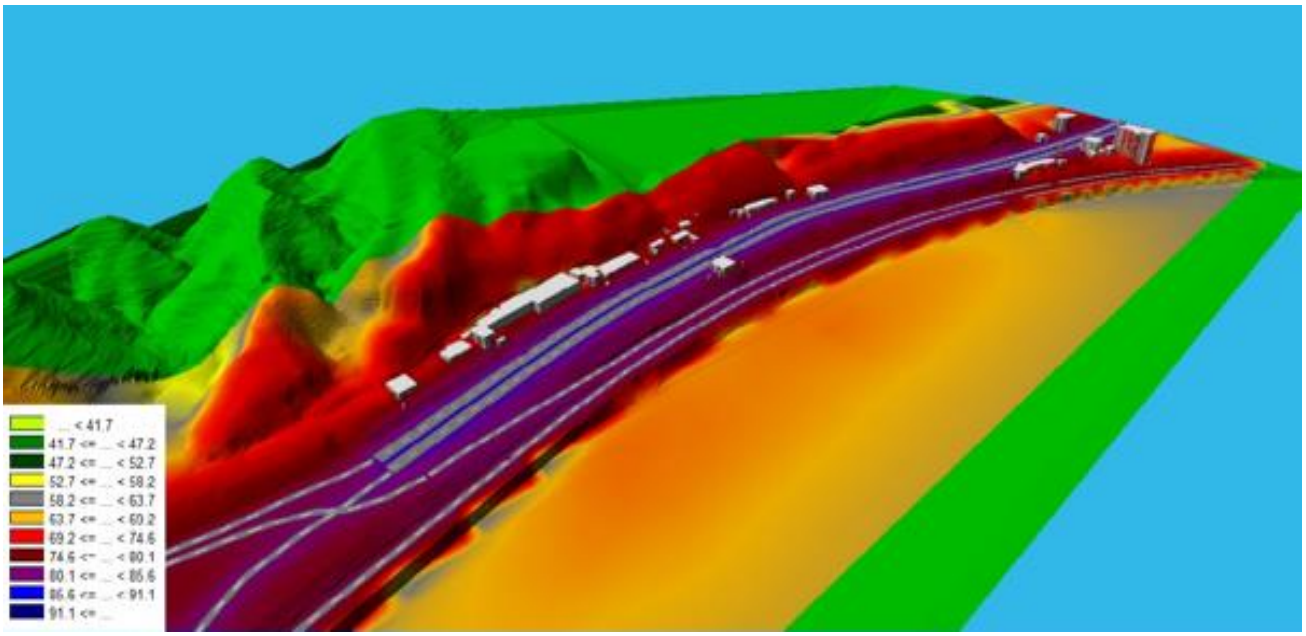
348. For the modeling of the existing noise level the following data were used: (i) the results of the 24-hr measurements of the existing noise levels at 5 points in the project zone; (ii) the data of the existing traffic analysis; (iii) strength and direction of the wind; (iv)maximum allowed traffic speed (speed limit), and (v) the type and qualityofroad pavement. Noise modeling was done for current situation, construction stage and operation stage. Location of studied buildings and measurement points see bellow in figure 67.

Figure 67: Location of studied buildings and measurement points



349. The schematic diagram of current situation for the whole project zone modeling is shown in **Figure 68.** Modeling was done in the day time hours when there is peak traffic in the project zone.

Figure 68: Model of noise propagation in the project zone (The current situation)



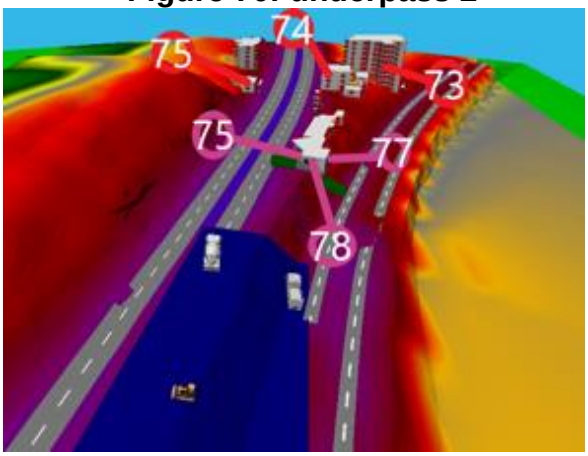
350. During the intense traffic in the project zone, the noise level is relatively higher near some buildings and premises. The baseline noise level is 3-4 dBA more at Marshal Gelovani Avenue and Mkvari right bank junction than at the end of the project zone. The main reason for such a difference is the jams at the traffic light.

Construction Phase

351. During the underpass construction phase (underpass 1), which will be constructed at Marshal Gelovani and Mtkvari right bank junction, the impact on the nearest receptor reached 84 dBA, and the noise level during the construction of the planned underpass in front of the 9-storey offices (underpass 2) was 78 dBA at the nearest receptor.

Figure 69: underpass 1

Figure 70: underpass 2



352. According to the modeling results, in order to reduce the noise level at the nearest receptors adjacent to the underpass during the underpass construction phase, a temporary noise-protecting wall (barrier) will be necessary to install along the underpass construction perimeter with the minimum height of 5 m.

Operation Phase

353. Following the implementation of the project, one of the noise sources, the jams, will be eliminated in the project zone. Besides, the widened roadway will contribute to the reduction of noise. In addition, the speed limit of 60 km/h along the design section after the implementation of the project will have a positive impact on the noise level.

354. **Figures 71-74** show the values of noise levels obtained through modeling at different buildings and premises found in the project zone before and after the implementation of the project. The results are obtained during the peak traffic in the project zone. As the obtained results show, after the project implementation, the noise level will be reduced by 2-4 dBA in different objects.

Figure 71: Impact of pre-project noise propagation on different floors of the office buildings

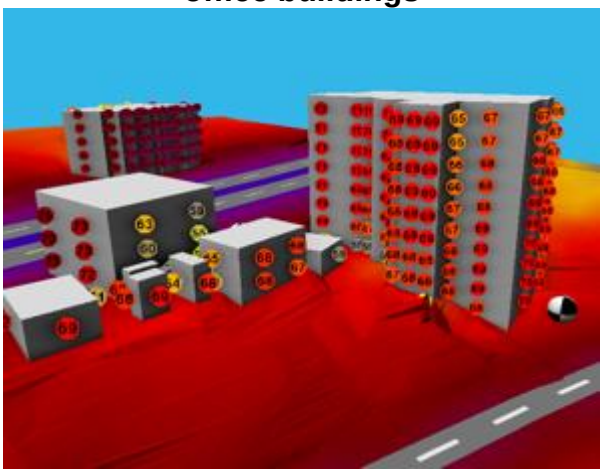


Figure 72: Impact of post-project noise propagation on different floors of the office buildings

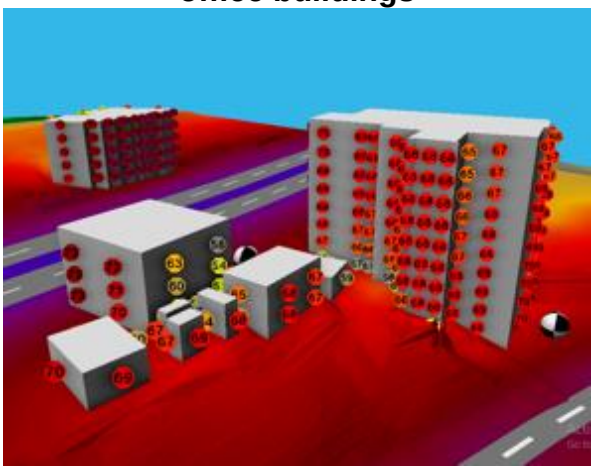


Figure 73: Impact of pre-project noise propagation on Gulf washing area

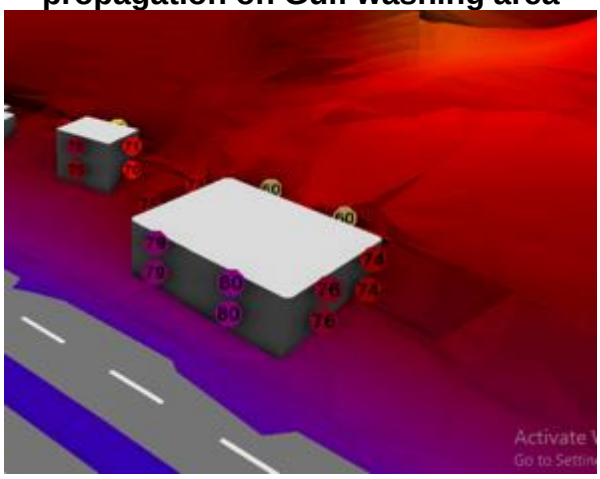
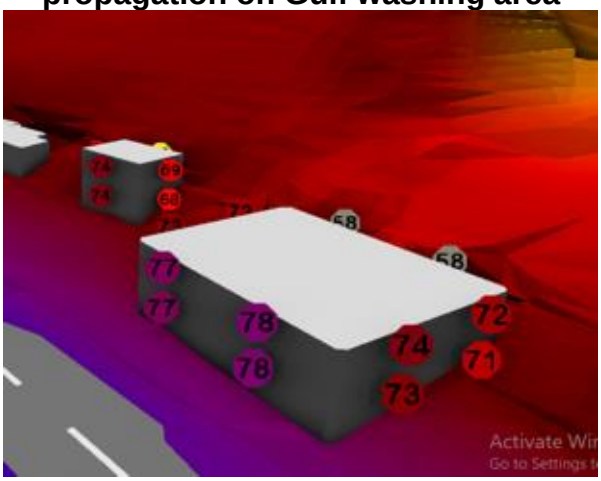


Figure 74: Impact of post-project noise propagation on Gulf washing area



355. Information about the noise impact on each building in the project zone in different project phases is given in **Table 83**.

Table 50: Impact of noise on the buildings and premises located in the project zone (the table shows maximum expected impact)

No	Building	Baseline	Construction stage	Operation stage	Operation Stage 2040
	Building 1	75	79	73	76
	Building 2	72	84	70	73
	Building 3	73	77	71	73
	Building 4	74	78	72	74
	Building 5	74	80	73	75
	Building 6	76	82	74	76

	Building 7	77	78	73	77
	Building 8	76	84	74	77
	Building 9	75	81	74	75
	Building 10	75	78	73	76
	Building 11	74	79	72	75

356. The numbering of the buildings is done in accordance with the numbering given in **Figure 41.**

357. The Construction Contractor, prior to the onset of the construction, must develop and submit the Supervision Consultant a Topic SpecificPlan – Noise Management Plan for the construction phase. The Plan must envisage all the existing technologies and best practice to avoid occurrence of noise and/or minimize the noise level.

358. According the noise modeling during the operation phase the noise level at the receptors (small and medium enterprises) located near Marshal Gelovani Avenue will be radiused (see table 83). The reduction of the noise level at the existing receptors in the operation phase is caused by the changed traffic as a result of the project implementation. Consequently, the number of vehicles in Marshal Gelovani Avenue where all businesses are found will decrease by 25-30% of the present number. Consequently, the number of cars will increase three-fold in Bakradze street on the right bank of the Mtkvari River, but there are no buildings or premises found there.

352. At present, the number of vehicles in Marshal Gelovani Avenue is 3 or 4 times more the number of vehicles on the right bank of the Mtkvari River. As after the implementation of the project, the traffic flows change and both streets are made one-way traffic, half of the vehicles moving along Marshal Gelovani Avenue will shift to the right bank of the Mtkvari River (which travel from Tbilisi to West Georgia), while half of the vehicles moving along the right bank of the Mtkvari River will shift to Marshal Gelovani Avenue (which travel from West Georgia to Tbilisi). As a result, the number of vehicles in both streets will equalize. This means that the number of vehicles in Marshal Gelovani Avenue will decrease by minimum 25-30%, while the number of vehicles on the right bank of the Mtkvari River will increase by the same rate.

E.2.4.1 Mitigation at the Source

359. Source control is, in general, the most effective form of noise mitigation and involves controlling a noise source before it is able to emit potentially offensive noise levels. Construction noise (exclusive of blasting) is typically generated by two source types: (i) Stationary equipment; and (ii) Mobile equipment.

360**.** Less noisy equipment: One of the most effective methods of diminishing the noise impacts caused by individual equipment is to use less noisy machinery. By specifying and/or using less noisy equipment, the impacts produced can be reduced or, in some cases, eliminated. Source control requirements may have the added benefits of promoting technological advances in the development of quieter equipment.

361. Mufflers: Most construction noise originates from internal combustion engines. A large part of the noise emitted is due to the air intake and exhaust cycle. Specifying the use of adequate muffler systems can control much of this engine noise (**Figure 75).**

362**.** Shields: Employing shields that are physically attached to the particular piece of equipment is effective, particularly for stationary equipment and where considerable noise reduction is required (**Figure 76).**

Figure 75: Muffler system

Figure 76: Employing shields

363**.** Aprons: Sound aprons generally take the form of sound absorptive mats hung from the equipment or on frames attached to the equipment. The aprons can be constructed of rubber, lead-filled fabric, or PVC layers with possibly sound absorptive material covering the side facing the machine. Sound aprons are useful when the shielding must be frequently removed or if only partial covering is possible.

364**.** Enclosures: Enclosures for stationary work may be constructed of wood or any other suitable material and typically surround the specific operation area and equipment. The walls could be lined with sound absorptive material to prevent an increase of sound levels within the structure. They should be designed for ease of erection and dismantling.

E.2.4.2 Mitigation along the Path

365. In some situations, such as in urban areas or on isolated sections of a project (Undrpass installation area), it may be beneficial and necessary to construct barriers adjacent to the work area or at the right-of-way. These can take the form of natural shielding, temporary shielding, and/or permanent shielding.

366. Temporary abatement techniques include the use of temporary and/or movable shielding for both specific and nonspecific operations. Some mobile shielding is capable of being moved intact or being repeatedly erected and dismantled to shield a moving

operation. An example of such a barrier utilizes noise curtains in conjunction with trailers to create an easily movable, temporary noise barrier system.

E.2.4.3 Mitigation at the Receiver

367. Mitigation at a receiver can vary in its complexity, ranging anywhere from relocating residents for a day to insulation of a building. Even after mitigation measures have been applied, the outcome may still be unpredictable with no guarantees that the implemented methods achieve expected results. Therefore, mitigation at the receiver should only be considered as a last alternative. However, there are cases where creative techniques have been successfully implemented

E.2.4.4 Training Programs for Contractors

368. Require contractors to participate in training programs related to project-specific noise requirements, specifications, and/or equipment operations. Such training may be provided by agency or project management personnel, outside consultants, and/or equipment manufacturers or suppliers. For example, project personnel (or consultants assigned to the project) may train the contractor in the measurement of construction-related noise levels that may be required to meet the contract specifications.

369. In addition to the additional mitigation measures proposed by the Contractor, the latter must observe the norms, which are common for the construction phase of any project. Such norms are:

1. Use of non-faulty construction techniques and vehicles;
2. Accomplishing the noisy works during the day as far as possible;
3. Running the vehicle drives at minimal speed;

Operation phase

370. Following the works accomplished in the operation phase, the traffic lights at Marshal Gelovani and Mtkvari right bank junction will be abolished giving the vehicles the possibility to travel freely.

371. Moving a part of the traffic flow to the bank will reduce the concentration of the noise source at one point what will help to some extent reduce the noise impact on the businesses adjacent to the project zone, as now, a certain portion of the vehicles moving along Marshal Gelovani Avenue will shift to the right bank of the Mtkvari River where there are no businesses operating.

E.3 Impact on Soil

372. Soil pollution may occur as a result of spills, improper waste management, oil leakages from the old outdated techniques or other actions.

373. Soil pollution may occur due to the relocation or replacement of the underground

infrastructure in the project zone, as a result of an accidental damage of the pipe(s) or improper management of the polluted soil.

374. The major portion of the project zone is a road. Consequently, topsoil stripping will be necessary only from the small artificial island at Marshal Gelovani and Mtkvari right bank junction, as well as from the center mall of the Highway. The total amount of the topsoil planned to strip within the scope of the project is approximately 600 m^3. It will be impossible to store the topsoil near its stripping area, as there is a road there. The topsoil must be transported and temporarily stored near the site allocated for the camp. This will need transporting the topsoil to 20 m to 1,5 km distance (the distance depends on the topsoil stripping location).

Mitigation measures

1. Topsoil must be transported with closed vehicles
2. Cutting the topsoil and piling it in isolation from the lower soil layer and other materials.
3. In order to avoid the topsoil erosion, the height of fill must not exceed 2 m and the inclination of the fill slope must not exceed 45^o.
4. Water-diversion channels will be made along the perimeter of the topsoil fill and will be protected against the scattering by the wind blow;
5. In case of storing the topsoil for long, measures must be taken to maintain its qualitative properties. Periodic loosening or grass sowing is meant.
6. Use of non-faulty construction techniques and vehicles;
7. In case of spills of oil/lubricants, the spilled product will be localized/cleaned in the shortest possible time.
8. The appliances creating the risk of ground water pollution when in operation will be equipped with drip pans;
9. The vehicles must be preferably washed at private car washing areas;
10. Using temporal water diversion channels;
11. Filling the holes in a timely manner.

Impacts in the operation phase

375. Possible indirect impacts may be related to the dust and exhaust emissions from transport movements, or to the pollution with surface runoff. Contaminants from the road surface may affect the development of the green cover.

E.4 Impact of water sources

376. During implementation of the Project the risk of surface water contamination is of medium level.

377. The surface water may be contaminated due to improper placement of the excavated soil, poor management of construction camps, and improper storage of construction materials and leakage of fuel and lubricates from construction machinery.

378. There is a drainage system installed and operating flawlessly in the project zone. Consequently, the water getting on the mountain slopes as precipitations will not reach the project zone. The proposed territory for the camp is located approximately 100 m from the project zone. No great quantities of fuel are planned to store on the camp territory (the operation machines and techniques will be fueled at gas filling stations). Consequently, no large-scale spills are expected on the camp territory. Potential small spills on the camp territory will not have impact either on surface, or underground waters.

379. Inadequate assessment of the hydrological conditions in the Project Area and poor design could result in damage to Project structures. This in turn would result in several impacts including cost to rebuild the structures, potential flooding of construction site and property and impacts to surface water quality.

Mitigation Measures

380. The following mitigation measures shall be implemented:

- Where works are in progress, erosion control and sedimentation facilities including sediment traps and straw bale barriers or combinations thereof will remain in place;
  - Lubricants, fuels and other hydrocarbons will be stored at least 50m away from water bodies.
  - Topsoil stripped material shall not be stored where natural drainage will be disrupted.
  - Solid wastes will be disposed of properly (not dumped in streams).
  - Guidelines will be established to minimize the wastage of water during construction operations and at campsites.
  - hazardous waste shall have special preventive measures implemented, containers shall have secondary containmentand no mixing of hazardous waste with any other waste;
  - During construction, machinery and transport will be used by the contractor, both have potential of causing contamination to underground and above ground water assets. There is need to compile temporary drainage management plan before commencement of works;
  - Proper installation of temporary drainage and erosion control before works within 50m of water bodies should be done

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

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

Impacts in the operation phase

382. Possible indirect impacts may be related to the dust and exhaust emissions from transport movements, or to the pollution with surface runoff.

E.5 Biological Environment

Impacts during Construction

Flora

383. The impacts on flora and fauna during implementation will be minor. It will be necessary to strip only green cover from the center mall of the Highway, where there grow the artificially planted bushes and small trees.

384. If it is necessary to cut down the trees in the project zone, the Construction Contractor will tax the trees to cut down before starting the construction and Tbilisi City Hall will charge the compensation fee based on the presented taxation. The compensation fee will be paid within the scope of the project by the construction contractor. Then, the compensation planting will be done by the Department of Environment and Green Spaces of Tbilisi City Hall. The territory for the compensation planting will be selected by Tbilisi City Hall.

385. There are 4 walnut trees in the project zone. These 4 trees, which are included in the Red Book, will not be cut down. The walnut trees grow in the area where only the road pavement is planned to replace. These construction activities do not necessitate cutting down these trees.

Fauna

386. There are no sensitive areas in the study area, as the number of animals spread here is very low. The only bird nest fixed by us was that of a crow, which mostly feeds from Tbilisi landfills. Despite this, some hazards are to be considered.

387. Despite this, some hazards are to be considered:

- During the rehabilitation works, the noise and vibration levels will increase and the plants will be covered with dust what will have an impact on the feeding base and reproduction of the vertebrate and invertebrate animals (Yablokov, Ostroumov, 1985).
- The disturbing factor for the birds and bats nesting near the construction site will increase.
- In case the harmful substances get on the soil, the animals spread nearby will be harmed. The soil and water poisoning may last for many years what will result in an extreme reduction of the numbers of most animal species, which are rare even so (Yablokov, Ostroumov, 1985).

388. The following measures need to be implemented to avoid any impacts on flora and fauna:

1. Obtaining the permit from Tbilisi Municipality;
2. Cutting down the trees and plants under the supervision of the specialists an authorized agency;
3. The expected impact is partly compensated at the expense of recultivation and landscaping works;
4. Protecting the project perimeter to prevent excess harm to the plants.
5. Avoid unplanned tree cutting;
6. The trench shall not be kept open in the night/after working hours. This will avoid any safety risk to wild animals.
7. The measures to reduce dust emissions during the works.
8. The measures to reduce the noise and vibration levels during the works.
9. Prohibition of any spills of oil products and other poisoning substances on the ground and in the water.
10. The construction works must be planned after the second half of July.

Impacts During Operation

390. Risk of damage and destruction of vegetation cover during the operation phase is minimal. Possible indirect impacts may be related to the dust and exhaust emissions from transport movements, or to the pollution with surface runoff. Contaminants from the road surface may affect the development of the green cover.

E.7 Wastes from Construction Activities

E.7.1 Municipal Waste

391. Municipal waste may be generated on the Storage area. Mainly this is rubbish, plastic or glass bottles, glasses, waste food, etc. and a stationary waste. Waste should be collected both by the specially assigned personnel and the workshop workers on the area. The waste is placed into 0.24m^3 plastic containers and further a local Sanitary Service takes it to landfills. The following should be taken into account:

- Generation of dust should be avoided;
- Plastic containers should be closed to prevent spread of the smell and also to avoid contact of rodents and insects with the waste.

392. The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in:

- Waste handling
- Waste treatment; and
- Waste storage.

393. Burning of waste on any construction site is forbidden with the exception of stub and small branches from felled trees and bushes, which is better to be burned in order to avoid pest dissemination.

E.7.2 Medical Waste

394. Medical waste is generated in the Medical Care and Control Point and belongs to hazardous waste category. This waste is collected in special plastic boxes and is transferred to a contractor for farther incineration. It is recommended that the medical waste is directly transferred to a contractor from the place of its consolidation. While disposal of the medical waste the following requirements are to be met:

- Medical waste must be disposed in special plastic boxes, which can be hermetically closed.
- Medical waste for farther incineration should be transferred to a certified contractor.

E.7.3 Non-Hazardous Construction Waste

395. Non hazardous construction waste may be generated on the Storage and construction area and will be collected by contractors workers. Waste disposed first on the sites of origin, and then moved to construction waste temporary storage facility before transferred to a contractor.

396. Disposal construction wastes both on the sites and at the temporary storage facilities the following requirements are to meet:

- Place of disposal of the waste concerned must be enclosed.
- The waste must not have access to drainage water.
- Waste must be immediately removed from the working sites.
- Waste must be placed in secondary protective basins.
- This waste can be transferred only to a certified contractor.

E.7.4. Hazardous waste

397. No large amounts of hazardous waste are expected to originate in the project construction phase. This waste must be handed over to the contractor having the relevant license. The main area of origination of hazardous waste is the construction camp.

398. Poorly managed solid and/or liquid waste may affect water environment and soil leading to impact on vegetation and wildlife and creating nuisance to local residents. To prevent the impact on environment the waste must be collected and temporarily placed in the pre-selected, agreed area with consideration of requirements applicable to each waste type. All waste mustbe source-separated in order to ensure proper management and enable reuse. Until removal from the site, domestic waste (food waste, plastic bottles, packaging) must be collected in containers with fitted lid to avoid attraction of scavengers, emanation of odour and scattering by wind.

399. Since there are no landfills for hazardous waste available in Georgia, this category waste must be handed over to authorized contractor for utilization. For hazardous waste agreement with company authorized for treatment (deactivation, incineration) or re-use in other technological processes will be signed.

400. The area allocated for temporary storage of hazardous waste shall have special preventive measures implemented, in particular, containers shall have secondary containment and no mixing of hazardous waste with any other waste shall be allowed. Hazardous waste containers shall be checked for tightness. The staff involved in hazardous waste management shall be trained in waste management and safety issues. The waste shall be removed every 3days. Treatment, utilization, disposal of waste shall be carried out by an authorized contractor.

401. Soil polluted with petroleum hydrocarbons because of accidental small scale fuel/oil spills (leakages) can be remediated onsite (e.g. in situ bioremediation). Larger spills (less likely to be the case from experience with other similar projects) must be localized, contaminated soil removed by authorized contractor for remediation. New, clean soil must be introduced, followed by re-cultivation. It is recommended to involve an authorized company for this service.

Mitigation Measures

402. Construction company before start construction activities shall prepare a company waste management plan5. The plan shall generally include:

a) information about waste generated (in particular about its origin, and types, composition and amount of waste defined in the List of Waste);
b) information on the measures to be taken for the prevention of waste generation and its recovery, especially in the case of hazardous waste;
c) a description of the method for separation of waste generated, in particular of hazardous waste, from the other waste;
d) methods and conditions for the temporary storage of waste;
e) waste treatment methods applied and/or information on persons to whom waste is transferred for further treatment.

403. On the site allocated for temporary, short term keeping of hazardous wastes ensure compliance with the following safety measures:

- Use containers suitable for each type of waste;
- Prohibit use of damaged containers. Check integrity of containers - regularly;
- Mark containers adequately;
- Provide secondary containment;
- Do not mix various waste streams.
- Hire authorized contractor for hazardous waste removal;
- In case of large scale spills (that is less likely to happen) – localize the spill, excavate
- contaminated material and removed by licensed contractor for remediation. New, clean soil
- will be introduced area cultivated.

5Source: Waste management Code– chapter 15

- Train staff in waste management issues.

E.7.5 Asbestos-Containing Material[6]

404. In the construction phase, at the stage of dismantling and moving the underground infrastructure, there may be asbestos-containing pipes or other parts identified in the area. These materials are hazardous materials/waste and need special management. The following actions are necessary to manage the asbestos waste found in the project zone:

1. The amount and content of the waste is to be identified;
2. The waste management plan is to be developed;
3. The company with relevant resources (both, human and infrastructural) is to be identified;
4. The waste is to be removed from the area and safely disposed under the prepared plan.

405. The goal of the „Waste Asbestos-Containing Material Management Plan“ is to avoid, reduce or manage any potential adverse impact on the environment and/or humans caused by the project implementation. In order to achieve this goal, the following measures are necessary:

- The quantity and content of the waste placed in the project zone in an uncontrolled manner is to be identified;
- The degree of risk of the negative impact of the existing situation on the environment is to be identified;
- A duly qualified project-implementing organization is to be identified through a tender;
- A detailed „Waste Asbestos-Containing Material Management Plan“ is to be developed;
- The separation/collection, transportation and safe disposal of the AC waste is necessary;
- The monitoring plan is to be developed and implemented.

E.8 Traffic

Impacts during Construction

406. Within the scope of the project, the traffic impact is one of the most risky impacts. The given road section is not only a part of the Highway and transit road, but it also connects the city center to several big suburban areas of the city. Even one-day stop of the traffic along the road will cause jams all over the city. Consequently, in the project implementation phase, developing a traffic schedule is one of the most important and sensitive issues. The preliminary plan developed by the Consultant is not final and needs further elaboration. Within the scope of the project, it is necessary to invite a consultant

[6]means any material or product which contains more than 1 percent asbestos.

with an international qualification to further elaborate and develop the final version of the plan. During the plan development, particular attention must be paid to the following issues:

407**. Traffic management**. A traffic control and operation plan will be prepared together with the local traffic management authority prior to any construction. The plan shall include provisions for diverting or scheduling construction traffic to avoid morning and afternoon peak traffic hours, regulating traffic at road crossings with an emphasis on ensuring public safety through clear signs, controls and planning in advance;

408**. information disclosure**. Residents and businesses will be informed in advance through media of the road improvement activities, given the dates and duration of expected disruption. The relevant information leaflets must also be distributed to the transit vehicle drivers crossing the border of the country.

409**. Construction sites**. Clear signs will be placed at construction sites in view of the public, warning people of potential dangers such as moving vehicles, hazardous materials, excavations etc and raising awareness on safety issues. Heavy machinery will not be used after day light and all such equipment will be returned to its overnight storage area/position before night. All sites will be made secure, discouraging access by members of the public through appropriate fencing whenever appropriate.

Impacts During Operation

410. In the operation phase, the situation will be much better than it is now, before the project implementation. Consequently, no additional mitigation measures will be necessary during the operation phase.

E.9 Impacts on Archaeological Sites

411. Land clearance works, grading and excavations are associated with the risks of damaging underground archaeological remnants. However, in the case of the proposed Project no archaeological monuments are expected to be touched during construction phase. There is a low probability for chance finds of archaeological objects. However, during construction, possibility of appearance of the new archaeological findings still should be taken into account and, therefore, special care should be taken not only at the new construction sites, but also at construction camps and storage areas.

Mitigation Measures

412. To avoid this risk, preliminary preventive studies and archaeological supervision during the earth-works is necessary. Supervisory procedures and all other necessary measures should be agreed with the Ministry of Culture when obtaining the construction permit, in accordance with the rules of the permit issuance. According to the article 14 of the Law on Cultural Heritage, Permit on conducting quarrying activities in Georgia, as well as construction of an object of a special importance as it may be defined under the legislation of Georgia, is issued by a competent authority based on the positive decision of the Ministry of Culture, Monument Protection of Georgia. The basis for the conclusion is the archaeological research of the proper territory to be carried out by the entity wishing to

accomplish the ground works. The entity wishing to do the earth-works is obliged to submit the Ministry the documentation about the archaeological research of the territory in question. The preliminary research should include field-research and laboratory works.

413. Therefore steps should be taken minimize the risk. This should involve:

- Contractor should put in place a protocol for conducting any excavation work, to ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved.
- To comply with the previous condition, having excavation observed by a person with archaeological field training. Supervisory procedures and any other necessary measures shall be agreed with the Ministry of Culture;
- Stopping work immediately to allow further investigation if any finds are suspected;
- Calling in the state archaeological authority if a find is suspected, and taking any action they require ensuring its removal or protection in situ.

E.10 Construction Camps

414. The establishment of contractor's work camp may cause adverse impacts if various aspects such as liquid and solid waste management, equipment maintenance, materials' storage, and provision of safe drinking water are not addressed properly. Finally, the site for the work yard will be selected by the contractor in agreement with the Tbilisi Municipality. The territory proposed for the camp is connected to the water drainage and water-supply system. Consequently, the Construction Contractor will be able to be connected to the system after concluding the relevant agreement with Tbilisi Water Supply Company.

415. To ensure that potentially resulting impacts are kept at a minimum the contractor will be required to prepare the following plans or method statements:

- Layout plan of the work camp including a description of all precautionary measures proposed to avoid potential adverse impacts on the receiving environment (surface and ground water, soils, ambient air, human settlement);
- Waste management plan covering the provision of garbage bins, regular collection and disposal in a hygienic manner, as well as proposed disposal sites for various types of wastes (e.g., domestic waste, used tires, etc.) consistent with applicable national regulations; and
- Description and layout of equipment maintenance areas and lubricant and fuel storage facilities including distance from the nearest surface water body. Storage facilities for fuels and chemicals will be located at a safe distance to the water body. Such facilities will be bounded and provided with impermeable lining to contain spillage and prevent soil and water contamination.

416. These plans will be approved by the Engineer prior to beginning of construction activities. After the works are complete, the Construction Contractor must totally restore the area used for the construction camp and must return it to Tbilisi City Hall totally restored.

E.11 Construction Related Impacts at the Quarrying Sites

417. The quarries and borrow pits will be finally selected by the contractor. The exploration of the borrow pits should be conducted by the licensed companies or the Contractor has to obtain its own license. However, potential impact of the increased quarrying activities on river bed and floodplain landscape, ichthyofauna and groundwater should be considered.

Mitigation Measures

418. The exploration of the borrow pits should be conducted by the licensed companies. In case if the constructing company intend to perform quarrying activities, the company has to obtain related license. Potential impact of the increased quarrying activities on ichthyofauna, groundwater and landscape should be considered anyway. Validity of licenses for the abovementioned companies is a main mechanism to guarantee that most of impacts related to quarrying will be mitigated. License is provided by the MoE only on a basis of preliminary assessment (including limits and conditions for reinstatement). MoE environmental Inspectorate are in charge to control compliance of the quarrying company's performance.

419. The role of the MDF within this plan should be to ensure timely and permanent involvement of the MoEPA in construction supervision.

420. The Construction Contractor is obliged to conclude the contract only with the companies holding the license to extract inert materials. If the company decides to extract the inert materials itself and opens a quarry, company is obliged to prepare due diligence report and obtain the permit from the Ministry of Environment and Agriculture of Georgia.

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

E.12 Impact of the climate change on the project

422. Forecasting the climate change within the scope of any concrete project is impossible. The possible measures to reduce the impact, which can be envisaged by the project, are:

1. Increasing the conductivity of the drainage pipes under the road;
2. Providing the right carriageway gradient to ensure the water drainage from the surface;
3. Maintaining the grass cover over the slopes of the roadbed.

E.13 Impact on social environment

423. There are no residential houses or structures located in the project zone or adjacent to it. The project has no impact on any land parcel with the buildings and structures or fruit trees on it.

424. The project will have an impact on 15 land parcels with the total area of 19 022 m^2. Of this area, the project will use 11 853 m^2, making 62.3% of the total area. 14 of the mentioned land parcels are owned by the state and their total area is 14 880 m^2. Of this area, the project will use 11 221 m^2. One land parcel is owned privately by two physical entities.

425. The total area of the land parcel owned by the private entities is 4142 m^2, with the project to use 632 m^2, making 15.7 % of the total area.
419. The project will also have an impact on 8 advertising banners owned by two legal entities.

426. There are 7 non-residential buildings located adjacent to the project zone and 4 building located vicinity from the project zone, which house small and medium business structures, such as: (i) two gas stations, (ii) a small market, which is located at one of the gas stations, (iii) oil store, located at the same gas station, (iv) car-washing area located at the same gas station, (v) vehicle fair and (vi) secondary tires store. A Special Traffic Management Plan was prepared by Engineer in order to avoid any potential impacts on businesses during construction and operation. This document was discussed and consulted with businesses. Detailed information in this regard is reflected under the LARP of the project, which has been approved by ADB. This document indicates that the project will not have an impact on these buildings and premises either in the construction, or exploitation phase.

Positive Impacts

427. Despite the fact that the project is short-term and lasts only one year, the local population will be employed in the construction phase.

Mitigation Measures

428. Within the scope of the project, the banners will be dismantled and installed by the relevant office of Tbilisi City Hall or Construction Contractor. If an owner of the banner refuses to receive the service of Tbilisi City Hall or Construction Contractor, he will be given the compensation for moving the banners fixed under the present document and he will dismantle and move the banners to the new location himself.

429. The owners (two owners) of one land plot which under project impact will be compensated Cash compensation at replacement cost.

430. For damage caused by a construction contractor not complying with its contractual obligations and normal good practice, such as for example, the unintentional destruction of a tree situated in an uncompensated property construction contractor will pay compensation for such damages during construction is a Contractor responsibility. Compensation will be assessed and paid per procedures and rates indicated in the LARP.

E.14 Occupational and Community H&S

431. Worker's safety during construction is important. Health and safety at workplace and during execution of work should be among the Contractor's work policy. The following items address overall worker's safety which is necessary to be considered by the Project (**Table 84)**.

Table 51: Worker's Safety Aspect

Project Potential Impacts on Worker's Safety	Recommended Mitigation Measures and Monitoring Activities
Design and Pre-Construction:	
Provision of PPE – Workers should be adequately protected when performing work at the site	For health and safety protection of workers the following shall be provided: • Adequate health care facilities (including first aid facilities) within construction sites; • Training of all construction workers in basic sanitation and health care issues, general health and safety matters, and on the specific hazards of their work; • PPE for workers, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection in accordance with legal legislation;
Workers Safety Awareness – Workers should know the risks and hazards of the job and should be advised and reminded accordingly	The Contractor shall hire a qualified health and safety expert who will provide safety training to the staff according to the requirements of the individual work place. Prior to the commencement of works, the work site personnel shall be instructed about safety rules for the handling and storage of hazardous substances (fuel, oil, lubricants, bitumen, paint etc.) and also the cleaning of the equipment. In preparation of this the Contractor shall establish a short list of materials to be used (by quality and quantity) and provide a rough concept explaining the training / briefing that shall be provided for the construction personnel.
Construction Phase:	
Worker Health & Safety – Risks and hazards of work are real day-to-day occurrence. Hence, health and safety should be taken seriously for the general welfare of the workers.	The Contractor shall be responsible for provision of: • Safety Training Program. A Safety Training Program is required and shall consist of an Initial Safety Induction Course. All workmen shall be required to attend a safety induction course within their first week on Site and Periodic Safety Training Courses. • Safety Meetings. Regular safety meetings will be conducted on a monthly basis and shall require

Project Potential Impacts on Worker's Safety	Recommended Mitigation Measures and Monitoring Activities
	attendance by the safety representatives of Subcontractors unless otherwise agreed by the Engineer. • Safety Inspections. The Contractor shall regularly inspect, test and maintain all safety equipment, scaffolds, guardrails, working platforms, hoists, ladders and other means of access, lifting, lighting, signing and guarding equipment. Lights and signs shall be kept clear of obstructions and legible to read. Equipment, which is damaged, dirty, incorrectly positioned or not in working order, shall be repaired or replaced immediately. • Safety Equipment and Clothing. Safety equipment and protective clothing are required to be available on the Site at all material times and measures for the effective enforcement of proper utilization and necessary replacement of such equipment and clothing, and all construction plant and equipment used on or around the Site shall be fitted with appropriate safety devices. The Contractor shall coordinate with local public health officials and shall reach a documented understanding with regard to the use of hospitals and other community facilities.
Sub-contractor's / Suppliers EMP Compliance – As part of the work force in the project, the sub-contractors should be instructed and contractually compelled to comply with the EMP.	All sub-contractors/ suppliers will be supplied with copies of the SSEMP. Provisions will be incorporated into all sub-contracts to ensure the compliance with the SSEMP at all tiers of the sub-contracting. All sub-contractors will be required to appoint a safety representative who shall be available on the Site throughout the operational period of the respective sub-contract unless the Engineer's approval to the contrary is given in writing. In the event of the Engineers approval being given, the Engineer, without prejudice to their other duties and responsibilities, shall ensure, as far as is practically possible, that employees of subcontractors of all tiers are conversant with appropriate parts of the SSEMP.
Post-Construction and Operations: None	**None**

Community Safety Aspect

432. Community safety has to be maintained during construction and a program for traffic safety needs to be continued during its operations. Below are the impacts and measures concerning over all community safety (**Table 85**).

Table 52: Project Potential Impacts on Community Safety

Project Potential Impacts on Community Safety	Recommended Mitigation Measures and Monitoring Activities

Project Potential Impacts on Community Safety	Recommended Mitigation Measures and Monitoring Activities
Design and Pre-Construction:	
Community awareness for Safety – Local people's safety should be upheld and maintained	For community wealth and safety it shall be made sure that • drinking water demand will not compete with adjacent communities; • there shall be adequate protection to the general public, including safety barriers and marking of hazardous areas; • there shall be safe access across the construction site to people whose settlements and access are temporarily severed by road construction;
Safety to Motorist and pedestrians – Construction sites should be made safe for all passing vehicles	The traffic safety issues shall be accounted for during the design phase of the Project, they including incorporation of: • Safety barriers • Traffic signs • Road Crossings • Speed Bumps • Speed limits Contractor to prepare Traffic Management Plan (TMP) as part of the SSEMP.
Construction Phase:	
Traffic Safety – To enable traffic to be unimpeded even during construction traffic safety is the responsibility of the Contractor.	It is important that truck drivers and equipment operators understand the importance of maintaining road safety especially at road junction points. Village access likewise should be accorded due focus for the safety of the general population, especially children, and farm animals. Proper coordination should be done to effect road safety. Checking of safety aspects should be done continuously with safety reminder meetings and done regularly. Safety traffic signs and warning lights should be installed at appropriate locations; and flagmen should be assigned at critical spots. Monitoring of this aspect can be conducted jointly by the Contractors' management and the Construction Supervision personnel. Truck drivers and equipment operators must be sensitized to the importance of maintaining road safety especially at road junction points and along roads for the safety of the general population, especially children, and farm animals. Proper coordination with the leaders should be done to effect road safety. Checking of safety aspects should be done continuously with safety reminder meetings conducted regularly. This can be a joint activity of the Contractors' management and the Construction Supervision personnel.
Electrical Systems – Safety in relocating them is important	During construction the Contractor shall ensure that all power lines be kept operational, this may include the

Project Potential Impacts on Community Safety	Recommended Mitigation Measures and Monitoring Activities
	provision of temporary transmission lines while existing poles and lines are moved. The only exception to this item will be during periods of blasting when HV power lines will be switched off for safety.
Post-Construction and Operations:	
Traffic Safety – Road traffic safety should be enforced to avoid vehicular accidents	Traffic regulations should be enforced at all times Traffic safety measures should be performed Regular maintenance should be done

F. Information Disclosure, Consultation and Participation

433. The borrower/client will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation.

434. There are no residential houses located in the project zone or adjacent to it. There are offices and small enterprises operating in 11 buildings and premises found in the project zone. There are also 3 fueling stations in the project zone. Therefore, initial public consultations have been conducted with affected business representatives.

435. Within the scope of the project, the Consultant prepared an information leaflet in the Georgian language. On May 1-5 of 2018, the Consultant accomplished the baseline vibration measurements in all buildings and premises. During the measurements, all businesses and their employees were given the leaflets prepared within the scope of the project, and the representatives of the Consultation Company answered their questions.

436. On May 4-9 of 2018, 23 employees in the project zone were subject to the social survey (**Figures75 and 76**) with the principal aim to identify their wishes and expectations in the project implementation and operation phases.

Figure 77: Social survey

Figure 78: Social Survey

437. The major demand of both, the business owners and majority of the employees was to prevent their businesses from stopping during the project implementation.

438. In addition to business representatives, additional meetings were held with the state and private organizations, which are the owners of infrastructures in the project zone. The information about the conducted meetings is provided in **Table 77.**

Figure 79: Meetings held within the scope of the project

No	Photo	Contact information of the organization
1		„Georgian Water and Power Company“ I Turn, Kostava street, #33, Tbilisi Nino Sulkhanishvili, Environmental Manager Tel: 574 73 88 71 (mob.)
2		Mikheil Chorgoliani, Head Specialist of the Department of Infrastructural Projects Management and Designing of Saburtalo District Tel: 591 01 53 54(mob.)
3		A meeting with the employees of the Department of Storm-water and drainage networks of “Tbilservice Group” Ltd. Nugzar Sikharulidze, Head of the Department Tel: (mob.) 591 51 27 56 Employee: Misha Talakhadze
4		A meeting with the employees of “Gamma” Ltd, in the project zone
5		A meeting with the small business representatives

439. The second public consultations are also planned to hold within the scope of the project upon approval of final draft of IEE:

440. Upon delivery of the final draft of the present IEE report, it will be disclosed in Georgian and English languages through the web page of MDF of Georgia and discussed with stakeholders. IEE report will be finalized through incorporation of the public feedback and the full account on the consultation process will be attached. During the IEE disclosure period, hard copies as well as the electronic version of non-technical summary of draft IEE will be available at the following addresses:

1. Municipal Development Fund of Georgia – Tbilis, Agmashenebeli 151;

2. Municipality of Vake-saburtalo – 10 Tamarashvili street. Tbilisi.

G. Grievance Redress Mechanism

441. During implementation of the Project, there might be several issues related to environmental hazards and disputes on entitlement processes may occur due to the Project activities. For example, intensive schedule of construction activities; inappropriate timing of construction vehicle flow; waste; noise and air pollution from construction activities; ecological disturbances; cultural conflicts between migrant workers, are some of the environmental issues that are likely to arise from the Project activities.

442. According to the existing legal and administrative system in Georgia, there are several entities responsible for addressing environmental complaints of population and interested parties. The administrative bodies directly responsible for environmental protection within the project area is MoEPA. The affected population and stakeholders may send their grievances, related to the project-induced environmental impacts directly to the mentioned administrative bodies responsible for environmental protection.

443. The official administrative bodies are obliged to respond to the grievances that have been received from population or other interested parties in accordance with the requirements of the Administrative Code of Georgia. However, the described system is not flexible and convenient for affected persons and does not provide efficient pre-litigation mechanisms for grievance resolution.

444. In accordance with the ADB SPS 2009 requirements, a Grievance Redress mechanism will be set up for the Project to deal with both the environmental and social issues of the Project. MDF as the Executive Agency (EA) has overall responsibility for project implementation and environmental compliance. MDF as the EA will facilitate the grievance resolution by implementing a project-specific Grievance Redress Process (GRP).

445. The GRC will comprise representatives from local authorities, affected parties, and other reputed NGOs or persons, as mutually agreed with the local authorities and affected persons. It will also comprise the Contractor's Environmental Specialist, Supervising Company's (SC) Environmental Specialist and EA Safeguards/Environmental specialist. The role of the GRC is to address the Project related grievances of the affected parties that are unable to be resolved satisfactorily through the initial stages of the Grievance Redress Mechanism (GRM).

446. EA will assist residents of affected territories (Saburtalo municipality) and affected community to identify local representatives to act as Grievance Focal Points (GFP).
408. GFPs are designated personnel from within the community who will be responsible for:

1. acting as community representatives in formal meetings between the project team (contractor, SC, EA) and the local community he/she represents
2. communicating community members' grievances and concerns to the contractor during project implementation

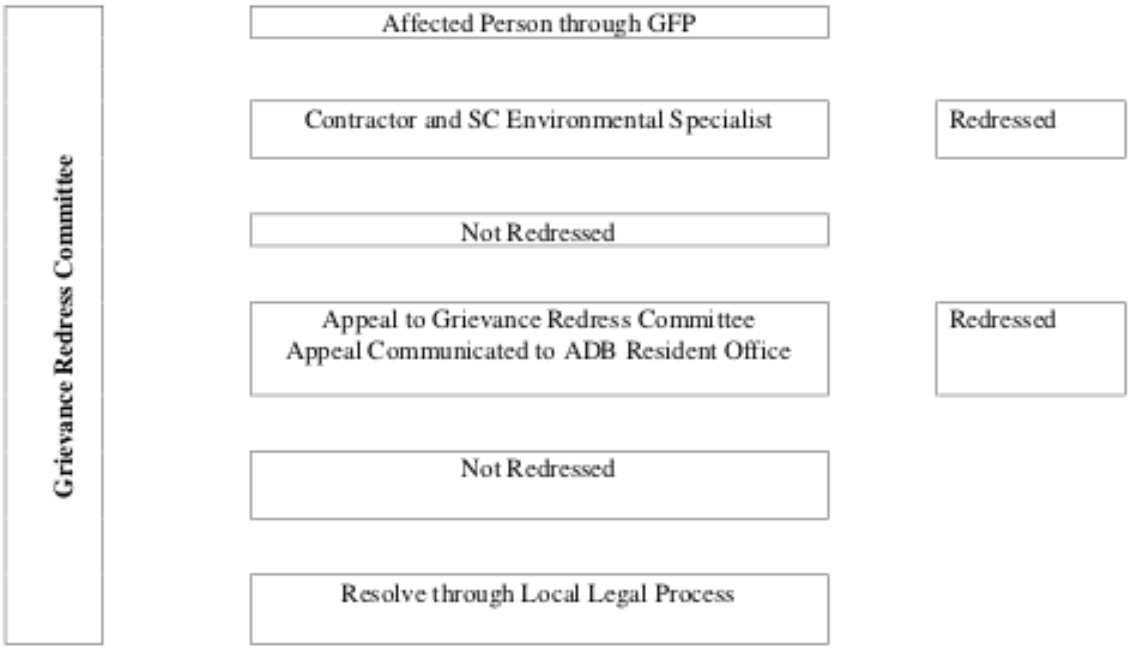
447. The sufficient number of GFPs for the project is – 4-5 persons.

448. A pre-mobilization public consultation meeting will be convened by the EA Environmental Specialist and attended by GFPs, contractor, SC, EA representative and other interested parties (eg. local NGOs). The objectives of the meeting will be as follows:

1. Introduction of key personnel of each stakeholder including roles and responsibilities;
2. Presentation of project information of immediate concern to the communities by the contractor (timing and location of specific construction activities, design issues, access constraints etc.) This will include a brief summary of the EMP - its purpose and implementation arrangements;
3. Establishment and clarification of the GRM to be implemented during project implementation including routine (proactive) public relations activities proposed by the project team (contractor, SC, EA) to ensure communities are continually advised of project progress and associated constraints throughout project implementation;
4. Identification of members of the Grievance Redress Committee (GRC).

449. Following the pre-mobilization public consultation meeting, environmental complaints associated with the construction activity will be routinely handled through the GRM as explained below**:**

1. affected persons will lodge their environmental complaint/grievance with their respective community's nominated GFP;
2. The GFP will deliver the individual's complaint to the Contractor and SC's Environmental Specialist;
3. The Contractor and SC will record the complaint in the Environmental Complaints Register (ECR) in the presence of the GFP;
4. The Contractor and SC will record the complaint in the Environmental Complaints Register (ECR) in the presence of the GFP;
5. The GFP will discuss the complaint with the Contractor and SC's Environmental Specialist and try to resolve it;
6. If the Complaint is not resolved within 2 weeks the GFP will present the complaint to the Grievance Redress Committee (GRC) GRC will notify ADB resident Office in Tbilisi about received complaints and will send a copy of written grievance or summary/minutes of oral communication to ADB. In case of need (e.g. gross contamination; damage of archaeological remnants) the GRC will inform and involve Ministry of Environmental Protection and/or Ministry of Culture and Monuments Protection;
7. The GRC will have to resolve the complaint within a period of 2 weeks and the resolved complaint will have to be communicated back to the affected individual or community. The Contractor will then record the complaint as resolved and closed in the Environmental Complaints Register;
8. Should the complaint not be resolved through the GRC, the issue will be adjudicated through local legal processes;
9. In parallel to the ECR placed with the Contractor, each GFP will maintain a record of the complaints received and will follow up on their rapid resolution;
10. EA will also keep track of the status of all complaints through the Monthly Environmental Monitoring Report submitted by the Contractor to the SC and will ensure that they are resolved in a timely manner.



Grievance Log

450. The Grievance Logs will be developed. The records in Grievance logs include the following information:

1. Name and contact details of the claimant
2. Date of receiving claim
3. Form of claim – (oral or written)
4. To whom the claim has been addressed initially (entry point)
5. The brief description of the essence of claim
6. The stages, dates and participants of negotiations with the AP with GRC
7. Minnutes of meetings

451. The copies of the records/documents may be also kept in the municipal office.

H. Environmental Management Plan

H.1 Introduction

452. The Environmental Management Plan (EMP) documents the impacts identified in the EIA report, the actions required to mitigate those impacts to acceptable levels in accordance with the Georgian legal requirements and the ADB safeguard policy, and the monitoring activities that are to be undertaken as part of the project to confirm that the mitigation actions have been effective in achieving their objectives or to initiate corrective actions required.

453. The EMP also details the institutional arrangements and capacities that currently exist, or that will be put in place as part of the project implementation, to ensure that the environmental due diligence (including the EMP) has comprehensively considered both the national and ADB requirements for environmental protection, has identified all likely environmental impacts and proposed appropriate mitigation measures, and has the systems in place to ensure that effective procedures for environmental monitoring and control of the project impacts and mitigation measures are implemented throughout the life of the project.

454. The environmental impacts associated with project have been detailed above in the chapter E of this IEE. Mitigation measures required to address the impacts identified in the IEE have been summarized in each of the relevant sections covering the physical, biological and socio-economic environment affected by the project (chapter E). The impacts identified and the specific mitigation measures proposed to address them have been consolidated into the environmental mitigation plan presented in Tabel in a form of matrix, which includes time frames, responsibilities and where applicable, estimated costs for each measure.

455. The environmental mitigation plan specifies the need for the civil works Contractor to provide its own detailed Site Specific Environmental Management Plan (SEMPs,) based on current EMP, but supplemented with the description of the schedule of planned activities, persons responsible for implementation of EMP and monitoring, as well as with method statements for spillage control and construction waste management.

456. An environmental monitoring plan is presented in Table 50, which outlines the activities and responsibilities associated with monitoring the effectiveness of the proposed mitigation plan and ensuring compliance with the recommendations of the IEE.

H.2 Implementation Arrangements and Responsibilities

457. The main institutions that will be involved in implementation of the SEMP and monitoring are the executing agency (EA), the Supervision Consultant (SC) the Contractor and to a lesser extent the Ministry of Environmental Protection and Agriculture. EA and SC are responsible for ensuring monitoring of the project implementation at the construction stage, while RDMRDI for monitoring at the road operation stage. Ministry of Environmental Protection and Agriculture has the authority for periodic audits but should not be considered as a party responsible for monitoring according to this IEE and EMPs.

458. MDF as the executing agency will be responsible for the day to day management of the project including implementation of the SSEMP. Management of environmental issues is carried out by the MDF through Environmental and Resettlement Unit, established in October 2014. From that time, number of Environmental and Resettlement team members has increased from 6 to 9 and currently consists of: Head of Unit, 4 environmental safeguards specialists, one safety specialist, one social safeguards specialist, 4 resettlement specialists and two ADB's individual consultants (one on resettlement issues and the other for environmental matters), who also are the members of Environmental and Resettlement Unit.

459. The MDF's Environmental and Social Specialists responsibilities in respect of implementation of the SEMP are as follows:

1. Ensure that all relevant EMP requirements (including environmental designs and mitigation measures) are duly incorporated into the project bidding documents;
2. Ensure that Contractor obtains necessary permits and/or clearance, as required, from MoENRP and other relevant government agencies. All necessary regulatory clearances should be obtained before commencing any civil work on the project;
3. Ensure that contractors have access to the EMP and IEE report;
4. Ensure that contractors understand their responsibilities to mitigate environmental problems associated with their construction activities and facilitate training of their staff in implementation of the EMP;
5. Approve the Site-Specific Environmental Management Plan (SSEMP) prepared by the Contractor before he takes possession of construction site;
6. Monitor the contractor's implementation of the SEMP in accordance with the environmental monitoring plan;
7. Prepare and submit semi-annual Environmental Monitoring Reports to ADB;
8. In case unpredicted environmental impacts occur during the project implementation, prepare and implement as necessary an environmental emergency program in consultation with MoENRP, any other relevant government agencies, and ADB;
9. Ensure that Contractor hires specialized companies to manage asbestos waste disposal and safe operations on dismantling, transportation and storage of oil contaminated equipment of gas filling stations. The other choice is to request Construction Contractor to hire the mentioned waste and pollution Management Company and to insert this requirement in Civil Works Contract.

460. The supervisor company (SC) of works commissioned by MDF is responsible to establish strong field presence in the Project area and keep a close eye on the course of works. Along with ensuring consistency with the design and ensuring quality of works, the supervisor is mandated to track implementation of EMP by the contractor, reveal any deviations from the prescribed actions, as well as.

461. The SC will include a part time international environmental specialist (1 month) and fulltime site-based national environmental specialist to assist the EA supervise and monitor implementation of the EMP during construction.

462. A Non-Compliance Notice will be issued to the contractor if the SC requires action to be taken. The contractor will be required to prepare a corrective action plan which is to be

implemented by a date agreed with the SC. Non-compliance will be ranked according to the following criteria:

1. Non-Compliance Level I: A situation that is not consistent with requirements of the EMP, but not believed to represent an immediate or severe social or environmental risk. Repeated Level I concerns may become Level II concerns if left unattended. •
2. Non-Compliance Level II: A situation that has not yet resulted in clearly identified damage or irreversible impact, but which demonstrates potential significance. Level II requires expeditious corrective action and site-specific attention to prevent severe effects. Repeated Level II concerns may become Level III concerns if left unattended;
3. Non-Compliance Level III: A critical situation that will result in significant social or environmental damage occurring or a reasonable expectation of very severe impending damage. Intentional disregard of Non-Compliance Notices or specific prohibitions is also classified as a Level III concern.

463. The failure to prepare a corrective action plan or to implement it within the required timeframe will result in the Employer undertaking the work at the Contractor's expense (as will be specified in the Contract).

464. Construction contractor is obligated to follow EMP and good construction practice. In order to meet this obligation, a contractor shall establish environmental management team and procedures.

465. The Contractor will appoint a full time Environmental Manager (EM) to be a senior member of the construction management team based on site for the duration of the contract. The EM shall have a university degree (preferably at Masters level) in Environmental Science or related discipline and have at least 10 years work experience in environmental management of infrastructure projects. In case if according to CW Contract, the engagement of specialized waste and pollution management company is responsibility of Contractor, they will ensure financing and arrangement of related contracts and supervise the activities of waste operator.

466. Key responsibilities of the Contractor (through the EM) are as follows:

1. Preparing the Specific Environmental Management Plan (SEMP) for endorsement by Supervision Consultant and approval by the Employer (EA) prior to the Contractors taking possession of the construction site (see below);
2. Ensuring the SEMP is implemented effectively throughout the construction period. (iii) Coordinating community relations issues through acting as the Contractor's community relations focal point (proactive community consultation, complaints investigation and grievance resolution)
3. Establishing and maintaining site records of: (i) weekly site inspections using checklists based on SEMP; (ii) environmental accidents/incidents including resolution activities; (iii) environmental monitoring data; (iv) non-compliance notifications issued by the SC; (v) Corrective action plans issued to the SC in response to non-compliance notices; (vi) Community relations activities including maintaining complaints register; (vii) Monitoring reports; (viii) Routine reporting of SEMP compliance and community liaison activities (see below); (ix) Adhoc reporting to the Employer's Engineer of environmental incidents/spillages including

actions taken to resolve issues of Specific Environmental Management Plan (SEMP).

467. Following the award of the contract and prior to construction commencing the Contractor will review the EMP and develop this into a detailed Specific Environmental Management Plan (SEMP) that amplifies the conditions established in the EMP that are specific for the project, the tasks involved and schedule of construction activities. The SEMP will identify persons who will be responsible for supervising the work within the contractor's team. The SEMP will include a matrix of mitigation measures corresponding to specific activities. As a stand alone documents the SEMP will be supplemented with method statements for spillage control and construction waste management. The spillage control method statement includes proper location and organization of fuel storage, filling stations and vehicle washing sites.

468. The SEMP will also include a monitoring plan and a reporting program corresponding to the requirements of the EMP. The SEMP will be submitted to EA for approval at least 10 days before taking possession of work site.

469. In addition to creating the SEMP additional topic specific EMPs will be developed by the contractor (e.g. waste management plan, traffic management plan, oil spill management plan, camp management plan, etc.). In addition, at key locations a location specific EMP may also be developed.

Traffic Consultant

470. A 7-phase construction plan is developed within the scope of the project. The major goal of this plan is to avoid any obstruction or stop of traffic in the project zone. The developed plan is more a primary document and needs further elaboration by the specialist with the relevant international qualification.

471. Prior to the onset of the construction, the Construction Contractor must hire a consultant or a group of consultants with international qualification to prepare the Trafic Management Plan. The developed plan must be agreed with the supervising company. The construction permit will be issued only if the plan developed by the Construction Contractor is approved by the supervising company and MDF. In case of absence of such a plan, the Construction Contractor will not be allowed to start the works

Site Induction

472. Following approval of the SEMP by the EA, the Contractor will be required to attend a site induction meeting with the SC's International Environmental Specialist whereby the SEMP is confirmed with the Contractor to ensure that all compliance conditions are clearly understood. Following confirmation of the SEMP with the Contractor the SC's International Environmental Specialist advises the SC Team Leader that the Contractor is now cleared to take possession of the Site and may commence moving equipment to the Site.

473. The Contractor will be responsible for ensuring that all sub-contractors abide by the conditions of the SEMP.

Reporting

474. Bi-annual Environmental Monitoring reports (EMRs) to be submitted within 1 month at the end of each reporting period. Quarterly project progress reports also should have a section on environmental safeguard compliance. Bi-annual EMRs should be a concise report in respect of compliance with EMP/SEMP requirements that will be submitted by the

475. EA with assistance from the SC. The report will contain the following sections.

1. Details of any environmental incidents;
2. Status of all non-conformance identified during audits and inspections that are identified by non-compliance notices;
3. Complaints from the public and proactive community relations activities;
4. Monthly Accident Report;
5. Waste volumes, types and disposal;
6. Details of any contaminated areas that have been identified and rehabilitated;
7. Details of any archaeological discoveries;
8. Details of any ecological issues;
9. Other relevant environmental issues;
10. Action plan for corrective measures.

476. The Contractor will have a duty to immediately report to the SC if any serious environmental breach has occurred during construction e.g. clearing of sensitive areas, serious oil spills etc.

477. The SC provides EA with monthly reports including review of the environmental and social aspects of the Contractor's performance, as well as HSE issues. In case of any serious accident or repeated violation requiring immediate reaction of the EA and authorities, SC sends appropriate notice to EA immediately.

478. MDF as the Executing Agency will submit quarterly reports to ADB reflecting project progress and compliance with the safeguards requirements. The quarterly reports will include SC monthly reports and short explanatory not of MDF specialists.

479. ADBs responsibilities in regard to implementation of environmental safeguards requirements for the 7project include: undertaking of occasional auditing of the SEMP implementation and due diligence as part of an overall project review mission; and if required, provide advice to MDF in carrying out its responsibilities to implement the SEMP for the project. Institutional Capacity Building Requirements for MDF.

480. Within MDF, is the environmental and social specialist and several monitoring officers are included in the staff. Although day-to-day quality control of works will be outsourced to the engineering supervisor of works, MDF should have in-house human resources to oversee performance of such technical supervisor and to work out decision to address issues which the supervisor may bring up for MDF's attention.

Environmental documents and records

481. It may be said that an important and perhaps, absolutely necessary mechanism of

SSEMP realization is putting the relevant environmental documents to order and ensuring their permanent update. After identifying the Construction Contractor and issues of construction organization, the MDFof Georgia, in line with the national legislation, is obliged to develop the following environmental documents and submit them to the MoEPA to reach an agreement:

1. Technical report of the stationary sources of harmful substances emitted into the atmospheric air (if necessary);
2. Detailed plan of waste management;
3. Documents envisaged by the terms of the Permit issued under the conclusion of the ecological expertise (quarterly reports of the environmental monitoring and the like may be implied);
4. Due diligence report for new/existing quarry sites. Approved by the MoESD;
5. Dee diligence report for inert waste disposal approved by the engineer and local government (in case of necessary);

482. The Construction Contractor must be engaged in the development of all above-listed documents.

483. On its turn, the contract concluded with the Builder must envisage his obligation to submit and agree the following documents and records to the Client:

1. Traffic management plan;
2. Health and safety site-specific management plan;
3. Noise site-specific management Plan;
4. Emergency response plan.

484. In addition, the Implementer (and the Construction Contractor on his errand) shall keep and use the following records in practice during the construction:

1. Plan and schedule of the works to accomplish;
2. List of the machines and equipment needed for construction;
3. Records related to the occurring environmental problems;
4. Records about the waste management issues;
5. Written marking of the areas of waste disposal and waste transportation instructions issued by the local authority;
6. Records about the supplies of necessary materials and their consumption;
7. Complaints log books;
8. Incident registration logs;
9. Reports about the correction actions;
10. Logs of equipment control and technical maintenance;
11. Reports about the personnel training.

H.3 Costs of Implementation

485. The costs of environmental activities associated with the construction (244 300) will be included in the contract for 141 000 civil works Contractor, and 94 000 GEL in contract with the Supervision Company (Engineer). 9000 GEL will be required for MDF capacity building (additional personnel and trainings). In total the planned environmental activities will cost around 244 300 GEL.

486. **Waste Management**. According to new GEO Law on "Waste Management Code" (Article 14-Waste management Plan of the Company), Contractor have to prepare Waste Management Plan of the Company (describing in details hazardous waste management) and submit it to the MOEPA for approval. In addition, according to the same law (article 15) – the Contractor should hire Environmental Manager, whose name will also be submitted to the MOEPA.

487. Within the scope of the project, no great amounts of waste are expected to originate following the scales and duration of the project. However, at the stage of the planned relocation or replacement of the existing infrastructure, the waste amount may increase significantly.

488. The exact portions of the infrastructure to relocate or replaced cannot be identified until the relocation process of the existing underground infrastructure starts. During the replacement, it is clear that the amount of waste will increase. Besides, the current state of the pipes is not known either and leakages due to the damaged pipes are not excluded, what in case of sewage pipes, will increase the volume of the polluted soil. A hazardous waste management plan is desirable to incorporate in the budget right at the given stage.

489. **Noise:** The level of noise exceeds the admissible standards even today. Consequently, all mitigation measures given in the document will be necessary to undertake so that the noise level should not increase further. Consequently, the Construction Contractor must undertake permanent noise monitoring. In addition, temporary noise barriers will be necessary to install at the construction objects.

490. **Emissions:** The levels of CO_2, NO_2, SO_2emissions in the air are close to the admissible standards and sometimes exceed them. The emissions will increase after bringing the heavy techniques to the project zone. Permanent emission monitoring by the Supervising Consultant is necessary. Mitigation measures will include:

- Damping down using water bowsers with spray bars or other technical means;
- Materials transported to site will be covered/ wetted down to reduce dust. The construction site will be watered as appropriate. Protective equipment will be provided to workers as necessary.
- All vehicles will be checked and repaired in case of need to eliminate increased emission due to damaged parts;
- Sheeting of construction materials and storage piles; and
- Use of defined haulage routes and reductions in vehicle speed where required. Materials will be transported to site in off peak hours;
- The construction works are to be prohibited from 8:00 pm to 8:00 am

Occupational and Community H&S

491. The Contractor shall hire a qualified health and safety expert who will provide safety training to the staff according to the requirements of the individual work place. Prior to the commencement of works, the work site personnel shall be instructed about safety rules for the handling and storage of hazardous substances (fuel, oil, lubricants, bitumen, paint etc.).

Water Sources

492. During the construction phase the Contractor will be required to construct, maintain, remove and reinstate as necessary temporary drainage works and take all other precautions necessary for the avoidance of damage to properties and land by flooding and silt washed down from the works. Should any operation being performed by the Contractor interrupt existing irrigation systems, the Contractors will restore the irrigation appurtenances to their original working conditions within 24 hours of being notified of the interruption. The Contractor will also be responsible for ensuring that no construction materials or construction waste block existing drainage channels within the Project corridor. The Engineer will be responsible for routine monitoring of drainage channels to ensure they remain free of waste and debris.

Staff:

493. The Contractor will appoint a full time Environmental Manager (EM) to be a senior member of the construction management team based on site for the duration of the contract.

494. In case if according to CW Contract, the engagement of specialized waste and pollution management company is responsibility of Contractor, they will ensure financing and arrangement of related contracts and supervise the activities of waste operator.

495. The SC's will appoint a Part time International Environmental Specialist.

496. Topsoil storage. 6,00m^3 of topsoil will be stripped and stockpiled. Cost of these operations equal 600m^3 x 10 Gel = 6,000 GEL.

Table 53: Costs of Implementation

Items	Cost (GEL)	Budget line
Mitigation measures		
Temporary sound barriers to be used on construction sites (120m x 2m)	30,000	CW
Speed control facilities (signs)	2000	CW
Flickering traffic light designed on urban boulevard	3000	CW

Topsoil temporary storage - 600 m^3	6000	CW
Polluted Soil Management	100 000	CW
Restoration	2400	CW
Monitoring		
HSE Personnel (local and International)	25 000	CW/SC
Device for dust measurement	3500	SC
Sound meter	800	SC
Training and Capacity Building		
Noise Training Programs for Contractors	3 000	CW
HSE for contractor	3,000	SC
Training of MDF personnel	3,000	MDF management
Training of RD personnel (Noise and Vibration)	6,000	CW

Table 54: Environmental Management Matrix: Pre - Construction Phase

Negative impact	Mitigation measure	Supervising body	Approximate value
Emissions of harmful substances into the atmospheric air, propagation of dust, noise and vibration	1. Selecting the sites for construction camps and concrete unit far from the settled area. The stationary sources of pollution are recommended to place in the initial part of the project corridor. 2. The sources of emission and noise must be placed as far as possible from the surface water zones;	SC	Extra costs may be associated with the greater distances of transportation of inert materials; however, these costs will not be too great.
Disturbance of the stability of the geological environment	3. Selecting geologically stable areas with least possible inclination for topsoil disposal.	„--------“	
Impact on private property/ business	4. Developing the Resettlement Action Plan and giving out compensations/compensating the damage.	„--------“	Costs may be associated with hiring the consultant
Impact on traffic flows	5. Developing the traffic management plan to consider the interests of the local people.	„--------“	To be considered in the total contract value
Preparation SEMPs	6. Developing the SEMP	CW	To be considered in the total contract value
Preparation of topic specific Noise Management EMP	7. Developing the SEMP	CW	To be considered in the total contract value

Table 55: Construction stage

Type of work	Location	Expected negative impact	Mitigation measure	Responsible entity	Controlled by
Preparatory works: mobilization of the temporal infrastructure, transport and construction appliances and equipment and mechanisms needed for construction.	The area of the construction camps	Emissions of harmful substances into the atmospheric air, propagation and noise propagation	1. Equipping the concrete unit with relevant air-cleaning systems. 2. Making noise-protection barriers if necessary between the noise sources and the receptors (population).	Construction Contractor	SC
		Risks of pollution of surface and ground waters and soils	1. Use of non-faulty construction techniques and vehicles. 2. The machines/equipment and potentially polluting materials will be placed far from the surface water objects, in the areas protected against the atmospheric precipitations. 3. Equipping the territory with sewage, storm-water and treatment systems at the initial construction stages. 3. Limiting the perimeter of the oil products supply reservoirs to prevent the propagation of the pollutants in case of emergency spills. 4. Discharge of any kind of untreated wastewater into the rivers is to be prohibited. 5. Making the water-proof layers over the surfaces of the storing areas.		
		Negative visual-	1. Temporal structures, materials and waste		

Type of work	Location	Expected negative impact	Mitigation measure	Responsible entity	Controlled by
		landscape change	will be placed at locations far and not visible from the visual receptors. 2. The color and design of the temporal structures will be chosen to suit the environment. 3. Demobilization of the temporal infrastructure and recultivation works following the completion of the works.		
		Risks of safety of local people and personnel	1. Use of non-faulty construction techniques and vehicles; 2. Fencing the camp territories right at the initial stage of the construction; 3. Installing the safety signs along the perimeter of the territory. 4. Protecting the perimeter of territory and controlling the movement of foreign people in the area. 5. Equipping the personnel with PPE. 6. Equipping the camps with first aid kits; 7. Ensuring electrical safety. 8. Keeping an incident registration log. 9. Personnel training at the initial stages.	Construction Contractor	SC

Type of work	Location	Expected negative impact	Mitigation measure	Responsible entity	Controlled by
Cleaning the corridor off the vegetation cover and accomplishing the earth works. The removal of the topsoil	Project road corridor	Cutting down the vegetation cover, habitat	1. Obtaining the permit from Tbilisi Municipality 2. Cutting down the trees and plants under the supervision of the specialists an authorized agency; 3. The expected impact is partly compensated at the expense of recultivation and landscaping works. 4. Protecting the project perimeter to prevent excess harm to the plants.	Construction Contractor	SC
		Noise propagation, emissions of dust and combustion products	1. Preparing noise management EMP 2. Use of non-faulty construction techniques and vehicles; 3. Accomplishing the noisy works during the day as far as possible; 4. Running the vehicle drives at minimal speed;	Construction Contractor	SC
		Vibration	1. In vibration persists for some time at a location (but below the threshold), mitigation in the surrounding properties should be done in terms of regular consultations and disseminating information leaflets consisting of construction activities schedule	Construction Contractor	SC
		Loss of topsoil and degradation of sites	1. Cutting the topsoil and piling it in isolation from the lower soil layer and other	Construction Contractor	SC

Type of work	Location	Expected negative impact	Mitigation measure	Responsible entity	Controlled by
			materials. 2. In order to avoid the topsoil erosion, the height of fill must not exceed 2 m and the inclination of the fill slope must not exceed 45º. 3. Water-diversion channels will be made along the perimeter of the topsoil fill and will be protected against the scattering by the wind blow; 4. In case of storing the topsoil for long, measures must be taken to maintain its qualitative properties. Periodic loosening or grass sowing is meant.		
		Risks of pollution of surface and ground waters.	1. Use of non-faulty construction techniques and vehicles; 2. In case of spills of oil/lubricants, the spilled product will be localized/cleaned in the shortest possible time. 3. The appliances creating the risk of ground water pollution when in operation will be equipped with drip pans; 4. The vehicles must be preferably washed at private car washing areas; 5. Using temporal water diversion channels; 6. Filling the holes in a timely manner.	Construction Contractor	SC

Type of work	Location	Expected negative impact	Mitigation measure	Responsible entity	Controlled by
		Accidental damage to the archeological monuments	1. In case of finding any strange item, stopping the works immediately and informing the technical supervisor or the Client; 2. Renewing the works only after the formal instruction is received from the technical supervisor or the Client.	Construction Contractor	SC National Agency to protect cultural environment
		Pollution of surface waters with the waters flowing out of the underpass	1. Making cesspools at the underpass portals and ensuring their proper exploitation.		
		Personnel safety risks	1. Using relevant ventilation system during digging; 2. Observing labor safety rules during the drilling and explosion works; 3. Equipping the personnel with PPE; 4. Reducing the working time of the personnel in the underpass.		
Transportation	Corridors of the roads used to transport necessary materials, temporal structures, labor and waste. The	Noise propagation, emissions of dust and combustion products	1. Use of non-faulty construction techniques and vehicles; 2. Limiting the driving speeds; 3. Maximally limiting the use of public roads and searching for and using alternative routes. 4. Watering the working surfaces in dry weather.	Construction Contractor	SC

Type of work	Location	Expected negative impact	Mitigation measure	Responsible entity	Controlled by
	routes running near the settled areas are also significant. The transport operations will continue for the whole construction period.		5. Duly covering the vehicle body during the transportation of dusty materials. 6. Informing the population about the forthcoming intense vehicle movement.		
		Damage to the local road surfaces	1. Limiting the movement of heavy techniques along the public road as much as possible; 2. Restoring all damaged road sections as much as possible to make the roads available to the people;	Construction Contractor	SC
		Overloaded transport flows, limited movement	1. Selecting an optimal bypass to the working area; 2. Installing road signs and barriers at necessary locations; limiting the movement of heavy techniques along the public road as much as possible; 3. Using flagmen in case of intense traffic; 4. Making temporal bypasses; 5. Informing the population about the time and periods of intense transport operations.	Construction Contractor	SC
		Risks of safety of local people and personnel	1. Use of non-faulty construction techniques and vehicles; 2. Driving the vehicles with admissible speeds. 3. Minimizing the use of the roads crossing	Construction Contractor	SC

Type of work	Location	Expected negative impact	Mitigation measure	Responsible entity	Controlled by
			the settled areas; 4. Limiting the traffic on holidays		
Paving the road surface and facing works	Design corridor	Pollution of soil and surface waters	1. Laying the road surface only in dry weather; 2. The road surface must be laid only by taking the relevant safety measures: the materials or waste must not dissipate over the site, etc.	Construction Contractor	SC
Waste management	Temporal waste storage areas, transport corridors and final storage areas	Irregular propagation of waste, environmental pollution	1. Delivering the construction and other necessary materials only in needed quantities. 2. Re-using the waste as much as possible, including the use of inert materials for make the roadbed. 3. Arranging the temporal waste storage areas and equipping them with relevant signs. 4. Assigning the duly qualified personnel for waste management. 5. Instructing the personnel.	Construction Contractor	SC

Table 56: Operational phase

Type of work	Location	Expected negative impact	Mitigation measure	Responsible entity	Controlled by
Exploiting the road in a common mode	Along the road	Noise propagation	1. Making noise barriers in the sensitive areas;	Contractor	
		Waste propagation; propagation of oil products.	2. Regular cleaning of the roadside zone; 3. Regular cleaning and repairing of water channels and pipes	Contractor	
		Development of hazardous geo-dynamic processes	1. Monitoring the trouble-free performance of the protective engineering facilities for slopes and riverside zone and regular repairs.	Contractor	
		Emergency risks	1. Equipping the road with relevant road signs; 2. Equipping the road with the night illumination system; 3. Permanent control of the technical state of the road cover and other road infrastructure (road signs, crossings, etc.), and accomplishing the relevant rehabilitation measures immediately after any damage.	Contractor	
		Biodiversity	4. Replacing the damaged/weathered plants along the road with new ones.		
Planned repairs and preventive	Along the road	Propagation of polluting substances (water, soil	1. The road surface must be repaired in dry weather to avoid the pollution of	Contractor	

works		pollution) during the repairs and replacement	the surface flow; 2. In order to avoid the dissipation of the materials used to repair the damaged road sections, the relevant works must be planned in an expedient manner.		

I.3 Environmental Monitoring Plan

497. As the previous chapters of the EIA report note, there are risks of certain impacts on some environmental receptors during the activity. One of the preconditions for reducing the negative nature and value is the correct management of the strict and well-planned activity under strict supervision (environmental monitoring).

498. The monitoring methods incorporate visual observation and measurements (if needed). The monitoring program describes the monitoring parameters, time and frequency of monitoring, and collection and analysis of monitoring data. The size of monitoring depends on the value of the expected impact/risk.

499. The environmental monitoring plan in the project base must cover the issues, such as:

- Assessment of the state of environment.
- Identification of the reasons for changes in the environment and evaluation of the outcomes.
- Identification of the correction measures when the target values cannot be reached.
- Regular supervision over the degree and dynamics of the impact of the activity on the environment.
- Compliance with the legal requirements for impact intensity.
- Control over the set parameters associated with significant ecological aspects.
- Prevention and timely identification of the possible violations related to ecological aspects or emergencies during the activity.

500. The following are subject to the regular observation and evaluation in the course of environmental monitoring:

- Atmospheric air and noise;
- Water;
- Soil;
- Labor conditions and meeting the safety standards, etc.

Table 57: Environmental monitoring plan in the construction phase

What? (Is the parameter to monitor)?	**Where?** (Is the parameter to monitor)?	**How?** (Must the parameter be monitored)?	**When?** (frequency or duration of monitoring)	**Who** (Is responsible for monitoring)?
1	**2**	**3**	**5**	**6**
Dust propagation, exhaust fumes	1. Construction camps; 2. Construction corridors; 3. Transportation routes; 4. The nearest Buildings	1. Instrumental measurement (How)	Checking dust propagation – during the intense operations and vehicle movement, particularly in dry and windy weather. Checking the technical state - at the start of the working day; Instrumental measurement - in case there are complaints	CS
Noise propagation	The nearest residential Business units and offices	Instrumental measurement.	Once a week in case there are complaints	CW
Traffic	Along the project alignment	4. Visual observation;	Permanently	CW
Engineering-geological stability	5. Sensitive instable sections identified in	6. Visual observation; 7. Periodic examinations	Particularly after the periods with precipitations;	CS

	the project corridor.	by the engineering geologist.		
Soil and ground quality	8. Areas adjacent to the construction camps; 9. Design corridor; 10. Materials and waste storage areas; 11. Corridor of the access road	Visual observation: 12. No significant oil spills are observed; 13. Laboratory control	Visual observation - at the end of the working day; Laboratory examination - in case of large oil spills	14. Visual observation - By anenvironmental manager 15. Laboratory control - with the help of the Contractor
Temporal storage of the removed ground and topsoil	16. Construction corridor; 17. Ground storage areas.	Visual observation: 3. The lower soil layer and topsoil are piled separately. 4. The height of the topsoil pile does not exceed 2 m. 5. The inclination of piles does not exceed 45º. 6. The soil is placed far from the surface water objects. 18. There are water diversion channels along the perimeter of the storage area; 19. The soil is stored	Every day following the completion of ground works.	Environmental Manager

		temporarily at places preliminary agreed with the technical supervisor.		
Vegetation cover and fauna	20. Construction corridor	Visual observation: 21. The works within the limits of the marked zone and no additional harm or plants or illegal cuttings take place. 22. No harm or death of animals is fixed.	23. Visual observation - at the end of the working day;	By an environmental manager
Waste management	24. Construction camps; 25. Construction corridor; 26. Temporal waste storage areas;	Visual observation: 1. The sites of temporal waste disposal are assigned in the construction area and are duly marked. 2. The storage areas for hazardous waste are protected against the penetration of strangers and against the weather impact; 1. On the territory, at due	4. Visual observation - at the end of each working day;	By an environmental manager

		locations, there are marked containers to collect domestic waste. 2. The sanitary condition of the territory is satisfactory – no dissipated waste is observed. 3. The waste is not stored on the territory for long;		
	5. Construction Contractor's office	1. Checking the waste registration log, 2. Checking the documented agreement about waste disposal	3. Document check - once a month	By an environmental manager
Oils and oil products management	4. Construction camps; 1. Warehousing facilities	Visual observation: 2. The protected areas for oils, oil products and other liquid products marked in a due manner;	3. Visual observation - at the end of each working day;	By an environmental manager
Technical state of the access roads, possibility of free movement	4. Corridors of the transportation routes	Visual observation: 1. The vehicles move along the routes specified in advance, bypassing the settled areas as far as	1. During the intense transport operations	By an environmental manager

		possible. 2. The state of the driving routes is satisfactory. 3. Free movement is not limited. 4. Driving speeds are observed.		
Labor safety	1. Working area	Visual observation: 1. The territory is fenced and protected against the illegal penetration of strangers, 2. The personnel are equipped with PPE. 3. The technical state of the exploited equipment and mechanisms is satisfactory. 4. Electrical and fire safety is ensured. 5. The safety, prohibiting and information signs are installed on the territory and along its perimeter. 6. There is a banner on the territory with the basic safety rules. 7. Smoking areas	1. Visual observation- before the onset of each working;	By an environmental manager

		are specially assigned.		
		Unscheduled control (Inspection): 2. The personnel observe the safety rules and use the PPE.	3. Inspection - regularly.	By an environmental manager

Table 58: Environmental monitoring plan in the operational phase

What? (Is the parameter to monitor)?	**Where?** (Is the parameter to monitor)?	**How?** (Must the parameter be monitored)?	**When?** (Frequency or duration of monitoring)	**Who?** (Is responsible for monitoring)?
1	**2**	**3**	**5**	**6**
Hazardous geological processes	4. Sensitive sections in the main road corridor; 5. Sites of the protective buildings.	6. Visual observation; 7. Controlling the efficiency of the protective buildings.	8. Twice a year, at the end of winter and in autumn	Roads Department
Vegetation cover	9. Vegetation in the RoW.	10. Visual observation	11. Several times a year;	Roads Department
Safe drive	12. In the road corridor	Visual observation: 13. Checking the presence of the relevant road signs; 14. Examining the technical state of the road cover.	15. Several times a year;	Ministry of Internal Affairs of Georgia
Proper operation of the drainage system	16. In the road corridor	17. Examining the technical state of the drainage system.	18. Several times a year;	Tbilservicegroup Ltd

Waste	19.	In the road corridor	Visual observation:	20.	On a periodic basis	Tbilservicegroup Ltd

J. Conclusions and Recommendations

J.1 Conclusions

501. Based on results of the conducted Initial Environmental Examination the following conclusions could be done:

1. The proposed project was assessed against the laws of Georgia and ADB's safeguard. At the stage of the document preparation, possible environmental impacts were identified and relevant mitigation measures were developed.
2. The project will have an impact on 15 land parcels, with 14 of them being owned by the state. The project does not affect any privately owned buildings or premises. Certain parts of the land parcel will be purchased from two owners only. The incomes of small businesses located in the project zone are not expected to reduce in the project implementation phase.
3. As a result of the project implementation, the traffic flow along the project road will be trouble-free. There will be no traffic lights and no traffic jams as a result what will improve the existing situation significantly. At the same time, it must be noted that Tbilisi bypass is being designed at the moment and following the completion of the bypass project, the transit heavy technique will be moved away from the project area what will help improve the air quality and reduce noise levels.
4. The present level of air pollution in the project zone is close to the admissible levels and sometimes exceeds them. As the major source of air pollution is traffic jams, it can be assumed that following the project implementation, the air pollution level will be reduced.
5. The noise level in the project zone is within the norm only at night, while during the day, it exceeds the admissible standards at most points. Presumably, following the project implementation, the baseline noise level will be reduced as the given road section will be distressed.
6. Vibration impact level is 40-50 times less the admissible standard and in neither project implementation or operation phase, the vibration caused by traffic may have any impact on the buildings or structures.
7. At present, the project road section is overloaded and traffic jams are frequent. In the project implementation phase, a step-by-step rehabilitation of the existing road is planned what narrow the road and a problem of traffic obstruction will occur.
8. The construction materials needed to implement the project will be necessary to purchase from the licensed carriers. The nearest carriers of construction materials are distanced by 25-30 km from the project zone making the prime cost of the construction materials expensive;
9. The Construction Contractor is obliged to conclude the contract only with the companies holding the license to extract inert materials. If the company decides to extract the inert materials itself and opens a quarry, it is obliged to obtain the permit from the Ministry of Environment and Agriculture of Georgia.
10. A presumable site for the construction camp is located adjacent to the project zone, which has due water-drainage, water-supply and power supply systems and it has a neat access road. After the works are complete, the Construction Contractor must

totally restore the area used for the construction camp and must return it to Tbilisi City Hall totally restored.

11. the compensation planting will be done by the Department of Environment and Green Spaces of Tbilisi City Hall. The territory for the compensation planting will be selected by Tbilisi City Hall.
12. There are urban improvement system and infrastructural objects found in the project zone. In the project implementation phase, it will be necessary to relocate or replace some infrastructural facilities. As some infrastructural facilities are located under the ground and have not been rehabilitated or replaced for several decades, it is impossible to evaluate in advance the number of the infrastructural systems to relocate or replace.
13. to the absence of information, the exact type(s) and volumes of waste expected to originate in the project implementation phase are not clear, particularly during the replacement or relocation of the underground infrastructure. Following the existing practice, there may be sites polluted with sewage waters within the area.

J.2 Recomendations

1. The EMP, its mitigation and monitoring programs, contained herewith will be included within the Bidding documents for project works for all Project components. 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 Contractors borrow pit locations. This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs.
2. The EMP and all its requirements will then be added to the Contractors 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 Manager to monitor and report Project activities throughout the Project Construction phase.
3. The management of the Construction Contractor will provide periodic training and testing regarding the observance of the environmental protection and job safety rules by the personnel engaged in the project implementation activities.
4. A strict control over the observance of the safety requirements and hygienic norms by the personnel will be introduced.
5. Before starting the construction works, a road traffic expert with an international experience must be hired to elaborate the 7-phase construction plan developed within the scope of the project so that traffic obstructions or temporal delays should be avoided in the project implementation phase.
6. Prior to the commencement of the construction works, the Construction Contractor is obliged to prepare the following environmental plans: (i) Site-specific environmental plan: to be submitted to the Supervision Consultant for approval. (ii) Noise management plan: to be submitted to the Supervision Consultant for

approval. (iii) Taxation of the trees to cut down: must be submitted to Tbilisi City Hall, who will specify the tree planting compensation fee. (iv) WasteAsbestos-ContainingMaterialManagementPlan will be prepared if the asbestos-containing materials are fixed present at the project implementation stage.

7. The Construction Contractor must undertake all mitigation measures to minimize the noise and other air emissions. In order to reduce the impact of noise emissions on the sensitive receptors.
8. Particular attention must be paid to the process of relocation or replacement of the communication and other urban improvement communications in the project zone and special project must be develop for every particular case with the participation of the companies owning the particular infrastructures.
9. In the project operation phase, permanent monitoring of noise level is necessary. If the noise level increases against the admissible standards, it will be necessary to develop and implement additional mitigation measures.

ANNEXES:

Annex 1: Emergency Response Plan

Goals and Objectives of the Plan

Goal of the emergency response plan is to determine and establish guidelines for workers employed for the road construction works in order to ensure rational and coordinated actions of personal during techno genic accidents or incidents, as well as protection of personnel, population and environment.
Objectives of this plan are:

1. Determination of possible emergency situations during the road construction;
2. Determination of groups responsible for response to each type of emergency situation, their equipment, emergency action plans and responsibilities;
3. Determination of internal and external alarm systems;
4. Immediate activation of internal resources and, if necessary, mobilization of additional resources and relevant procedures;
5. Provision of emergency management system;
6. Ensure compliance with legislative, regulatory and safety requirements during emergency situations.

Expected emergency response plan envisages the requirements of Georgian laws and legislative acts.

Types of Emergency Situations

Considering specificities of planned activities, following types of emergency situations are expected:

1. Traffic accidents;
2. Accidental spills of pollutants;
3. Fire;
4. Personnel traumatism and incidents related to their health safety.

It is noteworthy, that emergency situations, listed above, may be subsequent and development of one emergency situation may initialize another one.

Traffic Accidents

Trucks and heavy machinery will be used during construction works. During their movement on public and access roads, following are expected:

1. Collision with transport means, real estate or livestock of local population;
2. Collision with local population;
3. Collision with project personnel;
4. Collision with other project machinery;
5. Collision with local infrastructure facilities;

High risk of traffic accidents will be related to relatively intensified traffic. A number of preventive measures should be taken in order to minimize the risks of traffic accidents,

including: limitation of traffic speed, arrangement of warning signs, selection of optimal routes for vehicles, regulation of traffic by standard-bearer, etc.

Accidental Spills of Pollutants

Oil spill risk may be related to a violation of the conditions of their storage, fuel or oil leakage from vehicles and equipment and so forth.

Fire

The main factor of accident may be anthropogenic, namely: indifference of personnel and violation of safety norms, violation of storage rules for fuels, oils and other explosive substances and etc. in order to prevent fire eruption, strict supervision over fuel and lubricants storage rules, provision of fire fighting means on the construction site, periodic training of personnel on fire prevention and elimination of its consequences will be required.

Personnel Traumatism and Incidents Related to their Health Safety

Except incidents related to other emergency situations, personnel traumatism may also be related to:

1. Incidents related to heavy machinery/equipment used for project implementation;
2. Fall from large heights;
3. Poisoning with used chemical substances;
4. Electric shock, during working near aggregates under high voltage.

General Preventive Measures

Preventive measures for traffic accidents:

1. Selection of optimal transport movement routes and speed restrictions;
2. Installation of warning, prohibiting and pointing road signs at access roads and construction camps;
3. During movement of special and oversized machinery they should be escorted by specially equipped machinery and trained experienced personnel.

Preventive measures for hazardous substance spill:

1. Strict supervision over implementation of fuel and chemicals' storage and use terms. Fitness of storage vessel must be checked before storing;
2. The technical functionality of oil containing equipment should be periodically monitored;
3. Termination of works / suspension of equipment and machinery operation and implementation of maintenance work after detection of minor spill, so that incident would not become large-scale.

Preventive measures for fire/explosion:

1. Periodical training and testing of personnel on fire prevention issues;

2. Storage of easily flammable and explosive substances at safe places. Installation of corresponding warning signs at their warehouses;
3. Implementation of fire safety rules and arrangement of functional fire fighting equipment at the territory;

Preventive measures for personnel traumatism/injury:

1. Periodical training and testing of personnel on labour safety issues;
2. Provision of personnel with individual protection means;
3. Warning signs should be arranged within the dangerous zones;
4. Preparation of special staff, which will control implementation of safety norms at construction sites and will register facts of violation

Approximate Scale of Accidents

According to expected emergencies, liquidation resources and legislative requirements, accidents and emergency situations are sorted in 3 groups. **Table 1**gives description of emergency situations according to their level, indicating corresponding reaction.

Table 1.Description of emergency situations according to their level, indicating corresponding reaction

Accidents	Level		
	I level	II level	III level
General	The internal resources are sufficient for emergency liquidation	External resources and workforce are needed for emergency liquidation	Involvement of regional and country resources for emergency liquidation
Damage of other structures	Minor damage of road structures that is temporary, but will not interrupt significantly road operation. The provocation of other emergencies is less expected. Road service personnel will manage to liquidate emergency.	Hydraulic structures damage, which significantly impede the functioning of the traffic and the other risks provoking an emergency situation.	Significant damage to road structures (bank protection structures injury, significant damage to the roads, bridges, underpass, etc.). There is a high risk of flooding and damage to infrastructure facilities. It is needed to mobilize external resources for rapid elimination of the accident.
Hazardous substance spillage	Local spillage, which does not need external interference and can be eliminated with internal resources. The risks of spreading of the substance on large areas and river contamination do not exist.	Large spills (spills of hazardous substances 0.3 tons to 200 tons). There are risk of substance spreading in the area and the risk of the river pollution.	Large spills (more than 200 tons)
Fire /Explosion	Local fire, which does not need any external interference and is easily controlled. The meteorological conditions are not conductive to the rapid spread of the fire. There are no inflammable and explosive sections/ warehouses and materials.	Large fires, which spread quickly due to the weather conditions. There are inflammable/explosive areas/ warehouses and materials. It is necessary to call the local fire squad.	A large fire, which spread rapidly. The ignition risk of surrounding neighbourhoods and provocation of other emergencies is high. The approach to the territory is complicated. The inclusion of the regional fire service for the liquidation of the incident is necessary.

Road accidents	The damage of equipment, vehicles, infrastructure and non-valuable items takes place. Human health is not in danger.	The damage of the equipment, vehicles, infrastructure and valuable objects takes place. There is the threat to human health or II level traumatism is registered.	The damage of the equipment, vehicles, infrastructure and valuable objects takes place. There is the high risk of development of other emergencies. There is the threat to human health or III level traumatism is registered.
Personnel injury / Traumatism	1. One incident of traumatism; 2. Light fracture, bruises; 3. I degree burns (skin surface layer damage); 4. Assistance to injured personnel and the liquidation of the incident is possible by local medical service.	5. Individual cases of accidents; 6. Severe fracture - a fracture of the joints of the middle; 7. II degree burns (deep layer of the skin lesions); 8. There is the need to move injured personnel to the local medical facility.	9. Several traumatic accidents; 10. Severe fracture - Articular fracture etc.; 11. III and IV degree burns (skin, hypodermic tissues and muscle lesions); 12. There is the need to move injured personnel to the regional or Tbilisi medical service centres with relevant profile.

Note: Considering the scale of the project, its duration and specificity of location, the anticipated emergency situations will be mainly of I levels and less likely of II level, except underground structures damage.

Emergency Response

Response During Traffic Accidents

During the accident of road transport, it is necessary to implement the following strategic actions:

1. To stop vehicles/equipment;
2. Transmission of information in accordance with the emergency report scheme;
3. In case if there is no danger for human health and there are no risks of provoking other emergency situations (for example: collision of other vehicles, explosion, fire, oil spill, hydrodynamic accident or others), then:

1. Get out of the vehicle/equipment or get away from the accident place and stand on a safe distance;
2. Wait for the police/rescue team to come.
3. In case of further threats, act as follows:

1. Get out of the vehicle/equipment or get away from the accident place and stand on a safe distance;
2. If the vehicle accident has occurred on the dangerous section of the road of public use (for example: in the turning, there visual field on the road is limited), then ask to the accident witness to stop the cars moving in direction of an accident location;
3. If you are alone on the accident place, place the warning signs or sharp colour safe signs on the road away from the place of an accident, so that those signs will be visible for the drivers moving in direction of an accident place and will ensure the car stop;
4. In case of explosion, fire, oil spill, hydraulic accident and others, ac in accordance with the strategy given in the relevant paragraphs;
5. In case if there is a threat on the health of a person, do not try to move the body;
6. If the injured person is lying in the middle of the street, cover him with something and confine the accident location, so that it will be seen from a distance;
7. Remove everything from him, which might be making asphyxia (belt, scarf);
8. First aid to the injured in accordance with the first aid strategy given in the relevant paragraphs (but remember, by extra movement of the injured person, you might create additional risks to his health).

Response to Hazardous Material Spill

This section discusses only I scale emergency response strategy. The types of hazardous substances spill response are significantly determined by ground surface, also, the initial condition.

In case of hazardous substances spill on the pervious surface, it is necessary to implement the following strategic actions:

1. Information transfer according to the other personnel and emergency service;

2. Stopping every device-equipment working on the site;
3. Ask personnel to mobilize equipment and personal protection means for emergency response;
4. Block the entrances of household-fecal sewage systems (lids of wells);
5. Absorbents should be placed together in such way to create continuous barrier (fence) in front of the edge of moving oil products. Ends of the barrier must be folded in front, so that it will have a shape of a horseshoe;
6. Spilled oil products containment place must be covered with polyethylene membrane sheets, in order to prevent the oil occurrence in the lower layers of soil;
7. It should be noted, that if it is not available to lay down the polyethylene sheets, then the barrier arrangement will cause the oil accumulation on one place, which in turn will cause soil saturation with oil and oil products occurrence in the lower layers;
8. For drying in the spilled substances, absorbent pads usage is necessary;
9. Gather the oil products in such way, that it will be possible to collect them in container and then remove;
10. After absorption of the oil, these pads should be placed in polyethylene bags (if needed, these pads might be reused);
11. The site should be completely cleaned from residual oil products, in order to exclude the wash-off of the pollutants by the rain water;
12. After completion of cleaning operations, every cleaning material must be collected, wrapped and warehoused in relevantly safe areas.
13. Processing of vegetation and upper layer of the soil on existing on the ground surface must begin right after removal of the pollution source or after stopping the leakage;
14. When the whole spilled oil products will be cleaned, removal and remediation works implementation must start under supervision of construction works manager/head of the facility and invited specialists with a relevant competence.

Response during Fire

The strategic actions of the person and the personnel working in the vicinity, who detected fire or smoke, are as follows:

1. Termination of works on every site, except for safety measures;
2. Assessment of the situation, reconnaissance of fire hearth and adjacent territories;
3. Withdrawal of the equipment-devices from the areas, where the fire spreading is possible;
4. Electrical equipment should be turned out from the circuit;
5. In case if fire is strong and it is hard to approach the fire hearth, some kind of fire or explosive hazardous sites/substances are located adjacently, then:

1. Get away from the danger zone:

2. Inform senior manager/operator about the accident;
3. Wait for rescue team and when they appear, inform them about the fire reasons and the situation in the vicinity of fire hearth;
4. In case if the fire is not strong, the fire hearth is easily approachable and getting near to it is not dangerous for your health. At the same time, there are certain risks of fire distribution on adjacent territories, then, act as follows:
5. Inform senior manager/operator about the accident;
6. Search for the nearest fire stand and supply yourself with necessary fire inventory (fire extinguisher, axe, crowbar, bucket and etc.);
7. Try to liquidate fire hearth with fire extinguisher, in accordance with the instruction shown on the fire extinguisher;
8. In case if there is no fire stand on the site, use sand or water for fire hearth liquidation or cover it with less flammable thick cloth;
9. In case if the electrical equipment turned into the circuit are near the fire hearth, it is prohibited to use water;
10. In case of fire in the closed space, do not window the room (except for special needs), because the fresh air supports fire and fire scale growth.

Strategic actions of site manager/chief operator in case of fire:

11. Gathering detailed information on fire hearth location, existing/stored devices-equipment in the vicinity and substances;
12. Information transfer in accordance with the notification scheme;
13. Visiting the accident place and reconnaissance of the situation, risks analysis and assessment of expected fire scales (I, II or III scale);
14. Ask whole personnel to use vehicles and fire extinguishing equipment;
15. Controlling and managing the personnel actions.

Response during Accidents Related to Human Injuries and Incidents Related to Their Health and Safety

The person, who is taking care of injured person, must notify ambulance about an accident as a first action. Before the rescue will appear, injured person must receive first aid service in accordance with the tactics given below in following chapters. Before carrying out medical service, it is necessary to assess the situation and determine if approaching and helping an injured person might create some threat.

First Aid during the bone fracture

Open and closed bone fractures are being distinguished:

16. For the open fracture is characterized the violence of skin cover integrity. In this case, there is wound and bleeding in the damaged area. There is a high risk of infection in case of open fracture. In case of open fracture:

17. Promptly call helper, so that helper will immobilize the damaged area of the injured person, while you will process the wound;
18. Cover the wound with clean cloth and directly press on it to stop the bleeding. Do not press directly on broken bone fragments;
19. Without touching the wound with fingers, surround the damaged area with a clean cloth and fit ix;
20. If the broken bone fragment is seen in the wound, place the soft cloth around the bone fragment in such way, that the cloth will not be removed and the bandage would not impact on bone fragments. Fix the bandage I such way, that it will not disrupt the blood circulation below the wrapped place;
21. Carry out a broken bone immobilization, in the same way as during covered fracture;
22. Check pulse, capillary filling and sensitivity below the wrapped place once in every 10 minutes.
23. We are dealing with a closed fracture, if the ski integrity is not damaged in the injured area. In this case, haemorrhage and edema are observed in the injured area. In case of closed fracture:
24. Ask injured person to stay still and fix the damaged part of the fracture above and below it by hand, before it will be immobilized (fixed);
25. For a good fixation, fix the injured part of the body on uninjured part. If the fracture is on the hand, fix it on the body with triangle bandage. If the fracture is on the leg, fix the damaged leg on another leg;

Check pulse, sensitivity and capillary filling below the wrapped place once in every 10 minutes. If the blood circulation or sensitivity is reduced, make a less tight bandage.

First Aid During Wounds and Bleeding

here are three types of bleeding:

There is a little blood. In this case is risk of infection:

- Clean the wound of injured person with any colourless liquid suitable for drinking;
- Wrap the wound with clean cloth.
- There is a lot of blood. In this case there is a risk of blood loss:
- Cover the wound with several layers of cloth and make press bandage;
- If the blood is still leaking, tight the cloth to the wound again (do not take of the blood-drenched cloth) and strongly press on blood source area.
- The blood is pouring like a fountain from the wound. In this case the blood loss is very fast. In this case you must push finger (or fingers) on the artery projection area to avoid this and then put a bandage.

The areas of load on the artery are: the lower third of an arm and upper third of the thigh. The bandage should be fixed like this:

- The bandage is fixed only in extreme case, because often it leads to irreversible damage;
- The bandage is fixed above wound;
- The location where the bandage will be fixed must be covered with cloths. If the wound area is bare, we should place clean cloth under the bandage;
- First bandage must be tight (fixed as possible), then the bandage is getting tight and in addition placed 3-4 times (rope, belt and etc. can be used instead of bandage);
- The bandage should be fixed for 1 hour in the winter and for 2 hours in summer. Then we should release and after 5-10 minutes fix it slightly above from the original location;
- Check if the bandage is properly fixed – if it is properly fixed, there should be no pulse on limb;
- What we should not do;
- Do not put a hand in the wound;
- Do not take anything from the wound. If some foreign body is seen in the wound, we should try to maximally fix it (put a bandage around this body).

Internal bleeding is hardly determinable damage. Suspect internal bleeding, when the shock signs are observed after getting injured, but there is no significant blood loss. In case of internal bleeding:

- Lay injured person on his back and rise his legs up;
- Remind tight clothes on neck, chest, waist;
- Do not give food, medicine or drinks to injured person. If injured person is conscious and is very thirsty, just wet his lips;
- Warm injured person – cover with blanket or cloth;
- Check the pulse in every 10 minutes, as well as breathing and consciousness. If the person is losing mind, place him in safe location.

First Aid in Case of Burn

The burn might be developed by hot objects and steam impact (thermal burn), by chemical substances impact on the skin (chemical burn), electricity impact (electrical burn). In order to properly carry out first aid, you must determine the degree of burn, which depends on damage depth and damage area (on what part is the burn distributed).

The first aid measures during the burn are:

1. It is dangerous to breath in the smoke, so if there is a smoke in the room and it is not available to window fast, remove the injured person on a safe place, on a fresh air;

2. If the clothes are burning on the person, do not start to roll his body, pour the water on the body (in case of electrical burning, usage of water next to the equipment in the circuit, is prohibited);
3. If there is no possibility to use water, cover the body with non-synthetic cloth;
4. It is necessary to start cooling the burnt area in time with cold water (in case of I and II scale burn, water it for 10-15 minutes, in case of III and IV scale burn wrap it with clean wet cloth and then cool it in the water in such wrapped conditions);
5. Remove the cloth and other objects, from the damaged area, which may interrupt blood flow. Do not remove cloth pieces, which are stick to the damaged area;
6. Cover the damaged area with sterile wrapping. This would reduce the likelihood of infection;
7. Breathing in a hot air is possible when burnt, which leads to the burning of respiratory tracts. If the victim has hard noisy breathing, facial or neck burn, singed hair cover of face and nose, swelled mouth and lips, swallowing difficulty, cough, hoarseness voice – suspect the respiratory tracts burn and wait for the medical service;
8. Constantly check breathing and pulse before the medical service will come, be ready to carry out reanimation measures;
9. It is not allowed to take off the clothes particles from the burnt skin, cause this may lead to the deepening of the damage;
10. It is not allowed to destroy the integrity of blebs, because the skin cover is damaged and it makes a favourable conditions for the invasion of infection in the body;
11. Do not use ointments, lotions or oils for processing the damaged parts;
12. It is prohibited to process the chemical burn areas with neutralizing solutions/ For example, alkaline caused burn treatment with acid.

First Aid in Case of Electrical Trauma

There are three types of electrical trauma:

- The trauma caused by high-voltage electricity. The damage developed as a result of high voltage traumas, are fatal in most cases. Severe burns are being developed at this time. Due to the strong muscle compression the injured person is often threw away on a significant distance, which leads to serious injuries. In case of high-voltage power trauma:
- It is prohibited to get close to the injured person, before the electricity will be turned off and if necessary, the isolation will be made. Remain 18 m radius safe distance. Do not let other witnesses to approach the injured person;
- After receiving electric trauma, as soon as approaching the injured person, open the breathing ways without moving head back, by moving the lower jaw in front;

- Check breathing and circulation signs. Be prepared to make reanimation measures;
- If the injured person is unconscious but is breathing, place him in a safe location;
- Carry out first aid in case of burns and other injuries.

- The electrical trauma caused by low-voltage electricity. Low-voltage electricity trauma may turn into serious damages and even death reason. Often, this kind of electrical trauma is caused by damaged plugs, wiring and equipment. When standing on a wet floor or touching undamaged electrical wiring with wet hands, the risks of getting the electrical trauma are sharply increasing. In case of low-voltage power caused trauma:

- Do not touch the injured person, if he is touching the power source;
- Do not use metal object for removing the power source;
- If you are able, stop power supply (turn off the power switch). If it is not available, turn off the electrical equipment from the power source;
- If you are not able to switch off the electricity, then stand on dry insulation thing (for example: a plank of wood, on rubber or plastic pad, on book or pile of newspapers);
- Remove the victim's body from the power source by broom, stick, and chair. You can move the victim's body away from the power source, or vice versa, the power source away from the body, if it is more convenient;
- Without touching the body of injured person, tie a rope around his foot and shoulders and move away from the power source;
- At least, grab the injured person in dry not-tight cloth and move him away from the power source;
- If the victim is unconscious, open the airways, check the breathing and pulse;
- If the victim is unconscious, is breathing and has a pulse, place in a safe location. Cool the burned areas and wrap it;
- If the visible injuries are not seen on the victim and feels good, advice to take a rest.
- The electrical trauma caused by lightning/thunder:
- Various traumas, burns, face and eyes damage is often by the electrical trauma. Sometimes the lightning may cause a sudden death.

Quickly move damaged person form the place of the accident and serve with first aid as in case of different type of the electrical trauma.

Equipment Necessary for Emergency Response

Personal protection means are:

1. Helmets;
2. Safety glasses;
3. Uniforms with reflective stripes;
4. Waterproof boots;
5. Gloves.

Fire extinguishing equipment:

1. Standard fire extinguisher: on every site, as well as on every special machines and equipment;
2. Buckets, sand, shovels and etc.;
3. Properly equipped fire stands;
4. Fire truck – the nearest fire fighters team truck will be used.

Emergency medical service equipment:

- Standard medical boxes: Standard medical boxes for vehicles: on every project vehicle and equipment;
- Ambulance car

Spill response equipment:

- Heavy duty plastic bags;
- Absorbent pads;
- Gloves;
- Drip trays;
- Buckets;
- Polyethylene film.

Necessary Qualification and Personnel Training

Testing of each system of emergency response must be periodically implemented, obtained experience must be documented and weak spots should be improved (the same should take place in case of accident realization).

The whole staff, employed on treatment facility construction and operation, must undergo introductory training, which includes emergency response course. Personnel additional training registration system should exist and be kept at offices of customer or contractors.

Annex 2:Impact Assessment Criteria

Table 1: Noise and vibration propagation – Impact Assessment Criteria

Kind of impact	Assessment criteria		
	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Noise propagation	Noise levels at the border of the settled area exceed 55 dbA during the day and 45 dBA at night, or exceeds50 dBA during the day and 40dBA at night at sensitive receptors. Excess noise levels are intense. Population's dissatisfaction is inevitable.	Noise levels at the border of the settled area little exceed 55 dbA during the day and 45 dBA at night; however, the impact is expected only in some cases or is temporal. The noise levels at the sensitive receptors are admissible; however, additional preventive measures are recommended.	The noise background levels have deteriorated a bit near the settled areas or sensitive receptors. In any case, no levels in excess of the admissible levels are expected. It is sufficient to take standard mitigation measures.
Vibration	Due to the use of heavy technique and other methods, vibration spreads to great distances. There is a probability of damage or destruction of buildings and premises, monuments of cultural heritage or disturbance of geological stability.	Vibration does not spread to far places, or the impact is short-term. The probability of damage of buildings and premises, monuments of cultural heritage or disturbance of geological stability is very little. Minor and periodic discomfort is expected.	Vibration propagates only in the working zone. No damage of buildings and premises, monuments of cultural heritage or disturbance of geological stability is expected. No addiitonal mitigation measures are needed.
Condition of the working area (noise and vibration)	It is impossible to work. Using ear-plugs or other protective equipment is less inefficient. It is necessary to change the service staff frequently.	Noise and vibration is a nuisance in the working area; but working is possible provided the relevant protective equipment are used or other measures are taken (e.g. cutting the working hours and the like).	The noise and vibration levels in the working zone are not high. No PPE is needed, or if needed only for short periods. An 8-hour-long working day is permitted.

Table 2: Assessment criteria of the expected impact on water

Kind of impact	Assessment criteria		
	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Changed flow rate of the surface waters	Under the project impact, the natural river flow rate is strongly changed (either for the year, or temporarily); it is difficult to maintain the present state of the water eco-system. Other water-consuming unit has a limited access to water, or due to the increased water flow, the risk of developing hazardous hydrological events has increased.	Under the project impact, the natural river flow rate reduced to 70%(either for the year, or temporarily); however, the water eco-system is mostly maintained. The access of another water-consuming unit to water has not changed, or Under the project impact, the natural river flow rate increased to 110%. The risks of developing the hazardous - hydrological events are possible to eliminate by using relevant protective measures.	Under the project impact, the natural river flow rate reduced to 70% (either for the year, or temporarily). The access of another water-consuming unit to water has not changed, or the unit is not used for other purposes. The river flow rate will not increase under the impact of the project.
Deterioration of the surface water quality, origination of the sewage	Fishing or drinking-and-industrial water object is under the impact, or Significant amount of sewage is expected. Despite building the treatment plant, there is a probability of discharging the excessively polluted waters, or the probability of emergencies is high. Due to the near location of the water	An industrial-household water unit is under the impact. Sewage is originated; however, at the expense of relevant preventive measures (arranging the duly efficient treatment plant, etc.) it is possible to maintain the qualitative state of the surface water. The existing quality may be changed a bit what will have a minor impact on the water biodiversity, or the probability of emergencies to occur is	There are no surface waters near the water object. Therefore, there is only the possibility of indirect impact, which is not major. No sewage is expected to originate, or the small amounts of liquid remains can be managed by using the methods safe for the water environment (e.g. by an evaporating pond, recycling the liquid remains, etc.).

	body, there is a possibility for the solid remains and liquid mass to enter the water body.	not high. In such a case, the distances are so great that the risks of the polluting substances flowing into the water are minimal.	
Ground water pollution	The activity implies using the methods creating the risks of excess pollution of the ground waters (e.g. burying the materials containing polluted substances, etc.); mitigation measures are less efficient, or the probability of emergencies to occur is quite likely with the infiltration of the large amounts of oil products or other polluting substances into the ground layers.	The activity implies using the methods creating certain risks of pollution of the ground waters; however, using the mitigation measures is efficient and significantly reduce the risks, or there is probability of emergencies to occur; however, relevant preventive measures are taken.	The risks of the ground water pollution are associated with the unforeseen cases only (minor oil product leakages from technique or equipment and the like.). No large amounts of liquid polluting substances are stored or used in the area threatening the ground waters in case of accidents.
Impact on the flow rate of the ground waters, changed infiltration properties of the grounds	The activity envisages arranging deep engineering facilities, with which it is possible to cross the underground water-bearing infrastructure. As a result, the outflows of the underground waters may decrease, or The activity envisages using large land areas/cutting down the forests what will deteriorate the ground infiltration	The activity does not envisage arranging deep engineering facilities, and in addition, there are no particularly significant water-bearing horizons spreading on the territory. Despite this, cultivation of land areas or the used building and exploitation methods may have a certain impact on the outflows of less valuable springs.	By considering the small project area, used building and exploitation methods and existing hydro-geological conditions, the impact on the flow rate of the underground waters will be minor. No impact on either drinking, or industrial water is expected.

	properties. This may reduce the intensity of the underground water alimentation with the atmospheric precipitations.		

Table 3: Assessment criteria of the expected impact on the soil

Kind of impact	Assessment criteria		
	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Damage and erosion of the fertile soil layer	The project envisages using over 12,5 ha of agricultural plots or other land areas highly valuable in respect of fertility, or the methods used during the building and exploitation promote the activation of the soil erosion processes over significant areas.	The project envisages using less than 12,5 ha of agricultural plots or other land areas valuable in respect of fertility, or the area to manage is more than 12,5 ha, but this is not an agricultural land or is not otherwise valuable, or The methods used during the building and exploitation promote the activation of the soil erosion processes in some areas, but they can be prevented by using the relevant mitigation measures.	The project envisages using less than 12,5 ha of non-agricultural plots or other land areas less valuable in respect of fertility. Provided the fertile soils layer is duly managed, the impact will be minimal. No erosion beyond the used perimeter is expected.
Soil/ground pollution	Due to the methods used during the building and exploitation, the risks of polluting the fertile layer of the agricultural land of any area (exceeding MAC) are quite high or virtually inevitable	Due to the methods used during the building and exploitation, there are risks of polluting the less valuable surface layer of lands (exceeding MAC) or there is a probability of developing such	Only minor local pollution of soil/ground is expected, mostly in unforeseen cases. The technology of local cleaning the polluted soil can be used.

	or the probability of developing such emergencies leading to the pollution of over 100 m^2 area or over the depth of 0,3 m of soil and ground is quite high.	emergencies leading to the pollution of less than 100 m^2 area or less than the depth of 0,3 m of soil and ground.	

Table 4: Assessment criteria of the expected impact on the geological environment

Kind of impact	Assessment criteria		
	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Violation of the stability of the geological environment under the project impact, activation of hazardous processes	The project is planned to implement in the relief with the III degree of complexity in engineering-geological respect. During the earthworks, the probability of activation of such hazardous geodynamic processes, as landslide, rock fall, mudflow, etc. exists, or the risks of activation of the same processes exist in the operation phase of the object (hydrotehcnical facilities, underpass, etc. can be considered as such object). It is necessary to build the protective facilities of complex structures or to make corrections to the project.	The project is planned to implement in the relief with the II degree of complexity in engineering-geological respect. During the earthworks or in the operating phase, the probability of activation of hazardous geodynamic processes. However, provided the protective measures in terms of simple-structure facilities these can be prevented.	The project is planned to implement in the favorable relief. No significant resources to build protective structures are needed. Only local, minor erosive processes may develop.
Impact of the	The engineering-geological properties	The engineering-geological properties of	The object is not a facility of a

existing engineering-geological conditions on the project facilities	of the grounds are not favorable needing building deep foundations to establish the facilities on the cliffy rocks, or hazardous geodynamic processes threaten the stability of the object. It is necessary to build the protective facilities of complex structures or to make certain corrections to the project.	the grounds allow founding the object, but under certain conditions. The degree of the environment (ground and ground waters) aggressiveness to the reinforced concrete is satisfactory, or hazardous geo-dynamic processes pose a certain threat to the object's stability; however, the risk may be eliminated by taking protective measures of a simple structure.	complex structure. The engineering-geological properties of the territory-constituent grounds are satisfactory. Consequently, there is no need for either deep foundations, or significant measures to protect the engineering facilities.

Table 5: Assessment criteria of the expected impact on the biological environment

Kind of impact	Assessment criteria		
	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Generic and quantitative changes in the vegetation cover	The project implementation will lead to the destroy of the endemic or Red-Listed species or the project implementation will lead to the use of the forested area over 1 ha or there is a risk for invasive kinds to spread	Following the project implementation, the risks of direct or indirect impacts on the endemic or Red-Listed species are minimal or the project implementation will lead to the use of the forested area less than 1 ha	Following the project implementation, there is no risk of impact on the endemic or Red-Listed species. Only the destruction of the homogenous low-value vegetation cover is expected. There is no risk for invasive species to spread.
Deterioration of the animal habitats, habitat	The project implementation will lead to the destroy, reduction or fragmentation of the area of the	Following the project implementation, the impact on the endemic or Red-Listed species is less likely. The area of such	The project area is under the anthropogenic impact and is not a shelter for animal species. Only the

loss or fragmentation	endemic and Red-Listed animal species or certain species may be reduced or certain population may disappear in the project implementation area or the object is a linear object creating a kind of barrier for migrating animals or there is a risk for invasive kinds to spread.	living organisms with no ability to migrate to long distances may decrease, or quantitative changes of certain species are expected in the project implementation area, but their destroy is not likely.	animals adapted to the human activity live in the area with high ecological valency. The object is not a barrier hampering the migrating animals.
Immediate impact on fauna specie s	Due to the project implementation, there are some cases of animal perish (including endemic or Red-Listed species) during the year, or increased probability of poaching.	Due to the project implementation, there are few cases of animal perish (less valuable species) during the year	Perish of the animal species is less likely. The impact is short-term. The probability of increased poaching is minimal.
Direct or indirect impacts on the protected areas	Due to small distance and following the methods used at the building and exploitation stages, there are risks of long-term direct or indirect impacts on the territory.	Following the methods used at the building and exploitation stages, there is a risk of indirect impact on the protected area, but the impact is not long.	Due to a great distance, an impact on the protected area is less likely.

Table 6: Assessment criteria of the expected impact on the visual-landscape environment

Kind of impact	Assessment criteria

	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Landscape impact	The project implementation is planned within the limits of the rare and high-value landscapes, or the landscape and its components are in fact intact and have high degree of naturalness.	The project implementation is planned within the limits of a regional or local landscape or the landscape and its components are partially transformed due to the human actions. They have an average degree of naturalness.	The project implementation is planned within the limits of a low-value landscape, which can be substituted, or the landscape and its components are quite devastated due to the man's economic activity.
Visual changes	The project area is easily seen from many locations. Implementation of the activity will have a significant impact on the visual effect for the local people or tourists.	The project area is seen from some observation points having no touristic value.	The project area is almost invisible. The building and exploitation will have a minimal impact on the visual effect for the local people or tourists.

Table 7: Assessment criteria of the expected impact on the social environment

Kind of impact	Assessment criteria		
	Significant (high) impact	Average impact	*Insignificant (low) impact*
		Positive impact	
Increased budgetary flows	Increased central budgetary flows	*Increased budgetary flows*	Increased central budgetary flows
Employment and growing income of the population	The possibility to hire 70% of workforce from local population or The possibility to hire 40% of workforce from local rural residents or	A total of 30 to 100 people employment opportunities. or Local villagers from 10 to 30 people employment opportunities. or Highland status of rural residents few	10 persons employment opportunity.

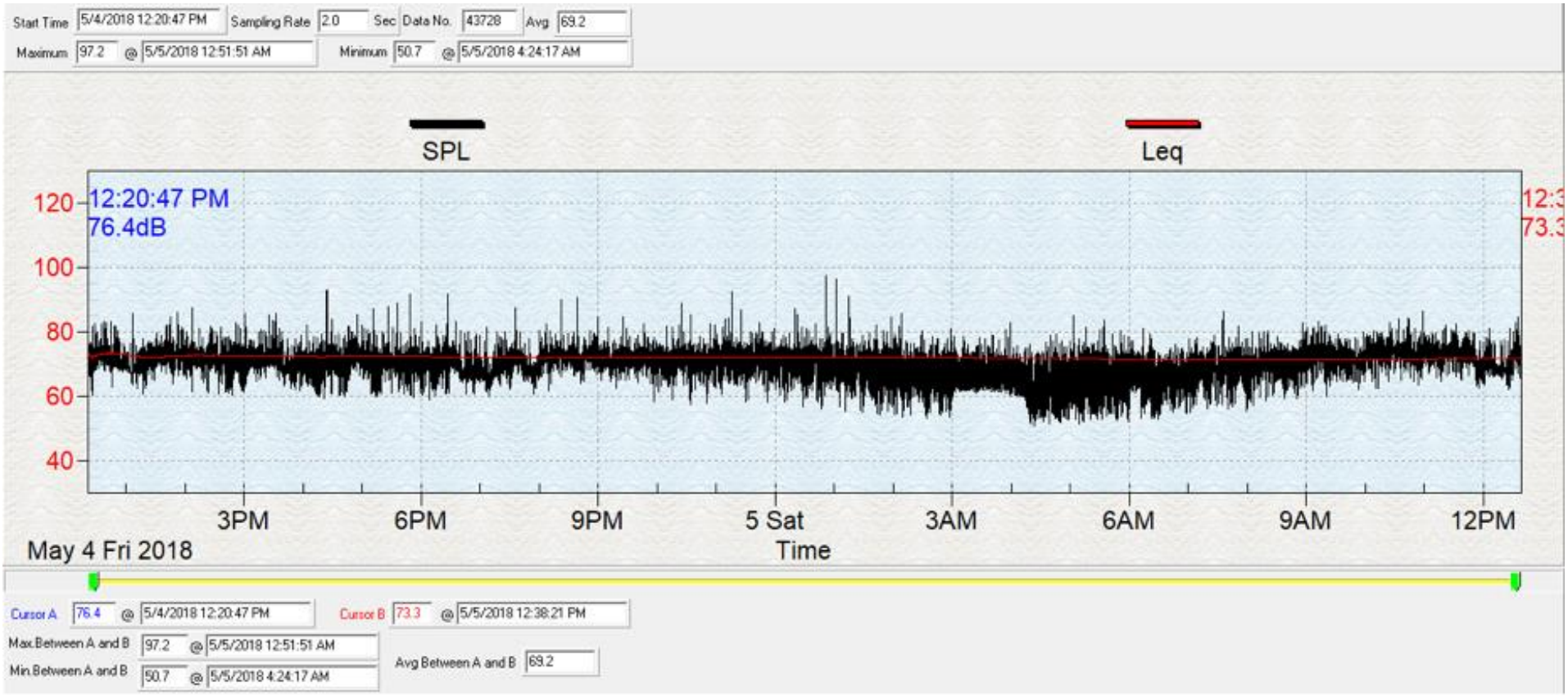
	the possibility to hire 20% of workforce from local population in the high-mountain villages.	employment opportunities.	
Improvement of transport infrastructure	Improvement of the technical state of the international, state and regional roads, high probability of distress of transport intensity.	Improvement of the technical state of the roads in some or high-mountainous village and easy transportation.	Simplified rehabilitation of rural roads and transportation
Other social-economic benefit	At a country, regional or municipal level, or for several high-mountainous villages: 1. Improved waste management conditions. 2. Improved water-supply and water-drainage conditions. 3. Improved power supply and gas supply conditions. 4. Improved accessibility to other kinds of resources.	For several or high-mountainous villages: 5. Improved waste management conditions. 6. Improved water-supply and water-drainage conditions. 7. Improved power supply and gas supply conditions. 8. Improved accessibility to other kinds of resources.	Only some families (homesteads) receive various social-economic benefits.
Negative impact			
Resettlement, need to use private property	One of several cases of physical resettlement, or over 10 cases of economic resettlement, or one or several cases of economic resettlement in a high-mountainous	Up to 10 cases of economic resettlement. Provided the compensation measures are taken, no population's dissatisfaction is expected	No physical or economic resettlement is expected. Temporal use of the privately owned land plots and units may be needed, with the relevant compensation measures

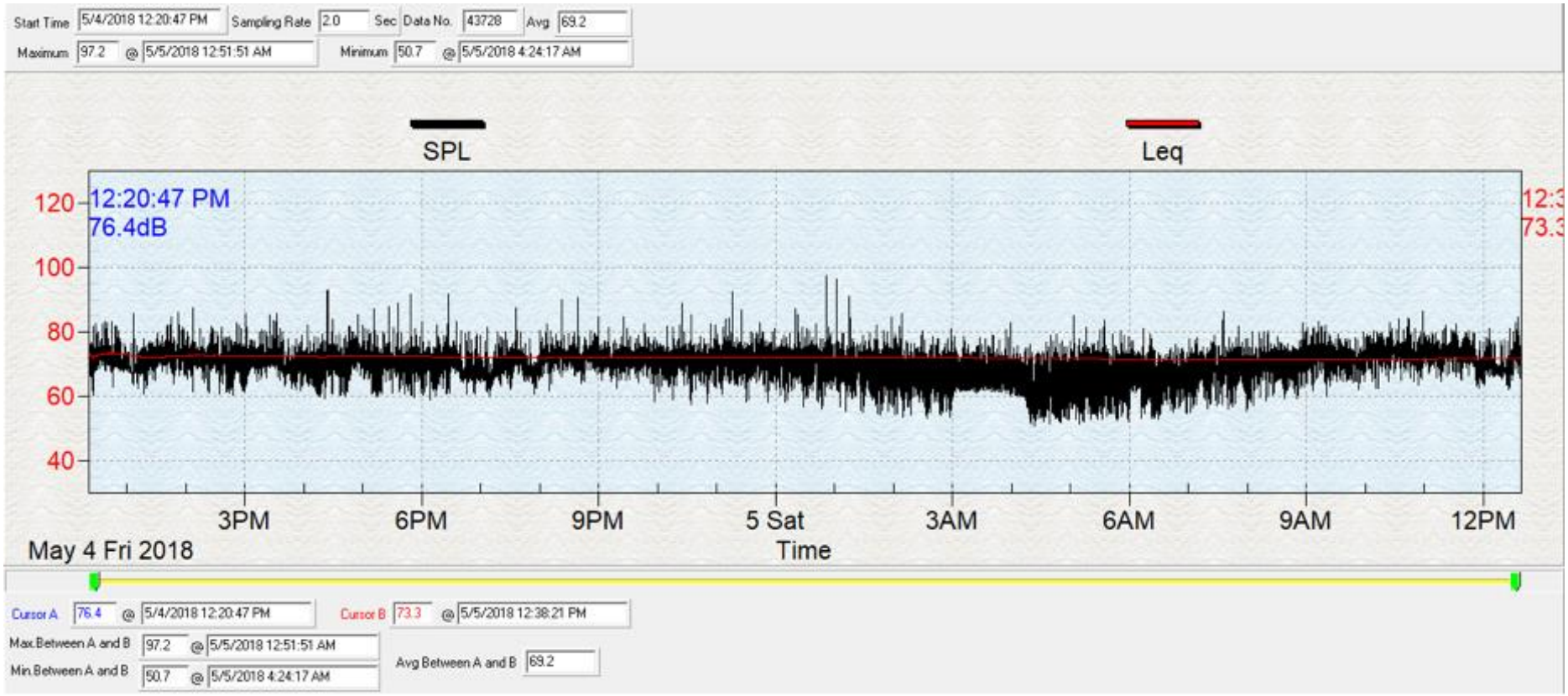
	village		planned.
Deterioration of transport infrastructure	Deterioration of the technical condition of the international, state and regional roads, significant increase of transport intensity.	Deterioration of the technical condition of the roads in some or high-mountainous villages or significant increase in vehicle movement; however, the impact is temporal.	No deterioration of local roads or significant increase of transport intensity is not expected.
Other negative social-economic effects	At a country, regional or municipal level, or for several high-mountainous villages: 9. Deteriorated waste management conditions and landfill overload. 10. Deteriorated water-supply and water-drainage conditions or overloaded relevant systems 11. Limited accessibility to other resources.	For several or high-mountainous villages: 12. Deteriorated waste management conditions and landfill overload. 13. Deteriorated water-supply and water-drainage conditions or overloaded relevant systems 14. Limited accessibility to other resources.	For several families 15. Deteriorated waste management conditions and landfill overload. 16. Deteriorated water-supply and water-drainage conditions or overloaded relevant systems 17. Limited accessibility to other resources. However, the problem can be solved by searching alternative routes.

Table 8: Assessment criteria of the expected impact on the historical-cultural monuments

Kind of impact	Assessment criteria		
	Significant (high) impact	*Average impact*	*Insignificant (low) impact*
Damage to the historical-cultural monuments	Due to the small distance and following the methods used in the building and exploitation phases, there is a probability of damaging the monuments of the international or local historical-cultural heritage.	Due to the small distance and following the methods used in the building and exploitation phases, there is a probability of damaging the monuments of the local historical-cultural heritage.	Due to the great distance, the probability of damaging the monuments of historical-cultural heritage is less likely.
Unforeseen damage to the archeological monuments	Following the historical designation of the project area, there is a probability of the late identification of the archeological monuments.		The area is quite anthropogenic. Therefore, identification of the recent archeological monuments is less likely.

Annex 3: Noise level 24 hour measurement results in 5 points of the project zone

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Minimum 50.7 @ 5/5/2018 4:24:17 AM
SPL
Leq
120
100
80
60
40
12:20:47 PM
76.4dB
12:3
73.3
3PM
6PM
9PM
5 Sat
3AM
6AM
9AM
12PM
May 4 Fri 2018
Time
Cursor A 76.4 @ 5/4/2018 12:20:47 PM
Cursor B 73.3 @ 5/5/2018 12:38:21 PM
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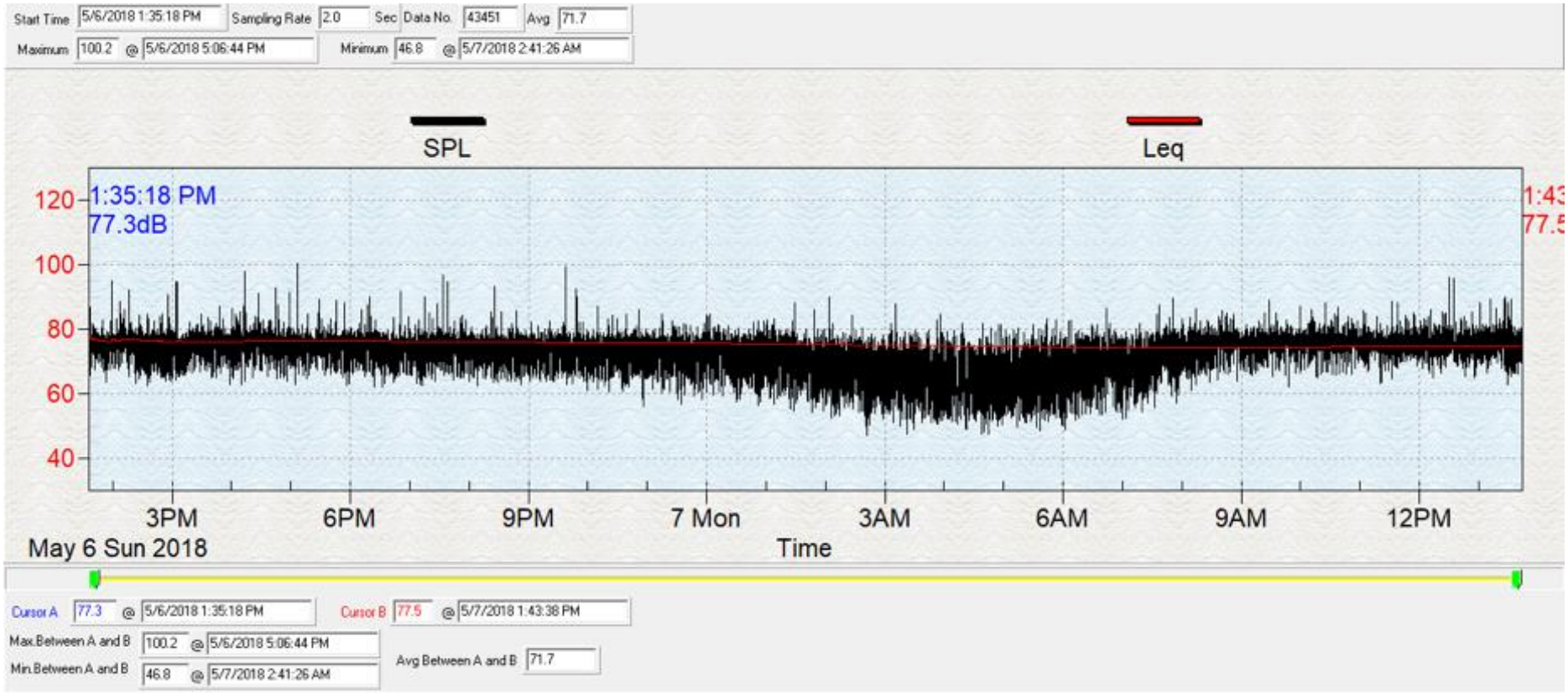
Avg Between A and B 69.2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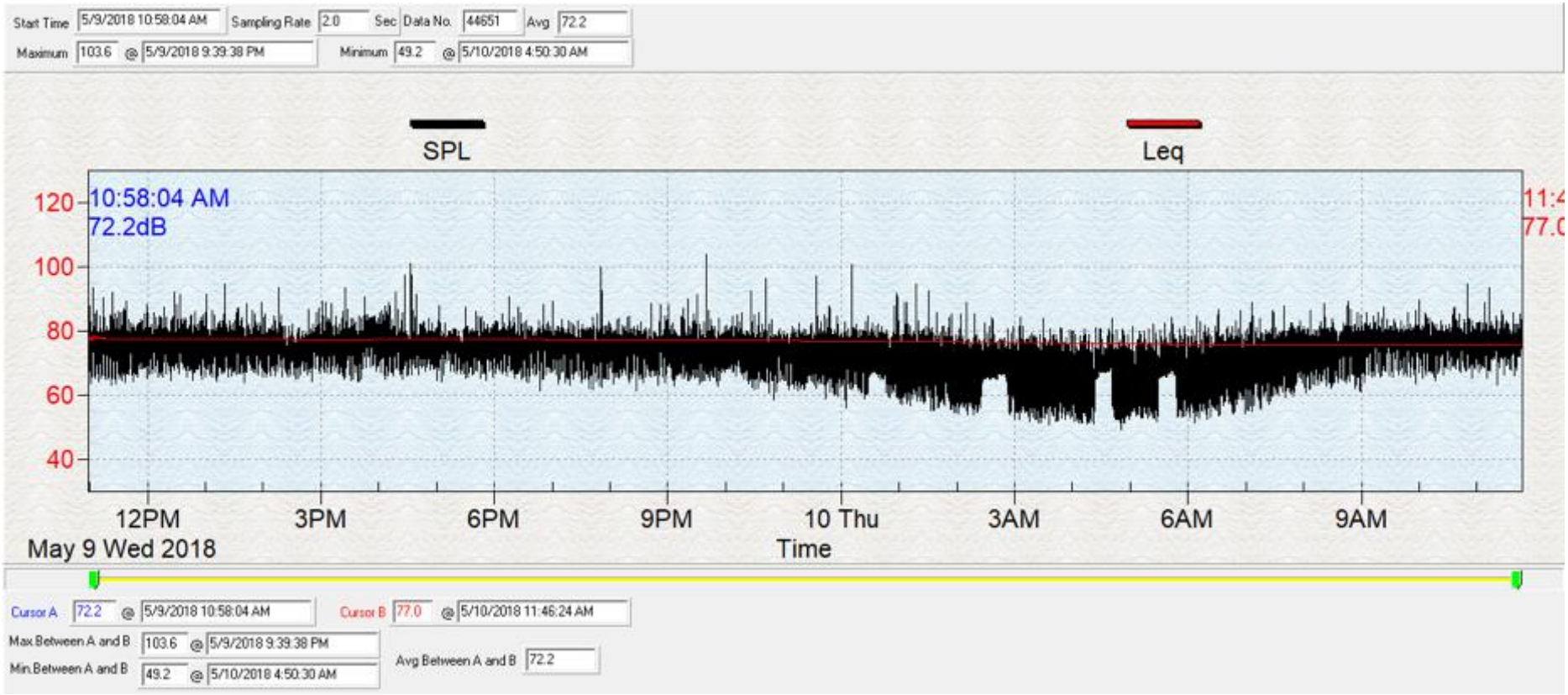
SPL
Leq
120
100
80
60
40
1:35:18 PM
77.3dB
3PM
6PM
9PM
7 Mon
3AM
6AM
9AM
12PM
May 6 Sun 2018
Time
Cursor A 77.3 @ 5/6/2018 1:35:18 PM
Cursor B 77.5 @ 5/7/2018 1:43:38 PM
Max.Between A and B 100.2 @ 5/6/2018 5:06:44 PM
Min.Between A and B 46.8 @ 5/7/2018 2:41:26 AM
Avg Between A and B 71.7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SPL
Leq
10:58:04 AM
72.2dB
120
100
80
60
40
12PM
3PM
6PM
9PM
10 Thu
3AM
6AM
9AM
May 9 Wed 2018
Time
Cursor A 72.2 @ 5/9/2018 10:58:04 AM
Cursor B 77.0 @ 5/10/2018 11:46:24 AM
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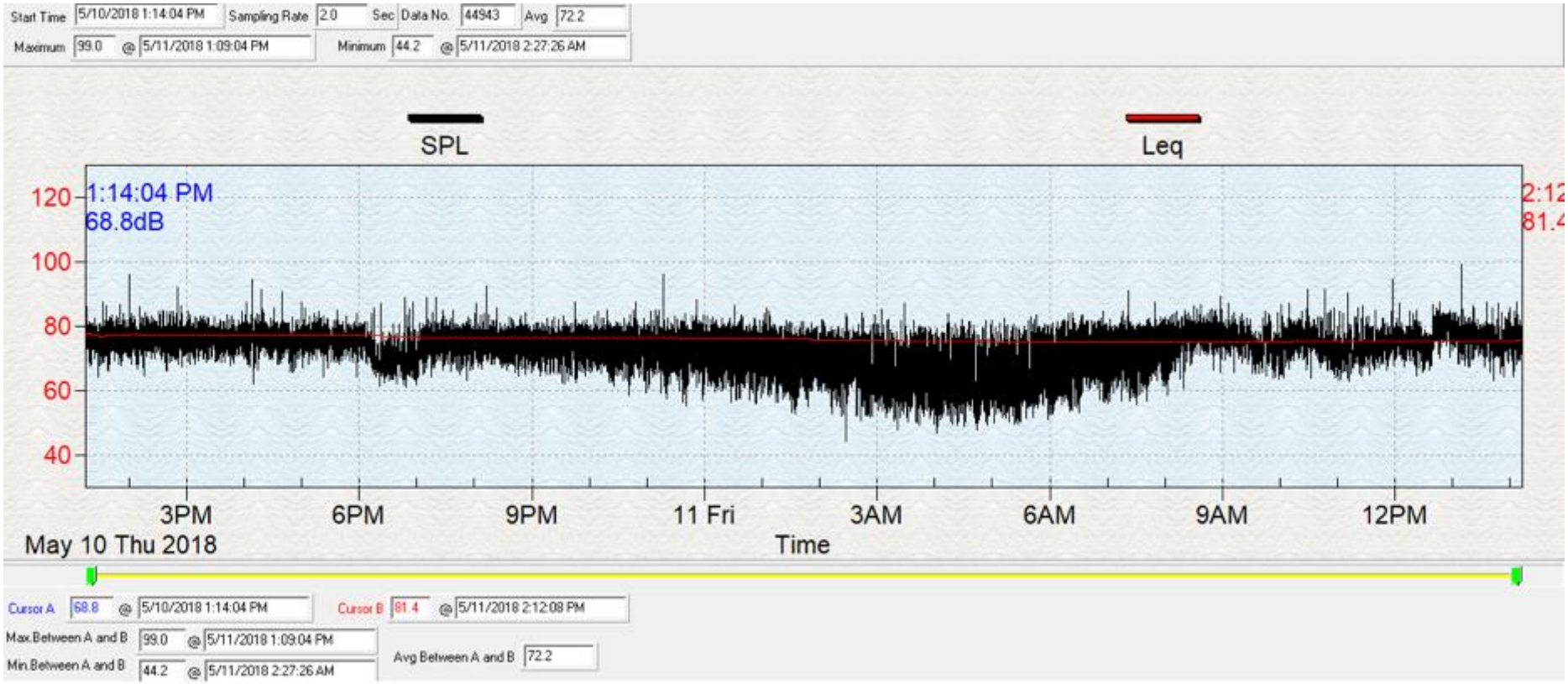
Avg Between A and B 72.2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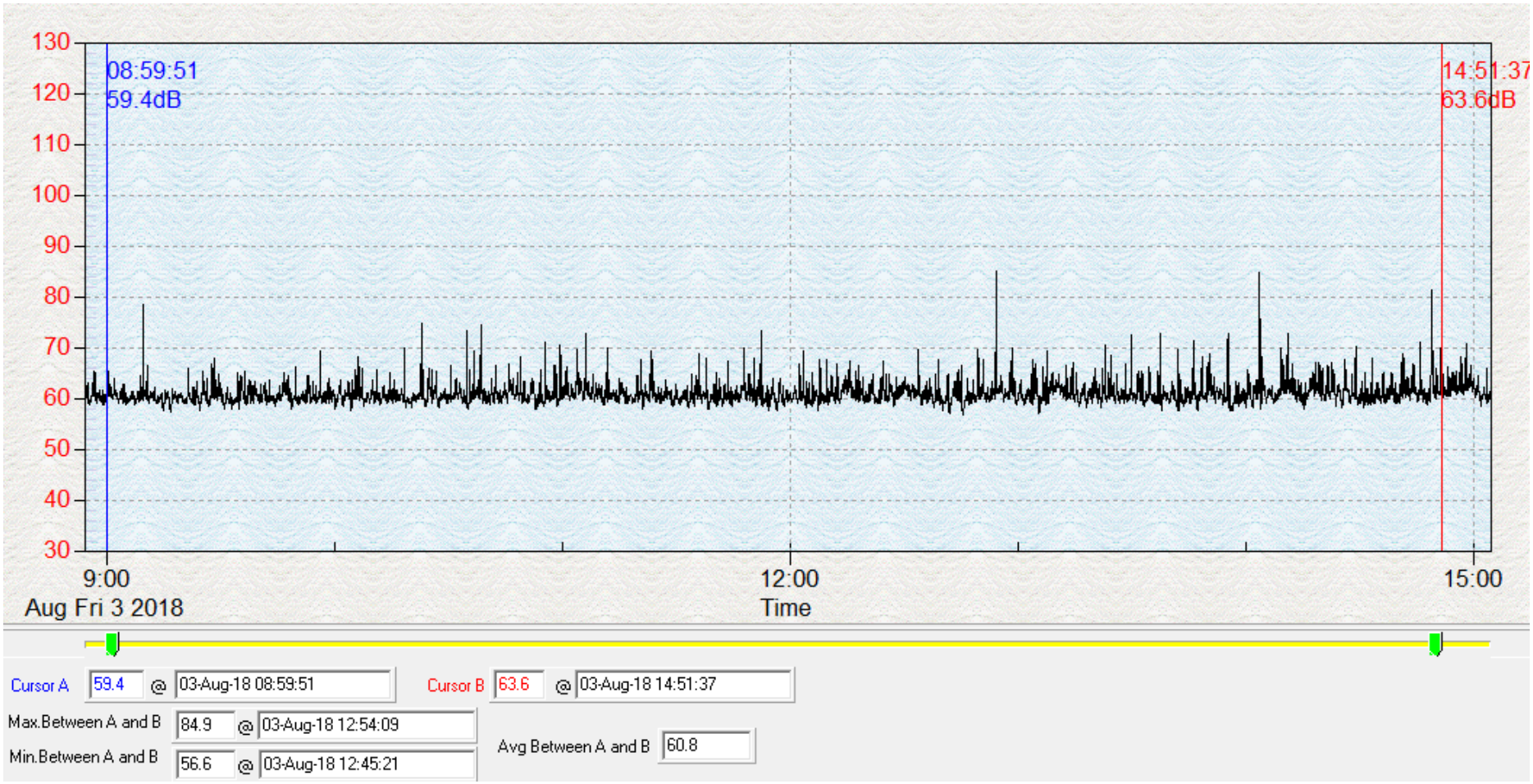
100
80
60
40
1:14:04 PM
68.8dB
3PM
6PM
9PM
11 Fri
3AM
6AM
9AM
12PM
May 10 Thu 2018
Time
Cursor A 68.8 @ 5/10/2018 1:14:04 PM
Cursor B 81.4 @ 5/11/2018 2:12:08 PM
Max.Between A and B 99.0 @ 5/11/2018 1:09:04 PM
Min.Between A and B 44.2 @ 5/11/2018 2:27:26 AM
Avg Between A and B 72.2

Annex 4: Noise level 6 hour measurement results in residential area (150 m from project area)

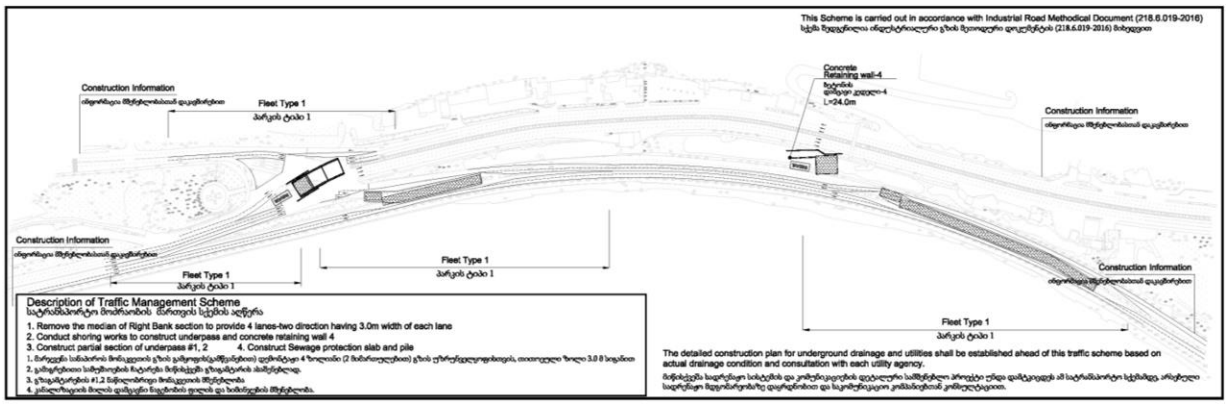


Annex 5: Traffic Management Plan

I Step:

- Remove the median of Right Bank section to provide 4 lanes-two direction having 3.0m width of each lane
- Conduct shoring works to construct underpass and concrete retaining wall 4
- Construct partial section of underpass #1, 2
- Construct sewage protection slab with board pile

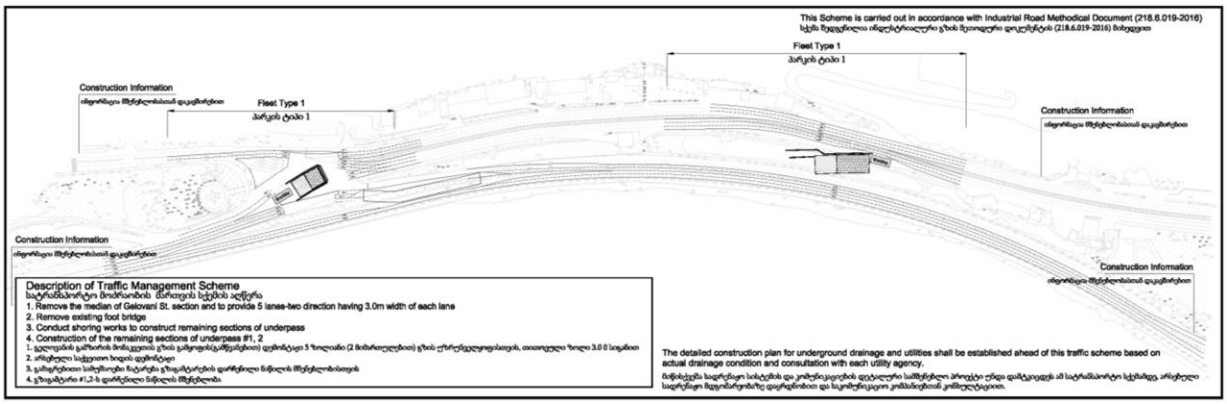
Figure 80: Temporary traffic management scheme (1/7)



II Step:

- Remove the median of Gelovani St. section and to provide 5 lanes-two direction having 3.0m width of each lane
- Remove existing foot bridge
- Conduct shoring works to construct remaining sections of underpass
- Construct of remaining sections of underpass #1, 2

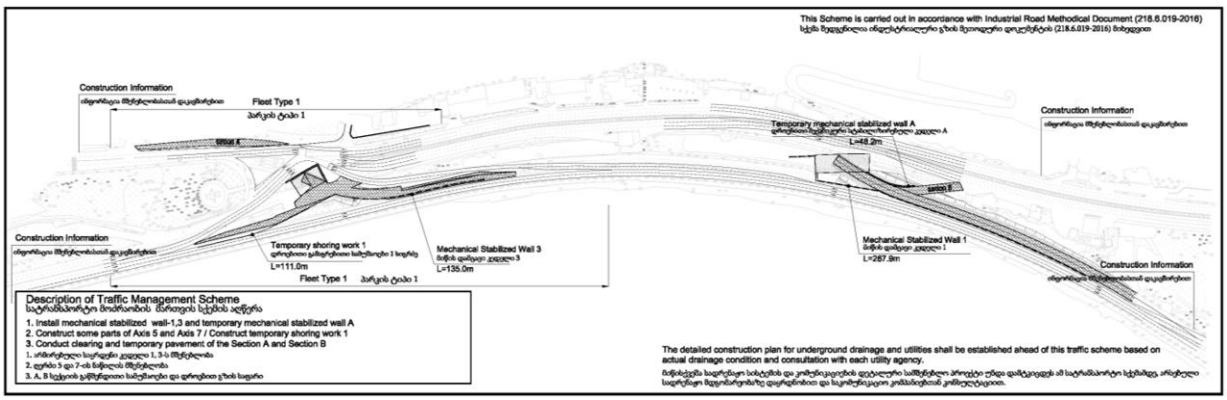
Figure 81:Temporary traffic management scheme (2/7)



III Step:

- Install mechanical stabilized wall 1, 3 and temporary stabilized wall A
- Construct some parts of Axis 5 and Axis 7 / Construct temporary shoring work 1
- Conduct clearing and temporary pavement of the Section A and B

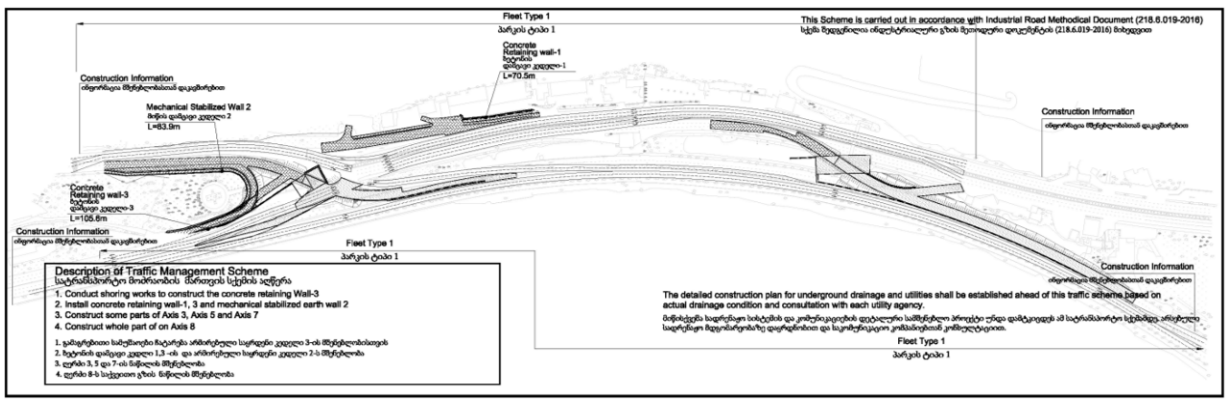
Figure 82: Temporary traffic management scheme (3/7)



Step IV:

- Conduct shoring works to construct the concrete retaining wall-3
- Install concrete retaining wall-1, 3 and mechanical stabilized earth wall-2
- Construct some parts of Axis 3, Axis 5 and Axis 7
- Construct whole part of on Axis 8

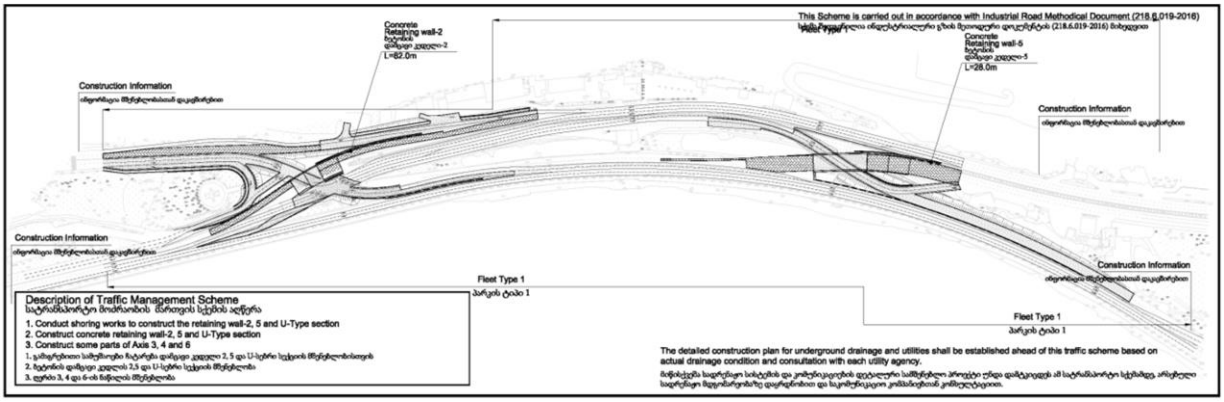
Figure 83: Temporary traffic management scheme (4/7)



Step V:

- Conduct shoring works to construct the construct concrete retaining wall-2, 5 and U-Type section
- Construct concrete retaining wall-2, 5 and U-Type section
- Construct some parts of Axis 3, 4 and 6

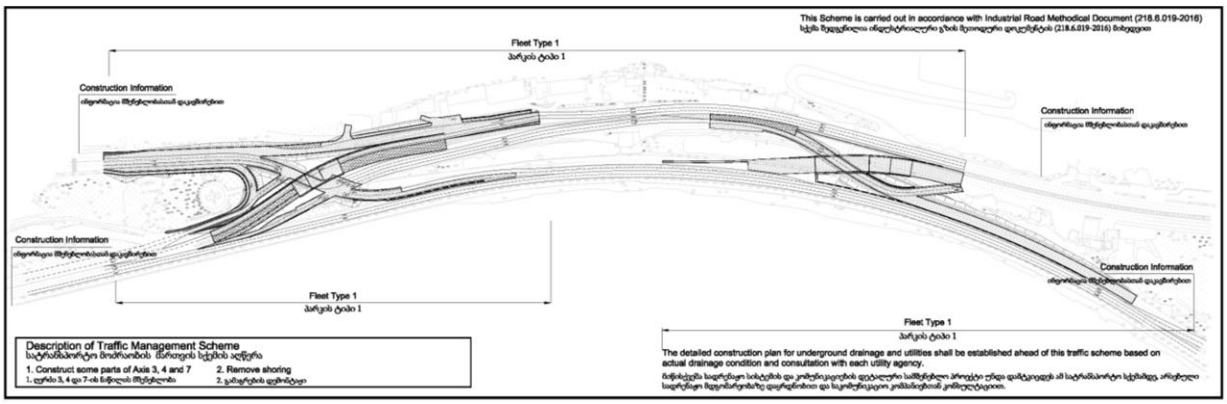
Figure 84: Temporary traffic management scheme (5/7)



Step VI:

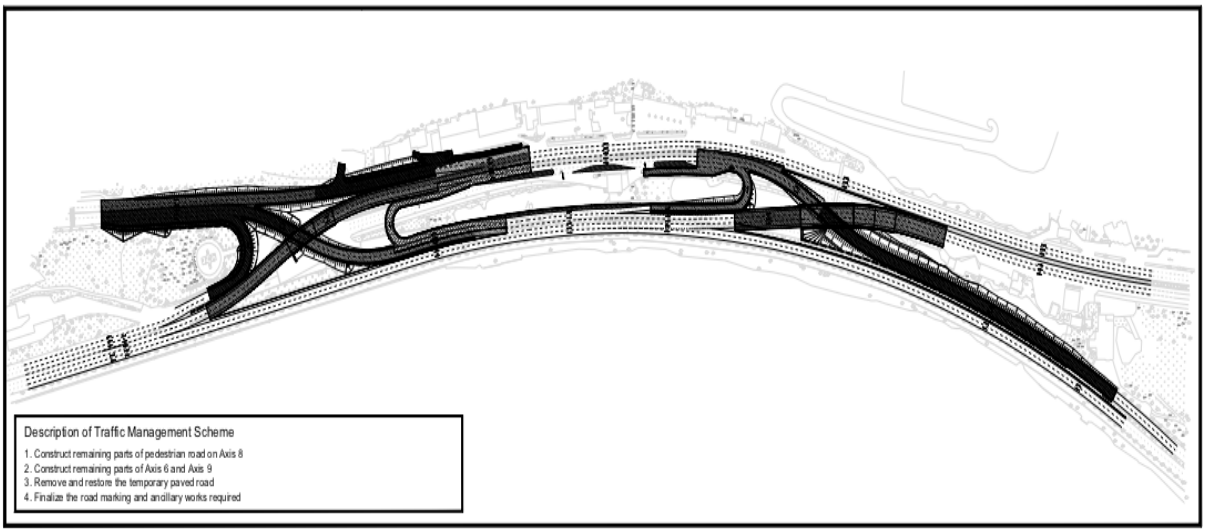
- Construct some parts of Axis 3, 4 and 7
- Remove shoring except temporary mechanical stabilized wall A

Figure 85: Temporary traffic management scheme (6/7)



Step VII:

- Construct remaining parts of pedestrian road on Axis 8
- Construct remaining parts of Axis 6 and Axis 9
- Remove and restore the temporary paved road and temporary mechanical stabilized wall A
- Construct Axis No9 and the rest of Axis 6
- Finalize the road marking and ancillary works required


Description of Traffic Management Scheme
1. Construct remaining parts of pedestrian road on Axis 8
2. Construct remaining parts of Axis 6 and Axis 9
3. Remove and restore the temporary paved road
4. Finalize the road marking and ancillary works required