August 2016

GEO: Urban Services Improvement Investment Program – Tranche 6 (Improvement of Marneuli Wastewater System Sub-project)

Prepared by United Water Supply Company of Georgia LLC of the Ministry of Regional Development and Infrastructure for the Asian Development Bank.

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ABBREVIATIONS

| CA- Cross section areaCC- Civil ContractorDC- Design ConsultantEA- Executing AgencyEIA- Environmental Impact AssessmentEIP- Environmental Impact PermitEMP- Environmental Management PlanGoG- Government of GeorgiaGRC- Grievance Redress MechanismIA- Implementing AgencyIEE- Initial Environmental ExaminationIP- Investment ProgramIPMO- Investment Program Management Office | |
|---|---|
| CCCivil ContractorDCDesign ConsultantEAExecuting AgencyEIAEnvironmental Impact AssessmentEIPEnvironmental Impact PermitEMPEnvironmental Management PlanGoGGovernment of GeorgiaGRCGrievance Redress MechanismIAImplementing AgencyIEEInitial Environmental ExaminationIPInvestment ProgramIPMOInvestment Program Management Office | |
| DC-Design ConsultantEA-Executing AgencyEIA-Environmental Impact AssessmentEIP-Environmental Impact PermitEMP-Environmental Management PlanGoG-Government of GeorgiaGRC-Grievance Redress MechanismIA-Implementing AgencyIEE-Initial Environmental ExaminationIP-Investment ProgramIPMO-Investment Program Management Office | |
| EA - Executing Agency EIA - Environmental Impact Assessment EIP - Environmental Impact Permit EMP - Environmental Management Plan GoG - Government of Georgia GRC - Grievance Redress Mechanism IA - Implementing Agency IEE - Initial Environmental Examination IP - Investment Program IPMO - Investment Program Management Office | |
| EIA-Environmental Impact AssessmentEIP-Environmental Impact PermitEMP-Environmental Management PlanGoG-Government of GeorgiaGRC-Grievance Redress MechanismIA-Implementing AgencyIEE-Initial Environmental ExaminationIP-Investment ProgramIPMO-Investment Program Management Office | |
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| GRC-Grievance Redress MechanismIA-Implementing AgencyIEE-Initial Environmental ExaminationIP-Investment ProgramIPMO-Investment Program Management Office | |
| IA - Implementing Agency IEE - Initial Environmental Examination IP - Investment Program IPMO - Investment Program Management Office | |
| IEE-Initial Environmental ExaminationIP-Investment ProgramIPMO-Investment Program Management Office | |
| IP - Investment Program IPMO - Investment Program Management Office | |
| IPMO - Investment Program Management Office | |
| | |
| kg - Kilogram | |
| km - Kilometre | |
| lpcd - Litres per Capita per Day | |
| M - Metre | |
| MFF-IP - Multitranche Financing Facility Investment Program | |
| mg/l - milligram per litre | |
| mm - Millimetre | |
| MoRDI - Ministry of Regional Development & Infrastructure of Georgia | |
| MoE - Ministry of Environment and Natural Resources Protection of Georg | a |
| PS - Pumping Station | |
| UWSCG - United Water Supply Company of Georgia | |
| WS Water Supply | |
| WWTP - Waste Water treatment Plant | |

Table of Contents

| Α | Executive Summary | 7 |
|-------------|--|----------|
| В | Policy, Legal and Administrative Framework | 9 |
| B.1 | ADB Policy | 9 |
| B.1.1. | International Standards | 10 |
| B1.1.1 | Ambient Air Quality | 10 |
| B1.1.2 | Noise | 11 |
| B.1.1.3 | Water Quality Standards | 11 |
| B.1.1.4 | Sanitary Wastewater | 12 |
| B.2 | Georgian Law | 13 |
| B.2.1 | Framework Legislation | 13 |
| B.2.2 | Licenses & Approvals Required | 16 |
| B.2.3 | Administrative Structure in Georgia | 21 |
| B 3 | Compare of the National legislation and ADB Requirements | 22 |
| B.4 | Harmonization of the ADB and Georgian Legislation Requirements | 24 |
| C. | Description of the Project | 19 |
| C 1 | Type of the Project | 25 |
| C 2 | General Information | 25 |
| C.3 | Existing Situation | 27 |
| C 4 | Population Development | 27 |
| C 5 | Design of Future Sewerage System | 20 |
| C.6 | Preliminary Design of Wastewater Treatment Plant | 23 |
| C.7 | Treatment Process | 33 |
| C.8 | Sewage Sludge Management | 34 |
| D.0 | Description of the Environment (baseline data) | 35 |
| D 1 | General | 35 |
| D.1 | Physical Besources | 35 |
| D.2 1 | Atmosphere | 26 |
| D.2.1 | Ambient Air Quality | 37 |
| D.2.2 | Belief and Geology | 28 |
| D.2.3 | Seismicity | 37 |
| D.2.4 | Soil Covers | 38 |
| D.2.5 | Hydrographic Network | 30 |
| D.2.0 | Biodiversity | 40 |
| D.2.7 | Information About the Background Pollution | 40 |
| D.3 2 | Natural Badiation Background | <u> </u> |
| D.3.2 | Analysis of the Water Guality | <u> </u> |
| D.3.4 | Social Surroundings Social-Economic Description | 13 |
| D.4 D/11 | Population | 43 |
| D.4.1 | Industry and Trade | 43 |
| D.4.2 | Industry and Trade | 43 |
| D.4.3 | Historical and Archaological Monumpote | 44 |
| D.4.4 | Dresodures in Response to the Artifact Findings | 45 |
| D.4.5 | Tourism | 40 |
| D.4.0 | Antiginated Environmental Impacts and Mitigation Measures | 47 |
| | Summary of Activities and Anticipated Impacts | 40 |
| E.1 | Developing Environmental Decumenta | 40 |
| E.2 E 2 | | 50 |
| E.3 | All Quality | 43 |
| E.J.I | Watar Quality | 51 |
| C.4 | Water wuldlily Contaminations of Surface Water | 00 |
| E.4.1 | Downotroom Llooro | 60 |
| E.4.2 | Duwiistiediii Users | 02 |
| E.4.3 | Contamination Underground Water | 02 |
| E.J | Sons quality and Topson management | 03 |

| E.6 | Biological Environment | 65 |
|--------|---|-----|
| E.7 | Traffic | 65 |
| E.8 | Hazardous Construction Wastes | 66 |
| E.9 | Other Wastes from Construction Activities | 66 |
| E.9.1 | Inert Waste | 66 |
| E.9.2 | Municipal Waste | 67 |
| E.9.3 | Medical Waste | 67 |
| E.9.4 | Non-Hazardous Construction Waste | 68 |
| E.10 | Impacts on Archaeological Sites | 68 |
| E.11 | Socio-Cultural Resources | 69 |
| E.12 | Construction Camps | 70 |
| E.13 | Construction Related Impacts at the Quarrying Sites | 70 |
| E.14 | Existing Asbestos Pips | 71 |
| E.15 | Cumulative Impacts | 72 |
| E.16 | Climate Change Impact | 73 |
| E.16.1 | Natural Threats | 73 |
| E.16.2 | Conclusions | 73 |
| E.16.3 | GHG Emissions from Waste Water Systems | 75 |
| E.16.4 | Recommendations | 76 |
| F | Analysis of Alternatives | 78 |
| F.1 | Sewage system | 78 |
| F.2 | Wastewater Treatment Plant | 78 |
| G | Information Disclosure, Consultation, and Participation | 80 |
| Н | Grievance Redress Mechanism | 82 |
| I | Environmental Management Plan | 84 |
| I.1 | Introduction | 84 |
| 1.2 | Environmental Impacts, Mitigation and Monitoring Plans | 84 |
| 1.3 | Implementation Arrangements and Responsibilities | 84 |
| 1.4 | Site Specific Environmental Management Plan (SEMP) | 86 |
| 1.5 | Site Induction | 86 |
| 1.6 | Implementation Costs | 87 |
| 1.5 | Monitoring | 97 |
| Κ | Conclusion and Recommendation | 104 |
| K.1 | Recommendation | 104 |
| K.2 | Conclusion | 104 |

List of Annexes

Annex 1- Minutes of Public hearing Meeting

| Table 1 | list of laws relevant to environmental protection | 13 |
|----------|--|----|
| Table 2 | Activities and responsibilities in EIA for national law and ADB policy | 17 |
| Table 3 | Population Development 2014 - 2044 | 20 |
| Table 4 | Wastewater Flow 2014– 2044 | 21 |
| Table 5 | Sewage Pipes | 22 |
| Table 6 | Atmospheric air temperature, C ⁰ | 26 |
| Table 7 | Relative Humidity, % | 26 |
| Table8 | Amount of precipitations, mm | 26 |
| Table 9 | Wind direction and still recurrence a year, % | 26 |
| Table 10 | Recommended baseline pollution levels by population quantities | 27 |
| Table 11 | Results of measuring of suspending particulars at "Narimanov" and | 32 |
| | "Marneuli" reservoirs area | |
| Table 12 | Noise level at "Narimanov" and "Marneuli" Reservoirs sites | 33 |
| Table 13 | Water Quality Analysis of Algeti River | 34 |
| Table 14 | Results of Chemical and Microbiological Examinations of Waste Water | 35 |
| Table 15 | Statistical Data of the Number of Population in Kvemo Kartli and | 35 |
| | Marneuli | |
| Table 16 | Site-Specific Impacts | 40 |
| Table 17 | Noise levels (Administration of the ministry of transport of the USA) | 43 |
| Table 18 | Noise levels (California Department of transportation) | 44 |
| Table 19 | Noise levels | 44 |
| Table 20 | Maximum Permissible Discharge | 50 |
| Table 21 | Dilution of effluent | 51 |
| Table 22 | Limit Values Heavy Metals | 54 |
| Table 23 | CH ₄ and N ₂ O emissionpotentialsfor wastewaterand sludgetreatment | 64 |
| | anddischarge systems | |
| Table 24 | Design Criteria and the Allowable Effluent Quality | 68 |
| Table 25 | Environmental Management Cost | 75 |
| Table 26 | Environmental Impacts and Mitigation Measures | 76 |
| Table 27 | Environmental Monitoring Plan for general construction activities in | 85 |
| | Marneuli | |

A. Executive Summary

1. The Government of Georgia wishes to improve and expand WSS services across urban centers by leveraging donor and private sector funds, and has requested ADB to develop an investment program to be financed through a multi-tranche financing facility (MFF). The proposed Investment Program will specifically address basic urban infrastructure and services management in the provincial capitals and secondary towns. The Investment Program will be implemented in various tranches; each tranche containing technically feasible and economically viable subprojects developed by UWSCG and agreed with ADB.

2. The scope of work under the consultancy services is to (i) assess the technical, financial, economic, and environmental feasibility of subprojects; (ii) conduct surveys and investigations; (iii) develop hydraulic models; and (iv) prepare detailed designs, drawings, cost estimates, specifications, and bid documents for implementing water supply and sanitation schemes in the Investment Program financed by the MFF.

3. The present IEE document: "Improvement of Marneuli Wastewater System"describes the expected environmental impacts of the sub-project implementation and gives the developed relevant mitigation measures to avoid, mitigate and/or manage such impacts. The present document covers both, construction and operation stages.

4. Marneuli is located in the south-eastern part of the country in the Kvemo Kartli region, approximately 39 km south of Tbilisi, capital of Georgia. It is the administrative centre of Marneuli District, which borders with Azerbaijan and Armenia. The total population of the town amounts to 22,506 (2014). Most of the populations are Azeribaijans, the largest ethnic minority of Georgia. The total area of Marneuli Municipality is 935 km² and the altitude of the territory in Marneuli lowland ranges between 350 to 600 meters above sea level. The highest point is the mountain Garadagh at 1,416 masl.

5. The project will be implemented according to the requirements of Georgian National and Asian Development Bank's Environmental Legislative Framework (SPS 2009).

6. Marneuli has an existing, rudimentary sewer network with a general flow direction from the north to the southern edge of the town. The main trunk follows the road from Tbilisi to the Armenian border with dimensions from DN 200 up to DN 800. The existing main trunk is in an acceptable state. Besides the main trunk there are sewer lines of DN 200. The existing system covers 20 % of the town; rural areas are not connected. The sewerage outfall discharges untreated sewage in the Algeti river. There is no sewage treatment facility. The alignment of the existing sewers is shown in the figure below.

7. The planned sewage system will be connected to the existing main trunk DN 800, which lies in the main road from Tbilisi to the Armenian border, at several points, The general flow direction for all existing and designed sewers is from north to south, to the determined location of the wastewater treatment plant at the south-eastern edge of the town,

8. The Project envisages the installation of the pipes along 125 km on the territory of the city of Marneuli. Along 121 km, the new pipes will be installed, while the old pipes will be replaced along 4 km. The sewage pipes cross the river at 6 points and water channels at 8 points. Both, irrigation channels and rivers will be crossed by using different methods, in particular, (i) a Pipe Rack method 9. will be used for 1 crossing point; (ii) a pipe bridge method will be used for 3 crossing points; (iii) the existing bridge will be used for 1 crossing point, and (iv) an iron pipe will be placed at 1 crossing point, past the river basin. In all eight cases of channel crossing, an iron pipe will pass below the existing channel.

9. Both, during the trench excavation and pipe installation, great amounts of inert waste will be accumulated. The Construction Contractor, in agreement with the local authority, shall select due sites to locate the inert waste. A certain amount of inert waste will be placed on Marneuli landfill, which is located 3 km from the city of Marneuli.

10. The Construction Contractor, prior to the onset of the construction, is obliged to conduct a number of studies and develop environmental plans, including (i) botanical study of the Project zone, (ii) Inert waste management plan, (iii) Site-Specific Environmental Management Plan (SSEMP) (iv), "Reinstatement management Plan"

11. The present document has been developed a number of mitigation measures to eliminate these problems. Accordingtothis, their proper and timely implementation will significantly reduce the potential negative impact.

11. At the stage of developing the Initial Environmental examination (IEE) document, a number of consultation meetings will be held with the local population, local self-governing bodies and all concerned parties. On 23 March, 2015, at the building of the Municipality of the city of Marneuli, under the organization of UWSCG, a public discussion of the present Project was held. It was attended by both, the representatives of the organizations engaged in developing the Project and other interested entities.

13. UWSCG if the executing agency of the project, which in turn hires construction and consulting companies on the basis of the tender. The above mentioned team takes full responsibility for the effective implementation of the project.

14. The overall conclusion of the IEE is that provided the mitigation and enhancement measures are implemented in full, there should be no significant negative environmental impacts as a result of location, design, construction or operation of the subproject.

16. There should in fact be positive benefits through major improvements in quality of life and individual and public health once the scheme is in operation. Project will stimulate economic growth. The wastewater good quality is a prerequisite for tourism development. Standard of individual and public health will improve as a result of the project. Project will generate new job opportunities.

B. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

17. This section discusses the national and local legal and institutional framework within which the environmental assessment is carried out. It also identifies project-relevant international environmental agreements to which the country is a party.

B.1 ADB Policy

18. Superseding the previous safeguard policies (the Involuntary Resettlement Policy, 1995, the Policy on Indigenous Peoples, 1998, and the Environment Policy 2002), 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.

19. 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:

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

20 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:

- **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.
- **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.

Category C - likely to have minimal or no adverse environmental impacts; EIA is not required.

21. The Marneuli WWTP subproject has been classified as environmental assessment category B) according to the criteria laid down in the checklist for water supply projects of the ADB's Environmental Assessment and Review Framework (November 2010, Updated in May 2015) that was especially prepared for the environmental assessment of the Georgia Urban Services Improvement Investment Program.

22. *ADB Review and Approval*. 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.2 Georgian Law

B.2.1 Framework Legislation

23. The basic legal document is "The Constitution of Georgia", which was adopted in 1995. While the Constitution of Georgia does not directly address environmental matters, it does lay down the legal framework that guarantees environmental protection and public access to information with regard to environmental conditions.

24. Article 37, Part 3 states that "any person has the right to live in a healthy environment, use the natural and cultural environment. Any person is obliged to take care of the natural and cultural environment." Article 37, Part 5 states that: "an individual has the right to obtain full, unbiased and timely information regarding his working and living environment."

25. Article 41, Part 1 states that "a citizen of Georgia is entitled to access information on such citizen as well as official documents available in State Institutions provided it does not contain confidential information of state, professional or commercial importance, in accordance with the applicable legal rules.

26. The **Law of Georgia on Environmental Impact Permit (2008)** defines the full list of activities on the territory of Georgia subject to mandatory ecological expertise. The Law defines the legal aspects of issuing an environmental permit, undertaking the ecological expertise, informing the public and participating in the given procedures. Under the Law, the environmental permit is the authorization to realize the planned activities. Under the Law, an environmental permit is issued by the Ministry of Environmental Protection and Natural Resources of Georgia based on the review/expertise of the application of an applicant for the environmental permit. The aim of the Law is to ensure the protection of a human health, natural environment, physical assets and cultural heritage during the activity.

27. The **Law of Georgia on Environment Protection (1997)** regulates the legal relations between the state establishments and physical or legal entities in the field related to the use of territorial waters, air space, including continental shelf and special economic zones, environmental protection and natural resources on the territory of Georgia. The Law regulates the standards of the environmental protection and issues of environmental management; it describes the economic sanctions, standards and issues of environmental impact, different issues of protection of the natural eco-systems and biodiversity, and global and regional management issues. In addition to the above-mentioned, the Law considers the major principles of waste management. The law defines the ecological requirements for the waste (Article 34). According to the provision of the given Article, an entrepreneur is obliged to reduce the origination of industrial, domestic and other types of waste, ensure their treatment, utilization, placement or burying by considering the environmental, sanitary-hygienic and epidemiological standards and rules. The Law defines the requirements for the placement of toxic, radioactive and other hazardous waste and prohibits their discharge in the surface water sources.

28. The Law of Georgia on Licenses and Permits (2005) defines the list of activities needing licenses or permits, including so called "Environmental permit". It also defines the requirements for the license or permit issue. The Law, together with the normative by-laws, regulates such organized activity or action, which relates to an indefinite circle of entities, is characterized by increased hazard to the human life or health, affects particularly important state or public interests

or is related to the use of a state resource. The given Law regulates the field regulated by a license or permit; it gives a thorough list of licenses and permits, and establishes the rules to issue the licenses and permits, 28 makes amendments to them or abolish them. Under the Law, a state regulation of the activity or action through a license or permit is undertaken only when the given activity or action is directly associated with the increased hazard to the human life or health or fields of state or public interests. The state regulation is undertaken only when the issuance of a license or permit is a real means to reduce the hazard in question or consider state or public interests. The aim and major principles of regulating the activity or action via licenses or permits are as follows:

- Provision and protection of human life and health;
- Safety and protection of a human's residential and cultural environment;
- Protection of state and public interests;

29. The Law of Georgia on State Ecological Expertise (2008). Under the given Law, the ecological expertise is a necessary measure for making decision on the issuance of environmental and/or construction permit(s). The aim of the ecological assessment is to protect the ecological balance by considering the requirements of environmental protection, rational use of natural resources and principles of sustainable development. A positive conclusion of the ecological expertise is mandatory for obtaining an environmental and/or construction permit. In addition, the holder of environmental and/or construction permit is obliged to comply with conditions specified in the ecological expertise conclusion. The process of ecological assessment is regulated by the Ministry of Environmental Protection and Natural Resources.

30. The procedure to be observed during ecological expertise, as well as the requirements on forming the expert commission is prescribed in the Provision on the Rule for Carrying out Ecological Expertise, which is approved by the Minister of Environment and Natural Resources Protection of Georgia. The full list of the activities, subject to mandatory ecological expertise for decision making on issuance of environmental permit or building permit, is specified by the Law of Georgia on Environmental Permit.

31. The state ensures protection of the environment and, correspondingly, protection of water as its main component in **The Law of Georgia on Water (1997)**. All residents of Georgia are liable to ensure the rational and sustainable use and protection of water. They have to prevent its contamination, pollution and depletion. The dumping of industrial, household and other garbage and wastes in water bodies is prohibited according to this act. The disposal of industrial, household and other effluents into water bodies is permitted on the basis of a license by the Ministry. With the objective of protecting the Black Sea and preserving its ecological system, all natural and legal persons (including foreigners) are obliged to take measures for preventing pollution of the sea with wastewater from the sources of pollution located on the land. The use of a surface water body for discharging industrial, communal-household, drainage and other wastewater is allowed only under a water use license issued on the basis of the Ministry-approved multipurpose water utilization plans and water management balance-sheet.

32. The **Law of Georgia on Cultural Heritage (2007)**. Article 14 of the Law specifies the requirements for 'large-scale' construction works. According to this Article, a decision on career treatment and ore 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 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 ground works is obliged to submit to the Ministry the

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

33. The aim of the **Law of Georgia on Public Health (2007)** is as follows: Promotion of the introduction of a good health and healthy lifestyle of the population; Creation of the environment, which is safe for a human health; Promotion of the protection of the reproductive health of a family; Prevention of infectious and non-infectious diseases. The Law defines the rights and obligations of the population and legal entities in the field of public health. Aiming at establishing the environment safe to the public health, the Ministry sets the qualitative standards for the environment safe for a human health (atmospheric air, water, soil, noise, vibration, electromagnetic radiation), including maximum permissible concentrations and rates of harmful impact. The standards are mandatory. Every person on the territory of Georgia is obliged not to carry out the activity, which causes a hazard of the infectious and non-infectious diseases to spread and helps the origination of the risks to human health; protect the sanitary and epidemiological standards; to supply the information to the public health department about all emergencies caused by the violation of the sanitary norms in the production or technological process, etc. The observance of the standards is controlled by appropriate state structures. The responsibility for the internal and external audits rests with a certified, independent laboratory.

34. Environmental Assessment and Review Framework (November 2010, updated in November 2013 due to changes in the scope of the USIIP, EARF) was established for the Asian Development Bank funded Georgia Urban Services Improvement Investment Program (or the Investment Program). This is prepared to adequately address the ADB Safeguard Policy Statement (2009) requirements and is to be endorsed by the Georgian government. Projects have to be assigned to Categories A, B, and C. General mitigation measures are listed for anticipated impacts.

35. Environmental Quality Standards and Norms In accordance with the Law on Public Health, environmental quality standards and norms, among them those of air quality and noise level, are set by Decrees No. 297/N dated 16.08.2001 of the Minister of Labour, Health and Social Affairs of Georgia (including the changes made to it by further decrees of the Minister Nos. 38/N of 02.24.2003, 251/N of 09.15.1006, 351/N of 12.17.2007). Atmospheric air quality standards (level of hazardous pollution) are also defined by the Decree 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 pollutants.

| Substance | MAC, mg/m3 |
|---------------------------------|------------|
| Nitrogen Dioxide | 0.085 |
| Sulphur Dioxide | 0.5 |
| Carbon Monoxide | 5.0 |
| Saturated Carbohydrates, C6-C10 | 30.0 |
| Inorganic dust | 0.3 |

| Table 3. Maximum Admissible Concentrations (MAC) of harmful substances in Ambient A | 4ir |
|---|-----|
|---|-----|

36. Noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception. The preferred method for controlling noise from stationary sources is to implement noise control measures at source. In the case of noise, WB/IFC

standards will apply. Noise impacts should not exceed the levels presented in Table 4, or result in a maximum increase in background levels of 3 dBat the nearest receptor location off-site.

Table 4: Noise Level Guidelines⁵ (IFC)

| | One Hour LAeq (dBA) | |
|-----------------------------|-----------------------|-------------------------|
| Receptor | Daytime 07:00 - 22:00 | Nighttime 22:00 - 07:00 |
| Residential; institutional; | 55 | 45 |
| educationa | | |
| Industrial; commercial | 70 | 70 |

37. Environmental standards regulate quality condition requirements of the environment and determine maximum allowable concentration of substances harmful for human health and environment which are contained in water, air and soil.

38. In Georgia, soil quality evaluation criteria is determined by instructions on "Level of Chemical Contamination of Soil" (MM 2.1.7. 004-02). Information on maximum admissible concentrations of various substances and elements is soils are given in the Table 5.

Table 5. Maximum admissible concentrations of various substances and elements is soils

| Arsenicmg/kg2-10Coppermg/kg3Mercurymg/kg2.1Nickelmg/kg4Leadmg/kg32Zincmg/kg23Compound Hydrocarbonsmg/kg0.1Phenol (Compound)mg/kg-Cyanidemg/kg-Sulphatemg/kg-Chloridemg/kg-Evaporable Organic Compoundsmg/kg0.3Toluolmg/kg0.3Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3 | Component | Unit | Level |
|---|---|-------|-------|
| Coppermg/kg3Mercurymg/kg2.1Nickelmg/kg4Leadmg/kg32Zincmg/kg23Compound Hydrocarbonsmg/kg0.1Phenol (Compound)mg/kg-Cyanidemg/kg-Sulphatemg/kg-Chloridemg/kg-Evaporable Organic Compoundsmg/kg-Benzoylmg/kg0.3Toluolmg/kg-Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3Semi-Evaporable CompoundsII | Arsenic | mg/kg | 2-10 |
| Mercurymg/kg2.1Nickelmg/kg4Leadmg/kg32Zincmg/kg23Compound Hydrocarbonsmg/kg0.1Phenol (Compound)mg/kg-Cyanidemg/kg-Sulphatemg/kg-Chloridemg/kg-Ammonium Nitrogenmg/kg-Evaporable Organic Compoundsmg/kg0.3Toluolmg/kg0.3Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3 | Copper | mg/kg | 3 |
| Nickelmg/kg4Leadmg/kg32Zincmg/kg23Compound Hydrocarbonsmg/kg0.1Phenol (Compound)mg/kg-Cyanidemg/kg-Sulphatemg/kg-Chloridemg/kg-Evaporable Organic Compoundsmg/kg0.3Benzoylmg/kg0.3Toluolmg/kg0.3Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3 | Mercury | mg/kg | 2.1 |
| Leadmg/kg32Zincmg/kg23Compound Hydrocarbonsmg/kg0.1Phenol (Compound)mg/kg-Cyanidemg/kg-Sulphatemg/kg-Chloridemg/kg-Ammonium Nitrogenmg/kg-Evaporable Organic Compoundsmg/kg0.3Toluolmg/kg0.3Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3 | Nickel | mg/kg | 4 |
| Zincmg/kg23Compound Hydrocarbonsmg/kg0.1Phenol (Compound)mg/kg-Cyanidemg/kg-Sulphatemg/kg-Chloridemg/kg-Ammonium Nitrogenmg/kg-Evaporable Organic Compoundsmg/kg0.3Toluolmg/kg0.3Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3Semi-Evaporable Compounds0.3 | Lead | mg/kg | 32 |
| Compound Hydrocarbonsmg/kg0.1Phenol (Compound)mg/kg-Cyanidemg/kg-Sulphatemg/kg-Chloridemg/kg-Ammonium Nitrogenmg/kg-Evaporable Organic Compoundsmg/kg0.3Toluolmg/kg0.3Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3 | Zinc | mg/kg | 23 |
| Phenol (Compound)mg/kg-Cyanidemg/kg-Sulphatemg/kg-Chloridemg/kg-Ammonium Nitrogenmg/kg-Evaporable Organic Compoundsmg/kg0.3Benzoylmg/kg0.3Toluolmg/kg0.3Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3Semi-Evaporable Compoundsin the second secon | Compound Hydrocarbons | mg/kg | 0.1 |
| Cyanidemg/kg-Sulphatemg/kg-Chloridemg/kg-Ammonium Nitrogenmg/kg-Evaporable Organic Compounds-Benzoylmg/kg0.3Toluolmg/kg0.3Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3Semi-Evaporable Compounds | Phenol (Compound) | mg/kg | - |
| Sulphatemg/kg-Chloridemg/kg-Ammonium Nitrogenmg/kg-Evaporable Organic Compounds-Benzoylmg/kg0.3Toluolmg/kg0.3Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3Semi-Evaporable Compounds | Cyanide | mg/kg | - |
| Chloridemg/kg-Ammonium Nitrogenmg/kg-Evaporable Organic Compounds-Benzoylmg/kg0.3Toluolmg/kg0.3Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3Semi-Evaporable Compounds | Sulphate | mg/kg | - |
| Ammonium Nitrogenmg/kg-Evaporable Organic Compoundsmg/kg0.3Benzoylmg/kg0.3Toluolmg/kg0.3Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3Semi-Evaporable Compounds | Chloride | mg/kg | - |
| Evaporable Organic Compoundsmg/kg0.3Benzoylmg/kg0.3Toluolmg/kg0.3Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3Semi-Evaporable Compounds | Ammonium Nitrogen | mg/kg | - |
| Benzoylmg/kg0.3Toluolmg/kg0.3Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3Semi-Evaporable Compounds | Evaporable Organic Compounds | | |
| Toluolmg/kg0.3Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3Semi-Evaporable Compounds | Benzoyl | mg/kg | 0.3 |
| Ethylbenzenemg/kg-Compound Xylene (ortho-, meta-, para -)mg/kg0.3Semi-Evaporable Compounds | Toluol | mg/kg | 0.3 |
| Compound Xylene (ortho-, meta-, para -)mg/kg0.3Semi-Evaporable Compounds | Ethylbenzene | mg/kg | - |
| Semi-Evaporable Compounds | Compound Xylene (ortho-, meta-, para -) | mg/kg | 0.3 |
| | Semi-Evaporable Compounds | | |

⁵IFC - Environmental, Health, and Safety (EHS) Guidelines. 1.7 Noise

| Benzoapiren | mg/kg | 0.02 |
|--------------------------|-------|------|
| Izopropilen-benzol | mg/kg | 0.5 |
| Pesticides | | |
| Atrazin | mg/kg | 0.5 |
| Linden | mg/kg | 0.1 |
| DDT (and its metabolite) | mg/kg | 0.1 |

39. Georgian legislation does not regulate quality standards for groundwater. Quality of groundwater is regulated by norms set for potable water.

40. Potable water quality criteria are determined by technical regulations on potable water (Government Regulation N 58 from Jenuary 15, 2014 Potable water quality criteria are given in table 6).

| Index | Measuring | Standard not | |
|--------------------------------|----------------------|--------------|--|
| | unit | more than: | |
| Common cha | aracteristics | | |
| Hydrogen index | PH | 6-9 | |
| Permanganate oxidation | mg O ₂ /L | 3,0 | |
| Nonorganic | substance | | |
| Barium (Ba ²⁺⁾ | mg/L | 0.7 | |
| Boron (B,total) | mg/L | 0.5 | |
| Arsenic (As,total) | mg/L | 0.01 | |
| Quicksilver (Hg, nonorganic), | mg/L | 0.006 | |
| Cadmium (Cd, total) | mg/L | 0.003 | |
| Mangan (Mn, total) | mg/L | 0.4 | |
| Milobden (Mo, total) | mg/L | 0.07 | |
| Nickel(Ni, total) | mg/L | 0.07 | |
| Nitrate(short impact by NO- 3) | mg/L | 50 | |
| Nitrite (long impact by NO-2) | mg/L | 0.2 | |
| Selenium(Se, total) | mg/L | 0.01 | |
| Copper(Cu, total) | mg/L | 2.0 | |
| Lead (Pb, total) | mg/L | 0.01 | |
| Flourine (F ⁻) | mg/L | 0.7 | |
| Chromium (Cr ⁶⁺) | mg/L | 0.05 | |
| Antimony(Sb) | mg/L | 0.02 | |
| Cyanide(CN ⁻) | mg/L | 0.07 | |
| Organic substance | | | |
| Total content of pesticides | mg/L | O,05 | |

 Table 6. Potable Water Criteria

41. Sanitary wastewater from industrial facilities may include effluents from domestic sewage, food service, and laundry facilities serving site employees. Miscellaneous wastewater from laboratories, medical infirmaries, water softening etc. may also be discharged to the sanitary wastewater treatment system. Recommended sanitary wastewater management strategies include:

• Segregation of wastewater streams to ensure compatibility with selected treatment option (e.g. septic system which can only accept domestic sewage);

- Segregation and pretreatment of oil and grease containing effluents (e.g. use of a grease trap) prior to discharge into sewer systems;
- If sewage from the industrial facility is to be discharged to surface water, treatment to meet national or local standards for sanitary wastewater discharges or, in their absence, the indicative guideline values applicable to sanitary wastewater discharges shown in Table 7;
- If sewage from the industrial facility is to be discharged to either a septic system, or where land is used as part of the treatment system, treatment to meet applicable national or local standards for sanitary wastewater discharges is required.
- Sludge from sanitary wastewater treatment systems should be disposed in compliance with local regulatory requirements, in the absence of which disposal has to be consistent with protection of public health and safety, and conservation and long term sustainability of water and land resources.

| Pollutant | Unit | Standard |
|------------------------|-------|----------|
| рН | рН | 6-9 |
| BOD | mg/l | 35 |
| COD | mg/l | 125 |
| Total phosphorus | mg/ l | 2 |
| Total nitrogen | mg/l | 15 |
| Total suspended solids | mg/l | 60 |

 Table 7: Georgian Standards for Treated Sanitary Sewage Discharges

B.2.2 Licenses & Approvals Required

49. Environmental assessment of various activities and development projects in Georgia is governed by the Law on Environmental Impact Permits (EIP). This Law notifies the list of the activities and projects, which are subject to ecological expertise and require Environmental Impact Permit. The Law also makes the public participation mandatory in the process of environmental assessment, ecological expertise and decision making on issuance of an environmental impact permit. Under this Law, various projects/activities have been divided into four categories based on their size, importance and potential environmental impact, and sets out permitting process for each category.

50. The requirements related to EIA studies and the EIA report is set forth in the Order N31 of 15 May 2013 of MoENRP.

51. The Law of Georgia "On the Red List and Red Book" (2003) regulates the legal relations in the field of developing the Red List and Red Book, protecting and using the endangered species, except the legal issues of the international trade with endangered wild animals and wild plants, which within the limits of the jurisdiction of Georgia are regulated by virtue of the Convention 'On the international trade with the endangered species of wild fauna and flora' concluded on March 3 of 1973 in the city of Washington.

52. According to Article 10 of the Law, any activity, including hunting, fishing, extraction, cutting down and hay-mowing, except particular cases envisaged by the present Law, Law of Georgia 'On animal life' and legislation of Georgia, which may result in the reduction in number of the endangered species, deterioration of the breeding area or living conditions, is prohibited. The Red List of Georgia was approved by the Presidential Decree No. 303 'On approving the Red List of Georgia' (May 2, 2006).

| Framework Legislation | | |
|-----------------------------|---|--|
| 1005 | Constitution of Georgia (as amended 04.10.2013) | |
| 1992 | Reg. No - 010.010.000.01.001.000.116 | |
| 1006 | Environmental Protection (as amended 26.12.2014) | |
| 1990 | Reg. No - 360.000.000.05.001.000.184 | |
| Permitting Legislation | | |
| 2005 | Licensing and Permitting (as amended 18.09.2014) | |
| 2007 | Environmental Impact Permit (as amended 26.12.2014) | |
| 2007 | Rag No - 360.160.000.05.001.003.078 | |
| 2007 | Ecological Expertise (as amended 25.03.2013) | |
| 2007 | Reg. No - 360.130.000.05.001.003.079 | |
| 2013 | Regulation on EIA (as amended 15.05.2013 by the Decree No 31 of MoENRP) | |
| Specific Environmental Laws | | |
| 100/ | Soil Protection (as amended 26.12.2014) | |
| 1994 | Reg. No - 370.010.000.05.001.000.080 | |
| 1006 | System of Protected Ares (as amended 30.04.2014) | |
| 1990 | Reg. No - 360.050.000.05.001.000.127 | |
| 2007 | on Status of the Protected Areas (as amended 30.04.2014) | |
| 2007 | Reg. No - 360.050.000.05.001.003.060 | |
| 2014 | Waste Management Code 26.12.2014 | |
| 2014 | Reg. No -360160000.05.001.017608 | |
| 1996 | Minerals (as amended 26.12.2014) | |
| 1990 | Reg. No - 380.000.000.05.001.000.140 | |
| 1007 | Wildlife (as amended 26.12.2014) | |
| 1997 | Reg. No - 410.000.000.05.001.000.186 | |

Table 8. list of laws relevant to environmental protection

| 1997 | Water Protection (as amended 26.12.2014) |
|------|---|
| 1007 | Reg. No - 400.000.000.05.001.000.253 |
| 1997 | Transit and Import of Hazardous Waste within and into the Territory of Georgia as amended 11.03.2011) |
| | Reg. No - 300230000.05.001.016218 |
| 1009 | Pesticides and Agrochemicals as amended 08.05.2012) |
| 1990 | Reg. No - 340120000.05.001.016723 |
| 1000 | Atmospheric Air Protection as amended 5.02.2014) |
| 1999 | Reg. No - 420.000.000.05.001.000.595 |
| 1000 | Forest Code as (amended 6.09.2013) |
| 1999 | Reg. No - 390.000.000.05.001.000.599 |
| 2003 | Red List and Red Data Book of Georgia (as amended 6.09.2013) |
| | Reg. No - 360.060.000.05.001.001.297 |
| | Other Relevant Laws |
| 2007 | On Cultural Heritage (as amended 26.12.2014) |
| 2007 | Reg. No - 450.030.000.05.001.002.815 |
| 0007 | On Public Health (as amended 29.05.2014) |
| 2007 | Reg. No - 470.000.000.05.001.002.920 |
| 2005 | On Fire Protection and Safety 24.06.2005 |
| 2005 | Reg. No - 140.060.000.05.001.000.355 |
| 2006 | on Regulation and Engineering Protection of Coasts of Sea, Water Reservoirs and Rivers of Georgia – 27.12.2006 |
| | Reg. No - 330.130.000.11.116.005.130 |
| 2014 | Technical Regulations: "on Drinking Water standart". Approved by the Government decree № 58 |
| | Reg. No- 300160070.10.003.017676 |
| 2014 | Environmental Technical Regulations. Approved by the Government decree № 17 |
| | Reg No- 300160070.10.003.017608 |

53. Some of the International Treaties and Conventions Ratified or Signed by Georgia are provided in the list below:

- Short List of the Ratified or Signed Conventions: Ramsar Convention on Wetlands (1996); •
- •

- United Nations Framework Convention on Climate Change (UNFCC) (1994);
- Kyoto Protocol (1994);
- Kyoto Protocol (1999);
- Basel Convention on the Control of Transboundary Movement of Hazardous Waste and Their Disposal (1999);
- Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) (1999);
- Convention on Biological Diversity (1994);
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1996);
- Convention on Long-range Transboundary Air Pollutants (1999);
- Stockholm Convention on Persistent Organic Pollutants (2006);
- Convention on the Conservation of European Wildlife and Natural habitats (2008);
- The Vienna Convention for the Protection of the Ozone Layer (1995);
- Montreal Protocol on Substances that Deplete the Ozone Layer (1995).

B.2.3 Administrative Structure in Georgia

54. Ministry of Environment and Natural Resources Protection of Georgia (MoENRP). MoENRP has the overall responsibility for protection of environment in Georgia. The Department of Permits of MoENRP is responsible for reviewing EIAs and for issuance of the Environmental Permits. MoENRP is the main state body pursuing state policy in the sphere of environment. Their functions for regulating economic or development activities with regard to environmental protection include:

- Issuing permits for project development (Environmental Impact Permit)
- Setting emission limits and issuing surface water intake and discharge consents
- Responding to incidents and complaint

55. For the projects, which do not require Construction Permit, the Environmental permit is being issued by the MoENRP on the ground of State Ecological Examination. State Ecological Examination is carried out by MoENRP upon official submission of Environmental Impact Assessment (EIA) prepared by project developers.

56. For projects requiring Construction Permit, no special permit is issued by MoENRP (according to "One window principle", only one permit shall be issued for each activity). The Construction Permit is issued by the Ministry of Economy and Sustainable Development of Georgia, but the issuance of the Permit is subject to the consent of the MoENRP in a form of Conclusion of Ecological Expertise, as well as the Ministry of Culture (Centre of Archaeological Studies). Consent of the MoENRP in such cases should be issued according to the same procedures (EIA, public consultations; SEE etc.) as for issuing Environmental Permit.

57. The Ministry of Economic and Sustainable Development as an administrative body issuing a permit ensures the involvement of the MoENRP as a different administrative body in the administrative proceedings initiated for the purpose of permit issuance, in accordance with Georgia's Law on Licenses and Permits.

58. As a rule, EIA permitting conditions contains requirement for informing MoENRP regarding fulfilment of the EIA permit conditions. This basically means giving information regarding implementation of Environmental Management and Monitoring Plans.

59. The **Ministry of Culture and Monument Protection of Georgia** is responsible for the 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 is also required for issuing construction permit (if such is necessary).

B.3 Compare of the National legislation and ADB Requirements

60. The above accounts of national environmental low and ADB policy indicate that the two systems are similar but then there are certain aspects in which ADB policy is more demanding or specified than the Georgian procedure. The main differences are as follows.

61. The Bank's guidelines provide a detailed description of procedures for screening, scoping and conducting EIA and explain a complete list of stages, which are not specified under the national legislation.

62. Considering ecological risk, cultural heritage, resettlement and other factors, the Bank classifies projects supported by them under categories A, B, C and FI. However in the Georgian legislation, EIA is carried out only if a developer seeks to implement projects listed in the Law on Environmental Impact Permit. This list is compatible with the category A projects of the Bank classification. According to the Georgian legislation EIA is not required in other .instances, while Asian Development Bank guidelines requires limited EIA or IEE for the B category projects, and an environmental review of projects that are not expected to produce environmental impacts (category C).

63. Georgian legislation does not specify the format of environmental management plans (EMPs) and the stage of their provision for projects requiring EIA and does not require EMPs for projects not requiring EIAs. The Asian Development Banks guideline requires EMPs for all categories of projects and provides detailed instructions on the content.

64. According to Georgian legislation MoE is responsible for monitoring of project implementation and compliance with the standards and commitments provided in the EIA, and the role of the EMP is less clearly is defined. The PIU or "Project Proponent" is responsible for implementing "self-monitoring" programs for projects requiring EIA. In contrast ADB guidelines stress the role of EMPs, which are important for all categories of projects, and the Project Proponent (in our case – MDF) is required to ensure inclusion of a monitoring scheme and plans into EMPs. Monitoring of performance compliance against EMPs is important element of ADB requirements.

65. The national legislation also does not take into account the issue of involuntary resettlement at any stage of environmental permit issuance. The Georgian legislation considers social factors only in regard to life and health safety (e.g. if a project contains a risk of triggering landslide, or emission/discharge of harmful substances or any other anthropogenic impact). While the Bank's document establishes the responsibility of a Borrower for conducting an environmental assessment, the national legislation provides for the responsibility of a project implementing unit to prepare EIA and ensure public consultation.

66. The role of the Ministry is restricted to participation in EIA consultation and carrying out state ecological examination required for the adoption of a decision on issuing an EIA permit as established under the legislation of Georgia. Under ADB regulations ADB carry out project screening and categorization at the earliest stage of project preparation when sufficient information is available for this purpose, also according ADB's Public Communications Policy, ADB is committed to working with the borrower/client to ensure that relevant information (whether positive or negative) about social and environmental safeguard issues is made available in a timely manner.

67. In regard with consultation: The Bank provides for consultations for A and B Category projects (at least two consultations for Category A projects) and requires a timetable of consultations from the Borrower. The national legislation until recently contained only a brief reference to this issue

without providing real tools of its fulfillment. The amendments to the Governmental Decree On the Procedure and Conditions of Environmental Impact Assessment established the requirement of public consultation of the EIA, which obligates a developer (i) to ensure public consultation of EIA, (ii) publication of information, (iii) receive comments within 45 days, (iv) arrange consultation not later than 60 days from the date of publication, invite stakeholders and determine the place of consultation.

| # | Action | Georgian Legislation | ADBRequirements |
|---|-------------------------|---|--|
| 1 | Screening | Project Proponent in consultation with MoE | Bank and Consultant hired by Project Proponent |
| 2 | Scoping | Not required. Could be conducted voluntarily by Project Proponent. | Obligatory. Bank and Consultant hired by Project Proponent |
| 3 | Draft EIA | To be prepared by Environmental Consultant. | To be prepared by Environmental Consultant. |
| 4 | Public Consultations | The EIA should be available for public review during 45 days. Publication of information in central and regional mass- media. Arrange consultation not later than 60 days from the date of publication. | At least two consultations for Category A projects – one at the scoping stage and one for the draft EIA. |
| 5 | Final EIA | Consider all comments received during public consultations, incorporate accepted remarks and explain rational when the comments are disregarded. | Consider all comments from Bank and public. Agree with the Bank on each raised point. Incorporate accepted public comments and explain rational when the comments are disregarded. |
| 6 | Management Plans | No clear guidelines on format, content and timing | Incorporate Monitoring and Management Plans in the EIA. |
| 7 | Review and Approval | MoE | Bank and separately - MoE (if the EIA is required by Georgian legislation). |
| 8 | Disclosure of final EIA | Not requested | Publication (mainly electronic) of the final EIA. |

Table 9: Activities and responsibilities in EIA for national law and ADB policy

B.4 Harmonization of the ADB and Georgian Legislation Requirements

68. In order to comply with the both regulations – the ADB and Georgian legislation – the content of the EIA should comprise issues required in both regulations, thus complementing each other. The EMPs should therefore be elaborated in details as required by the ADB regulations. The assessment of the stationary sources of emission (e.g. diesel generators) should be executed according to Georgian regulations: "Inventory of the Stationary Sources of Emission" and "Approval of the Emission Limits". For the category a projects the first public consultation

(requested by ADB guidelines but not by Georgian regulations) will be held at the Scoping stage. The second one will be executed according to Georgian requirements. Disclosure will be conducted as required by ADB.

C. DESCRIPTION OF THE PROJECT

C.1 Type of the Project

69. Marneuli wastewater sub-project involves the rehabilitation and extension of the wastewater network and the construction of a new wastewater treatment plant.

C.2 General Information

70. Marneuli is located in the south-eastern part of the country in the Kvemo Kartli region, approximately 39 km south of Tbilisi, the capital of Georgia. It is the administrative centre of Marneuli District, which borders with Azerbaijan and Armenia. The total population of the town amounts to 22,506 (2014). Most of the population is Azerbaijans, the largest ethnic minority of Georgia. The total area of Marneuli Municipality is 935 km² and the altitude of the territory in Marneuli lowland ranges between 350 to 600 meters above sea level. The highest point is the mountain Garadagh at 1,416 masl.



C.3 Existing Situation

71. Marneuli has an existing, rudimentary sewer network with a general flow direction from the north to the southern edge of the town. The main trunk follows the road from Tbilisi to the Armenian border with dimensions from DN 200 up to DN 800. The existing main trunk is in an acceptable state. Besides the main trunk there are sewer lines of DN 200. The existing system covers 20 % of the town; rural areas are not connected. The sewerage outfall discharges untreated sewage in the Algeti river that drains into the Caspian Sea via the Mkvari River. There is no sewage treatment facility. The alignment of the existing sewers is shown in the figure 1. There are no pumping stations or pressure pipes in the sewer system.

C.4Population Development

72. The development of the population in the service area for water supply and sewerageis presented in the table 10.

| Project area | Population Development | | | | | | |
|------------------------------------|------------------------|--------|--------|--------|--|--|--|
| | I. | | | | | | |
| Year | 2014 | 2024 | 2034 | 2044 | | | |
| Urban population | 22.000 | 24.262 | 26.134 | 28161 | | | |
| Rural population (water supply) | 14.872 | 16.839 | 19.000 | 21.666 | | | |
| Rural population (sewerage) | 6.167 | 6.983 | 7.907 | 8.952 | | | |
| Total (WS) | 37.378 | 41.091 | 45.200 | 49.749 | | | |
| Total (WW) | 28.673 | 31.235 | 34.041 | 37.113 | | | |

Table 10: Population Development 2014 - 2044

73. The population figures are calculated under the consideration of the following annual population growth:

- Urban: 0.75 %
- Rural: 1.25 %

74. The service areas for water supply and sewerage differ by rural zones in the East and in the South of Marneuli with a low population density and respective high investment costs per capita. In coordination with UWSCG it was decided to include these rural areas in the water supply service area but not to connect them to the sewage system.



Figure 1: Alignment of the existing sewers

75. The wastewater flow for the hydraulic calculation of the designed sewer networkdepends on the water demand. A wastewater/ water consumption ratio of 90 % isused for the dimensioning of pipes. As the wastewater flow is not constant during the day, a peak factor of 3.0 is applied for the hydraulic calculation.

| | | | 1 | | | |
|--|---------|-----|-----|--------|--------|--------|
| | | 201 | 4 | 2024 | 2034 | 2044 |
| Waste Water (separate sewer system) | | | | | | |
| inhabitants (Marneuli) | capita | 22 | 506 | 24 525 | 26 134 | 28 161 |
| inhabitants (villages) | capita | 6 | 167 | 6 983 | 7 907 | 8 952 |
| inhabitants (permanent stay) | capita | 28 | 673 | 31 235 | 34 041 | 37 113 |
| connection ratio | % | 9 | 95% | 95% | 95% | 95% |
| w astew ater/w ater ratio | % | ę | 90% | 90% | 90% | 90% |
| result w astew ater flow (average) | m³/d | 3 | 775 | 4 113 | 4 482 | 4 887 |
| w astew ater from industry | m³/d | 2 | 178 | 2 912 | 3 646 | 4 380 |
| peoples equivalent | PE | 10 | 890 | 14 561 | 18 231 | 21 902 |
| | n/a | | 16 | 16 | 16 | 16 |
| result wastewater flow (average) | m³∕a | 5 9 | 153 | 7 025 | 8 128 | 9 267 |
| infiltration (0.0058l/(s*Manhole) | | | | | | |
| No. of Manholes appr. | No. | | | 3 740 | 3 740 | 3 740 |
| peak factor for w astew ater flow | - | | 3.0 | 3.0 | 3.0 | 3.0 |
| daily flow (average) | m³/d | 5 9 | 953 | 7 025 | 8 128 | 9 267 |
| hourly flow (average) | m³/h | | 248 | 293 | 339 | 386 |
| hourly flow (max.) dry weather | m³/h | : | 372 | 439 | 508 | 579 |
| hourly flow (max.), for hydraulic calc. only | m³/h | | 744 | 878 | 1 016 | 1 158 |
| POD5 load of raw dom, wastow stor | a/(c*d) | | 60 | 60 | 60 | 60 |
| BODD - 10au of 1aw doffi. W aslew aler | g/(c u) | | 00 | 00 | 00 | 00 |
| BOD5-pollution load from households/hotels | kg/d | 1 | 720 | 1 874 | 2 042 | 2 227 |
| BOD5-pollution load from industry | kg/d | | 653 | 874 | 1 094 | 1 314 |
| total BOD5 - load | kg/d | 23 | 374 | 2 748 | 3 136 | 3 541 |
| average BOD5- concentration | mg/l | | 399 | 391 | 386 | 382 |

Table 11:Wastewater Flow 2014 – 2044

C.5Design of Future Sewerage System

76. The planned sewage system will be connected to the existing main trunk DN 800, which lies in the main road from Tbilisi to the Armenian border, at several points, The general flow direction for all existing and designed sewers is from north to south, to the determined location of the wastewater treatment plant at the south-eastern edge of the town.

77. In general, the network is divided into three areas: the western area discharges into pumping station number 1, As the elevation in this area ranges between 444 masl and 393 masl, it is not possible this area to be connected to the main trunk by gravity, The pumping station has a calculated outflow of 39 l/s with a discharge head of 41.39 m, In the western area, about 25 % of the domestic wastewater flow is produced.

78. The northern and western part of the system has some more low points, where a connection to the main trunks with gravity flow is not possible, As a consequence, 7 additional pumping stations are required, These pumping stations have a calculated discharge between 0,93 and 8,67 l/s, The discharge head is between 3.73 and 12.59 m with a total length for the pressure pipes of 1,021 m.

79. 89.4 % of the designed pipes have a diameter of DN 200. Only 12,817 m pipe lengths have a larger diameter, the table 5 shows the results of the hydraulic calculation.

| Dimension | New | Replacement | Existing | |
|-----------|------------|-------------------|----------|--|
| | Pipes | of existing Pipes | Pipes | |
| DN 150 | 0,00 | 161,00 | | |
| DN 200 | 108,150,58 | 690,00 | 670,00 | |
| DN 250 | 0,00 | 0,00 | | |
| DN 300 | 0,00 | 991,00 | 406,00 | |
| DN 400 | 6,835,00 | 1,622,00 | 724,00 | |
| DN 500 | 3,158,00 | 489,00 | 997,00 | |
| DN 600 | 2,218,00 | 0,00 | 678,12 | |
| DN 700 | 0,00 | 0,00 | | |
| DN 800 | 0,00 | | 2,275,65 | |
| | 120,967,58 | 3,953,00 | 5,750,77 | |

Table 12: Sewage Pipes

80. In total, 268 cess pits are indicated in the drawings, These cess pits are necessary, because the ground levels of these real estate's are significant lower than the road, where the sewer pipes were planned, This case mainly occurs in the vicinity of the Algeti River.

81. According to the land use plan, there are two industrial areas and a military base that discharge with a higher wastewater flow into the sewer network, The industrial area is a small area with a discharge of 8,45 l/s.

82. The industrial area with a size of approximately 78,03 hectares and a discharge of 50,27 l/s, is connected to the sewage treatment plant with a separate sewer with a diameter from DN 300 to DN 400, The existing canning factory and the flour mill discharge into the existing sewer network without pretreatment and the local service centre has many problems with blocked sewers in this area because of production waste of these factories, Through this unbundling of the sewer network, the risk of blockage of sewers is reduced to this separate sewer for the industrial area,

83. The military base with an average discharge of 39,68 l/sec is connected to the sewer network at manhole 2864.

84. Several special constructions are necessary for the new network: river crossings over the Algeti River, a railway crossing and a floor-mounted pipe at a local depression.

85. The river crossings are designed as pipe bridges with foundations of driven piles, just as the floormounted pipe. Inverted siphons are not recommended because of the low wastewater flow and the velocity for the calculated discharge. Unlike the main sewer pipe, the siphon pipes flow under pressure and must have flow velocities greater than 1,0 m/sec to keep material suspended. The use of inverted siphons is discouraged due to high maintenance requirements, especially for the small diameters of the separate system in Marneuli. The siphon inlet and outlet structures should also be located with convenient access, which cannot be ensured in Marneuli.

86. For the railway crossing a protective casing with a steel pipe will be used. Inside this protective casing the sewer pipe will be laid. It is recommended, not to fill the annulus. With manholes at the end of the protective casing; in future it will be possible, to replace the sewer pipes without earthworks.

87. The sewage pipes cross the river at 6 points and water channels at 8 points. Both, irrigation channels and rivers will be crossed by using different methods, in particular, (i) a Pipe Rack method will be used for 1 crossing point; (ii) a pipe bridge method will be used for 3 crossing points; (iii) the existing bridge will be used for 1 crossing point, and (iv) an iron pipe will be placed at 1 crossing point, past the river basin. In all eight cases of channel crossing, an iron pipe will pass below the existing channel.

88. There will be 48 road crossings and 24 railway crossings.

C.6 Preliminary Design of Wastewater Treatment Plant

Location

89. The new wastewater treatment plant will be located on public land in the west of Marneuli. The site is directly at Algheti River. The nearest communities from the planned WWTP is in the distance 350 m.



C.7 Treatment Process

90. For those wastewater treatment plants in the project towns with a capacity over 30,000 Population Equivalents (PE), the activated sludge technology with separate anaerobic sludge digestion is chosen. This process comprises the following treatment steps with its design horizon:

- Screens
- Aerated grit chambers
- Primary sedimentation tanks
- Aeration tanks
- Final sedimentation tanks
- Sludge thickener
- Digestion
- Sludge dewatering
- Gas storage
- Gas torch

91. The first stage in the wastewater treatment plant is the screening for the removal of coarse material that would damage the subsequent equipment and reduce process effectiveness. Generally, coarse and fine screens are applied before grit removal units. Grit chambers are designed to remove grit consisting of sand, gravel and other heavy solid materials that have subsiding velocities or specific gravities substantially greater than organic putrescible solids.

92. The second stage in the wastewater treatment plant is the activated sludge process. This process is a common treatment method and has been implemented worldwide. The aeration tanks are dimensioned for the carbonaceous BOD and COD removal (removal rates up to 90 - 95%) and for nitrification. Basic system adjuncts include phosphorus removal and microbial de-nitrification.

93. After some time, the mixture of biological solids is passed from the aeration tanks into the final sedimentation tank, where some of the settled sludge is recycled to maintain the desired concentration of organisms in the aeration tanks. The remaining sludge is removed from the system.

94. The final sedimentation tank will be designed under the following considerations:

- good separation of activated sludge from the reactor basin effluent;
- partial consolidation of the settled solids for return to the reactor basin;
- intermediate storage of activated sludge which is expelled from the aeration tank.

95. The sludge treatment will have the following units:

- primary thickening of primary and excess sludge;
- anaerobic stabilisation of sludge;
- conditioning and dewatering of sludge in a centrifuge.

96. The dewatered sludge will be disposed on a landfill.

C.8 Sewage Sludge Management

97. After the sludge treatment and dewatered. The sludge quality allows its disposal on a landfill or use in agriculture.

98. Sludge from sanitary wastewater treatment systems should be disposed in compliance with local regulatory requirements, in the absence of which disposal has to be consistent with protection of public health and safety, and conservation and long term sustainability of water and land resources. The sluge should betested for suitability for agricultural use or land application.

99. There is a temporary sludge storage area at the WWTP that has sufficient volume to store the sludge for some weeks. From time to time the sludge shall be transported to the landfill of Marneuli. A new landfill is in the project pipeline. UWSCG will provide transportation from the WWTP to the landfill. Information related with wastewater flow for Marneuli submitted in the table 4.

100. Another alternative for the disposal of the sludge is its use as fertilizer in the agriculture. As there is no industry in Marneuli the sludge quality is expected to be suitable for this usage. The WWTP is equipped with a storage place where sludge is temporarily stored and can be collected by interested farmers. UWSCG would give away the sludge for free; transportation would have to be provided by the farmers. After some weeks of operation, when UWSCG will have a better understanding of the quality and quantity of the sludge, UWSCG will announce the possibility to collect sludge from the site of the WWTP. Depending on the seasonal demand for fertilizer, the UWSCG will manage the temporary storage at the WWTP in such a way that a potential demand can be best served.

101. In view of the lack of Georgian legislation with regard to the use of sludge in agriculture, European regulations shall be considered in case the sludge will be used as fertilizer.

102. They provide that the use of sludge is prohibited:

- on grassland or forage crops if the grassland is to be grazed or the forage crops to be harvested before a certain period has elapsed (this period may not be less than three weeks);
- on fruit and vegetable crops during the growing season, with the exception of fruit trees;
- on ground intended for the cultivation of fruit and vegetable crops which are normally in direct contact with the soil and normally eaten raw, for a period of ten months preceding the harvest and during the harvest itself.

103. USA regulations related with the federal biosolids (treated sewage sludge) rule described in the EPA publication is contained in 40 CFR Part 503. Biosolids that are to be land applied must meet these strict regulations and quality standards. The Part 503 rule governing the use and disposal of biosolids contain numerical limits, for metals in biosolids, pathogen reduction standards, site restriction, crop harvesting restrictions and monitoring, record keeping and reporting requirements for land applied biosolids as well as similar requirements for biosolids that are surface disposed or incinerated. Most recently, standards have been proposed to include requirements in the Part 503 Rule that limit the concentration of dioxin and dioxin like compounds in biosolids to ensure safe land application.

D. Description of the environment (baseline data)

D.1. General

104. The present chapter gives the information about the natural and social-economic conditions of the Project site. This information is based on literary sources and fund materials, statistical data, data provided by the Client and results of the field studies accomplished immediately in the study area. This information will be further used to establish the positive and negative impacts during the

construction and exploitation phases of Marneuli water-supply Project and evaluate their scales.

D.2 Physical Resources

D.2.1 Atmosphere

105. Marneuli Municipality is located in the humid subtropical climatic zone with the climatic zoning corresponding to its relief: the climate in the most part of the territory is a warm steppe one with hot summers. Maximum precipitations fall in May and minimum precipitations fall in December. The climate on lagluja upland, as well as Loki ridge and Babakari hillock is somewhat different and is transient from the moderately humid steppe climate to the moderately humid climate, with hot summer. The climate on Loki ridge slope is moderately humid with typical cold winter and long warm summer.



Table 13: Atmospheric air temperature, C⁰2013-2015







Table 15: Rolative Humidity 2015

The average daily high (blue) and low (brown) relative humidity with percentile bands (inner bands from 25th to 75th percentile, outer bands from 10th to 90th percentile)

Table 16:Wind direction and still recurrence a year, 2014%

| North | N-E | East | E-S | South | S-W | West | W-N | Still |
|-------|-----|------|-----|-------|-----|------|-----|-------|
| 27 | 6 | 18 | 13 | 6 | 3 | 11 | 16 | 33 |



D.2.2. Ambient Air Quality

106. According to the visual audit results, no stationary sources contributing to ambient air contamination are located within the study area. The quality of the ambient air in the study area may be affected by exhaust gases produced by machinery and transportation means operating in the sites of the nearby container terminals and production facilities, as well as by the vehicles moving along the city bypass road. It is obvious that no air quality gauging stations exist in

Marneuli for years, and therefore practically no air quality data are available for the project impacted area. Due to such situation, it was found reasonable to apply the methodology approved by the Ministry of Environment and Natural Resources of Georgia (РД 52.04,186-89). This methodology recommends application of the population-based approach for evaluating the baseline ambient air condition for the areas lacking any observation data (**Table 17**).

| Population | Baseline pollution level, mg/m ³ | | | | | | | |
|----------------|---|-----------------|-----|------|--|--|--|--|
| ('000 persons) | NO ₂ | SO ₂ | СО | Dust | | | | |
| 250-125 | 0.03 | 0.05 | 1.5 | 0.2 | | | | |
| 125-50 | 0.015 | 0.05 | 0.8 | 0.15 | | | | |
| 50-10 | 0.008 | 0.02 | 0.4 | 0.1 | | | | |
| <10 | 0 | 0 | 0 | 0 | | | | |

Table 17: Recommended baseline pollution levels by population quantities

107. The baseline pollution data required for estimating the ambient air impact were determined based on the above methodology with consideration of Marneuli's population (>50,000), specifically:

• Nitrogen dioxide: 0.015 mg/m³;

• Sulphur dioxide: 0.05 mg/m³;

• Carbon oxide: 0.8 mg/m³;

• Dust: 0.15 mg/m³.

D.2.3 Relief and Geology

108. Most part of the Municipality territory is occupied by the plain with the same name, which covers the areas of the lower reaches of the rivers Algeti, Khrami, Mashavera and Debeda and is found at 240-400 masl. There are slightly dislocated clay and sandstone horizons of the Neogene found in the basis of Marneuli plain, which are covered with the Continental deposits of the Quaternary Age (shingle, conglomerates, sands and clays) with their total thickness exceeding 100 m at some places (as per the boring data). Marneuli plain is slightly inclined from west to east. The surface was formed by gradual merging of the flat surfaces of the floodplain, and first and second over-floodplain terraces of the rivers Algeti, Khrami, Debeda and Mtkvari. The first over-floodplain terrace of the rivers Debeda and Khrami.The surface of the second over-floodplain terrace (25-30 m) is most vastly represented in the inter-water of the rivers Khrami and Algeti, as well as in the valley of the river Algeti and valley of a former river of Kovutapa on the northern side of the river Algeti. Within the limits of Marneuli plain, the surfaces of the first and second over-floodplain terraces is covered with a dense net of irrigation channels of a minor depth (0.5-1.5 m).

109. The northern slope of Armenia ridge and Babakari hillock within the limits of Marneuli plain are built with the rocks of a volcanogenic and carbonate facies (limestones, marls, sandstones, etc.). The relief is mostly presented by a set of average- and low-mountainous erosive ridges and valleys. The northern slope of Armenia ridge within the limits of Marneuli Municipality is jointed with the erosive valleys of the rivers Talavaristskali, Shulaveristskali, Debeda and their tributaries and offshoots of Opreti (1400-1600 masl) and Shulaveri (800-1600 masl) found between the latter. There are sloping plateau-like surfaces found on the crests and slopes of these offshoots here and there (near villages Opreti, Khojorna, Tserakvi and Damia), and there are quests of minor relative heights and steeply sloping abrupt steps in the zone where the Cretaceous limestones are spread, at 100-1200 masl. South of Marneuli plain, the northern piedmont zone of Armenia ridge along a slightly inclined edge is intensely jointed with river valleys, dry gullies and ravines and is presented by the hills and hillocks of a minor relative height. A similar relief is developed on the right side of the river Debeda, which are intensely jointed slopes of Babakari hillock.

110. lagluja upland within the limits of Marneuli municipality with its length of 17 km and width of 10-11 km, is built with conglomerates, clays and sandstones of the Neogene Age. The absolute height of lagluja upland is 784 m, and its relative height in relation to Marneuli plain surface is more than 400 m. The surface of lagluja upland can be divided into three parts according to its morphological signs: the northern part of the upland is more elevated and is presented by a typical erosive hillock in the relief. Iagluja hillock is steeply inclined northwards and is sloping to Marneuli plain in the south and merges with the flattened surface of the upland. A southern edge of lagluja upland surface is elevated and forms Jamali erosive hillock. The northern slope of the latter is sloping towards Marneuli plain.

D.2.4.Seismicity

111. Marneuli area is located in the active seismic zone. Due to this, the terminal shall be designed and constructed in compliance with the requirements stipulated in the applicable Georgian construction standard Seismic Resistant Construction (PN 01.01-09)., The area selected for construction of the project facility is located in the seismic intensity zone 8 (MSK 64 scale), which dimensionless seismic coefficient 'A' equals to 0.15.



Map 2: Seismic Zone Map of Georgia

D.2.5Soil Covers

112. Brown soils (Eutric cambisols calcic kastanozems) are spread at 500-1200 masl, mostly on carbonate rocks, and are carbonate consequently. These soils have a clearly formed profile, with a dark accumulative or humus horizon with the depth of 20-30 cm. The soil structure is bean-cloddy, with a heavy loamy content, skeletal, with favorable drainage, highly productive and intensely cultivated. Due to inexpedient exploitation (excess irrigation, mistakes during the land cultivation) the brown soils are being degraded intensely.

113. Alluvial soils (Fluvisols) are spread along the valleys of the rivers Algeti, Krami, Debeda and their tributaries. Most of the alluvial soils are carbonate, with favorable physical properties and used for agriculture, while a minor part of them is covered with degraded floodplain forest and marshes.

114. Solonchaks. This type of soils on the territory of Municipality is presented by solonchaks and solonetzs. The solonchaks contain more or less solubale salts in the profile, while the absorbed sodium is accumulated in the colloid complex of solonetzs. These two soil categories of salination are closely associated in a genetic respect. Most of the salinated soils contain both, soluble salts and sodium cation accumulated in the absorbing complex. The salination process is associated with the delluvial-prolluvial phenomena taking place here in the past – the weathering products removed from the salt-containing rocks of lagluja ridge by the temporal water currents cause soil salination on the inclined surface of the piedmont zone. As a result, solonchaks are formed. As for the solonetz formation, this process is associated with the desulfitation of the sulphates accumulated in the soil in great amounts. Within the limits of Marneuli Municipality, there are slightly, averagely and intensely salinated soils spread. The slightly and averagely salinated soils are spread as individual sites on the territory of villages Jandara, Algeti, Zemo Kulari, Kvemo Kulari, Kapanakhchi and other *sakrebulos*. Soil salination is mainly a sulphate or a chlodire-sulphate nature. In addition to salination, gleization is another clearly typical feature of these soils as a result of a great number of irrigation channels and uncontrolled irrigation.

115. Most of the soils on the territory of Marneuli Municipality have lost their natural appearance and are being degraded to various degrees. This, first of all, is seen in their degraded physical-mechanical, chemical and microbiological properties and reduced productivity.

D.2.6 Hydrographic Network

116. The rivers Algeti, Khrami, Shulaveristskali and Debeda flow on the territory of the Municipality. The river Algeti penetrates the territory of the Marneuli Municipality from north-west, in the environs of village Jandara. Here, it leaves a narrow cliffy valley behind it and flows onto Marneuli plain, where it flows smoothly through quite a wide, low-sided bed in the northern part of Marneuli plain. The river Khrami leaves a canyon cut in the lava near village Nakhiduri and flows onto Marneuli plain. Here, it is a typical smooth plain river with a wide low-sided bed. The average annual discharge of the river Khrami is 65 m³/sec at the confluence. Within the limits of Marneuli region, the river Khrami is flown by Shulaveristskali and Debeda. The river Shulaveristskali heading on the crest of Armenia ridge, is a typical mountain river to settlement Shaumiani, with the alteration of canyon-like and V-shape erosive valley sections. From settlement Shaumiani, the river Shulaveristskali flows onto Marneuli plain, where its average multiyear flow (0,44 km/sec) is totally directed to the irrigation channels. The river Debeda flows in the extreme south-east part of Marneuli region, through quite a wide low-sided bed. The average of this river is 29.7 km/sec. The most important tributary of the river Debeda is the river Banoshistskali (with its length of 20,4 km), which heads on the northern slope of Loki ridge.

117. The rivers in Marneuli region are alimented by rainwater (with its share of 40-45% of the annual flow), snow water (20-25%) and underground waters (25-30%). Almost half of the annual flow of the rivers flows in spring. Floods also take place in this period. Flashfloods are rare in summer and autumn. During the droughty summers, due to the negative moisture balance of soils, the artificial irrigation in the field of land cultivation in the region has a decisive role.

118. As the data of 2008 suggest, there are 23 associations of ameliorators established in the Municipality. The total length of the local irrigation channels is 356,2 km and it is designed to serve 17303 ha of land area making 77.6% of the arable land available in the Municipality. As more than a half of the existing channels need cleaning and rehabilitation works, they cannot be loaded in full. The operating system irrigates only 7010 ha, but after it is cleaned and rehabilitated, it will be capable of irrigating additional 10 293 ha of land, i.e. the existing channels will be fully loaded.
119. There are no lakes on the territory of the Municipality.

D.2.7 Biodiversity

120. **Flora**: More plain and valley vegetation dominates on the territory of the Marneuli Municipality. The vegetation of beard-and-feather-grass and thornbush-thorny steppes, sparse hemixelous vegetation and floodplain and semi-desert vegetation is spread here.

121. Petrosimonia brachiata, wormwood and Salsola dendroides are typical for semi-deserts. The sub-forest is formed by tamarisk, medlar, sea-buckthorn, cornel, wild plum, hawthorn, etc. The vegetation cover on Marneuli plain is dominated by beard-grass, beard-grass- wormwood, beard-grass and thornbush-thorny and Salsoleta nodulosae vegetation. At some places, there is semi-desert vegetation growing here as well. Iagluja hillock is covered with beard-grass and beard-grass- Festuca supine-feather-grass steppe grasses, as well as xerophytic bushes. Small pine plantations also grow over Loki ridge. The slopes are covered with a hardwood forest with oak and hornbeam dominating in its lower part and beech in its upper part. Box elder, Georgain oak, oriental hornbeam and blackthorn dominate on Babakari hillock.

122. The WWTP project area is represented by steppes involving wild shrubs and thorns, the vegetation of which is entirely developed at post-forest zones. Paliurus (Paliurus spinachristi) and graining varieties (Bothriochloa ischaemum, Festuca ovina, Stipa pulcherrima) are the dominants for this type of steppes. Here and there, there are few individuals preserved such as field maple (Acer campestre) and acacia (Celtis caucasica). The shrubby and thorny steppes are used for grazing therefore clearly resulting grazing digression. The fertile topsoil layer is eroded and ripped.

123. No representatives of the RED BOOK or endemic flora are observed under the project area.

124. **Fauna**: Fauna in Marneuli Municipality is quite diverse. Wild boar, badger, stone marten, Least Weasel live in the forest; jungle cat, rabbit, wolf, jackal are met almost everywhere. Ornitofauna is numerous: Common pheasant, lark, redleg, partridge, quail, etc. Reptiles are also many in numbers. Different kinds of lizards are particularly common with lajluga upland. Tortoise, grass snake, sheltopusik and sand boa (rarely) are also common. Barbel, mursa, khramulya and stone loach are common in the river Debeda.

125. Most of the Project site covers the territory of the city of Marneuli and is consequently, under a strong anthropogenic impact. The impact on flora and fauna both, in the construction and operation phases of the Project, is low.

D.3 Information About the Background Pollution

D.3.1 Natural Radiation Background

125. The existing radiation background was conducted at the WWTP project area by using Russian appliance RADEX. (Figure 4 and 5).

Figure4 and 5: Measuring the radiation background in the Nerimanov reservoir project area



126. The radiation background at different points of the WWTP project area varied between 10 and 14 microroentgen/hr.

D.3.2 Analysis of the Water quality

127. The water quality of Orjonikidze headwork was analyzed on April 14, 2015.

128. The relevant samples were taken headed by "Eco-Spectri" Ltd. The chemical and physical analyses were done by "The center for ecological expertise and analysis" at the laboratory of physical-chemical analysis of R. Agladze Institute of inorganic chemistry and electrochemistry.

129. The laboratory makes chemical analysis. In case of minor concentrations of the study elements in the samples, the following physical methods of analysis are also used: polarography, photocolorimetry, spectrometry, radiography to fix the structure and properties of substances (roentgen-physical analysis), derivatography.

130. The laboratory is equipped with the following appliances to do the above-listed analyses: muffle burners, diffraction roentgenograph ДPOH-3M; photocolorimeter KΦK-2MΠ; polarograph OH-105; derivatograph Q1500D; atomic absorption spectrophotometer C-115; potentiometer, spectrophotometer-16; differential scanning microcalorimeter ДCM-2M.

131. The results of the analysis of Algeti river are given in Table 18 and waste water Table 19.

| # | Parameter | Unit | Algeti river |
|---|---------------------|-----------------|-----------------|
| 1 | Color | cobalt scale | 5 |
| 2 | Odor | NTU | 0 |
| 3 | Turbidity | - | 8 |
| 4 | Sulphate | mg/l | 142.4 |
| 5 | Chlorides | mg/l | 27.6 |
| 6 | Oil Products, total | mg/l | - |
| 7 | Calcium | mg/l | 72.4 |
| 8 | Magnesium | mg/l | 14.52 |
| 9 | Sodium | mg/l | 29.3 |

Table 18: Water Quality Analysis of Algeti River

| 10 | Zinc | mg/l | 0.03 |
|----|----------------------|------|--------|
| 11 | Iron, total | mg/l | 0.09 |
| 12 | Total coliform | MPN | 142 |
| 13 | E-coli | MPN | 98 |
| 14 | рН | | 7.5 |
| 15 | Total mineralization | mg/l | 645 |
| 16 | Barium | mg/l | 0.07 |
| 17 | Boron | mg/l | 0.19 |
| 18 | Arsenic | mg/l | 0.003 |
| 19 | Mercury | mg/l | 0.0004 |
| 20 | Cadmium | mg/l | 0.001 |
| 21 | Manganese | mg/l | - |
| 22 | Nickel | mg/l | - |
| 23 | Nitrate | mg/l | 19 |
| 24 | Nitrite | mg/l | 0.061 |
| 25 | Selenium | mg/l | 0.006 |
| 26 | Copper | mg/l | 0.003 |
| 27 | Aluminum | mg/l | 0.004 |
| 28 | Lead | mg/l | 0.0001 |
| 29 | Fluoride | mg/l | 0.1 |
| 30 | Chromium | mg/l | 0.015 |
| 31 | Antimony | mg/l | 0.0003 |
| 32 | Cyanide | mg/l | - |
| 33 | Pesticides | mg/l | - |
| 34 | Total hardness (as | mg/l | 500 |
| | CaCO3) | | |

Table 19: Results of Chemical and Microbiological Examinations of Waste Water

| Ν | Determined | Results |
|---|-------------------------|----------------------|
| | Ammonia mg/l | 900 |
| | Tintite mg/l | 380 |
| | Nitrate mg/I | 890 |
| | N Total mg/l | 680 |
| | P Total mg/l | 21.9 |
| | Suspended Solids mg/l | 500 |
| | COD mg/l O ₂ | ≥700 |
| | BOD | 420 |
| | Lactose positive | ≥ 11.10 ⁹ |
| | bacteria Colony forming | |
| | unit (100 ml) | |

D.4 Social Surroundings, Social-Economic Description

132. Marneuli Municipality is located in the eastern part of Kvemo Kartli. The administrative center of the Municipality is the city of Marneuli. It is located on Marneuli plain, on the banks of the river Algeti, 410 masl. The distance between Marneuli and Tbilisi is 29 km. Marneuli is distanced from the city of Rustavi by 48 km and by 30 km from the borders of Azerbaijan and Armenia.

D.4.1 Population

133. The population of Marneuli, as per the data by January 1, 2015 was 104 900 men. The data are based on the preliminary results of the universal population survey of November 5, 2014 and sum of the total growth for the last 2 months of 2014 (natural growth + migration balance)⁶.

134. Table15shows the statistical data of the number of population in Kvemo Kartli and Marneuli Municipality in 2005-2015. The preliminary data of the general census of the population in Georgia evidenced that the past data of the Statistical Office of Georgia were not accurate. The given table clearly shows that the number of population in Georgia has decreased by 754 200 people (making 16% of the data of 2014). The population in Marneuli decreased by 25 700 people making over 19% of the data of 2014).

| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Georgia | 4321,5 | 4401,3 | 4394,7 | 4382,1 | 4385,4 | 4436,4 | 4469,2 | 1497,6 | 4483,8 | 4490,5 | 3729,5 |
| | | | | | | | | | | | |
| Kvemo Kartli | 494,7 | 507,6 | 508,3 | 486,9 | 488,8 | 499,9 | 505,7 | 511,3 | 511,1 | 513,1 | 425,0 |
| Marneuli | | | | | | | | | | | |
| Municipality | 117,9 | 121,0 | 121,8 | 122,5 | 123,5 | 126,3 | 128,1 | 129,6 | 129,8 | 130,6 | 104,9 |

Table20: Statistical Data of the Number of Population in Kvemo Kartli and Marneuli

135. The following nationalities live on the territory of Marneuli Municipality: the Azerbaijani, Georgians, Armenians and others. The absolute majority of the population (approximately 80%) is Azerbaijani.

136. With their religious belief, most of the population is Moslem, followed by Orthodox Christians. Others are mostly Armenian Gregorian.

137. As per the age groups, Marneuli Municipality much differs from the average indicators of Georgia. Young and average aged people are most in number. This may be the reason for higher birth rate in the area and less migration of the youth to other cities and towns.

D.4.2 Industry and Trade

138. The leading branches of economy in Marneuli Municipality are flour and bread and pastry production, dairy and cheese production, fruit and vegetable tinning, including meat mix, cutting and processing decorative stones, furniture manufacturing and processing sand carriers, etc.

139. There are approximately 2100 enterprises registered in Marneuli Municipality. 100 of them are industrial ones. The industrial enterprises in the Municipality are mostly small or average enterprises. In this respect, Marneuli Municipality does not differ from the other regions of Georgia.

140. Trade is well developed in the Municipality, with many retail and wholesale trade and service units. In terms of appropriate investments, operation of small cement plants is quite perspective, as the components needed for cement manufacturing are available on the territory of the Municipality.

141. As per the data of the Agriculture Development Department of Marneuli Municipality, by December 1, 2011, the agricultural land fund of the Municipality was 57,052,59 ha. The agricultural lands are distributed as follows:

• Arable land - 22,271.29 ha

⁶Source: http://www.geostat.ge/?action=page&p_id=472&lang=geo

- Hey-making meadows- 1,724.98 ha
- Pastures 30,945.8 ha
- Area occupied by perennial crops 2,110.52 ha.

142. The city of Marneuli and communities of Kapanakhchi, Algeti, Kachagani and Kasumlo use 6512 ha of lagluja and Babakari pastures. 33,230 ha of agricultural land is privatized. The common agricultural crops in the Municipality are: wheat, barley, maize, rye, sunflower; common vegetables are: potato, cabbage, carrot, onion, garlic, beans, cucumber, tomato, etc.

143. The conditions in Marneuli Municipality are much favorable for agriculture. The major competitive advantage is the favorable climate allowing gaining harvest twice or three times a year.

144. Cattle-breeding is a well-developed branch in the Municipality, including sheep-breeding and poultry-raising. It should be noted that the summer pastures survived on the territory of the Municipality fail to meet the least demand for green forage for the cattle locally, as the ratio of pastures is approximately 0,3 ha of pasture per head. This is 5 or 6 times less the standard. In addition, following the local natural-climatic conditions, the plant vegetation starts in early spring and the people start using the pastures with wet soil as early as the young grass starts growing.

145. Allowing the cattle to the pastures early in spring and overloading some pasture massifs causes burying the young grass with too weak roots into the soil when walking over it, intense destruction of the grass on the pasture, destruction and washing down the soil turf what is aggravated by frequent rains. This promotes soil degradation and rarefication of the grass cover and reduction of the pasture productivity.

146. There are 3 hospitals and 3 polyclinics operating in the city of Marneuli. At least one ambulatory is in every community. Free first aid service is available in the city of Marneuli and villages Kutliari, Damia-Geurarkhi and Shaumiani. There are 74 public schools in Marneuli Municipality, with 9 of them in the city of Marneuli. There are also 3 higher education institutions and 1 college in the city of Marneuli. Kindergartens operate in the Municipality in every community, except villages of Kutliari, Damia-Geurarkhi, Khojorna, Kasumlo, Sadakhlo, Tserakvi, Shulaveri, Akhkerpi, Opreti and Kulari.

147. There are 7 libraries on the territory of the Municipality.

148. A sports school training the young people in football, basketball, boxing, kick-boxing, Taikvando, judo, sambo, Georgian wrestling, triathlon, sports acrobatics, operates in the city of Marneuli.

D.4.3Infrastucture

149. The territory of Marneuli Municipality is totally in the "Magticom", "Geocell" and "Beeline" coverage zones. Telephone company "Silknet" also operates in the city of Marneuli. Internet providers are: "Silknet" (ADSL @s DIAL-UP), "Magticom" and "Geocell". Georgian broadcasting or internet is not provided in the communities of Agkerpi, Opreti and Khojorni.

150. In respect of electrification, Marneuli Municipality is not totally electrified. Electrical power is supplied by ,,ENERGO-PRO GEORGIA".

151. Marneuli Municipality totally supplied with drinking water, including the city of Marneuli and all villages, except villages: Khutor Lezhbadini, Khikhani, Takalo, Khanchigazlo and Kirachmuganlo, where the people receive the drinking water from springs and wells. The households with the

drinking water supply, receive the water through central water pipelines from the collection reservoirs near the natural springs. 40% of the population of the city of Marneuli and 30% of village Tsopi is equipped with sewage system.

152. Drinking water is not supplied to the following villages: Khojorni, Shaumiani, Tserakvi, Agkerpi and Opreti, as well as Olmazlo, I Kesalo, II Kesalo, Kapanakhchi, Budionovka. The drinking water systems in other communities operate more or less trouble-free. The length of the central and local roads in Marneuli Municipality is 540 km, with 220 km of central roads and 320 km of local roads. 230 km of the roads is asphalted and 310 km is ground roads.

D.4.4 Historical and Archeological Monumnets

153. There are 34 historical-archeological monuments in Marneuli Municipality. An old Georgian architectural monument, Monastic Complex Khujabi (XIII c.) near village Akhkerpi is worth mentioning. A middle-century monastery Khojorni is also important. Tsopa Fortress is also worthwhile. It functioned in the VI-XIII centuries. The fortress is built on a cliffy mountain. There is a site of ancient village near Tsopa Fortress. Opreti Fortress near village Opreti is also worthwhile, which is first mentioned in the literary sources in the X century. The Tserakvi Monastic Complex near village Tserakvi is also notable. The Complex includes a church and other structures.

154. Mikheil Javakhishvili's House-Museum is found in village Tserakvi and Melik Pashaev's House-Museum is found in village Shaumiani.



Figure 6: Historical Monuments in marneuli

155. At the construction stage archaeological monitoring should be ensured by the constructing contractor under the supervision of the Ministry of Culture, Monument Protection of Georgia. The

budget necessary for the archeological supervision and other agreed works should be fixed under the construction works appraisal.

D.4.5Proceduresin Response to the Artifact Findings Chance Finds Procedure:

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

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

158. Archaeological supervisor conducts daily monitoring at all construction sites, where the earthworks (land clearance; grading; excavations etc.) are planned according to the schedule.

169. Besides that, archaeological supervisor instructs the workers to report him immediately in case of any chance finding of potential archaeological relics.

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

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

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

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

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

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

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

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

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

D.4.6Tourism

170. The region has certain tourism potential, but this potential is not significant. Mostly, culturalrecognition tourism is developed in Marneuli Municipality. Agro-tourism is developed on the territories of Tamarisi and Kulari communities. Akhkerpi has a certain potential to become a resort. The Municipality has a perspective to develop horse and hunting tourism. Marneuli can be considered as an intermediate point along the south tourist route of Kvemo Kartli, starting in Tbilisi and ending in Bolnisi.

E ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

E.1 Summary of Activities and Anticipated Impacts

171. Proposed wastewater treatment plant project will certainly produce some environmental impacts in project area. Activities to be performed within the scope of the Project were examined in 2 phases:

A. Construction Phase

- Pre-construction activities such as contractor office set ups, necessaryequipment stacks and the site preparation
- · Construction of the Treatment Plant per tender drawings

172. Environmental effects likely to occur during the construction of the Project are noise, dust, solid and liquid wastes. Effects likely to occur during the construction phase are short term effects and they cannot deteriorate the existing conditions.

B. Operational Phase

- Commissioning and Operation of the Wastewater Treatment Plant
- Use of treated effluent for irrigation or/and dispose of on the landfill.

173. The most sensitive receptor both, during the construction and operation of Marneuli WWTP adjacent to the Project zone is the operating restaurant on the other bank of the river Algeti. The relevant mitigation measures are given in Chapter E.3

174. Possible environmental effects during operational phase arise from effluent discharge, solid and hazardous wastes, sludge disposal and odor and do not include any adverse environmental effects as long as monitoring and mitigation measures, if needed, are executed.

175. This paragraph provides a brief description of anticipated site-specific impacts related to the construction phase of the sub-project "Improvement of Marneuli Waste Water Supply system".

| # | Pre-Construction Phase. Potential Impacts During Construction site preparation works | Risk | Sites |
|----|---|---------------|--|
| 1. | Loss of Topsoil | Moderate | WWTP project Area |
| | Construction Phase. Potential Impacts During Construction Works | Risk | Sites |
| 1 | Dust, noise, vibration | High Risk | During excavation of pipe trenches within the areas of town of Marneuli. WWTP project area |
| 2 | Pollution of surface water | Moderate Risk | Planned rehabilitation of the existing |

Table 21: Site-Specific Impacts

| | Pre-Construction Phase. | | |
|---|--|---------------|--|
| # | Potential Impacts During Construction site preparation works | Risk | Sites |
| | during construction and rehabilitation works | | network of waste water system crosses river Algeti several places. |
| 3 | Flooding | Moderate Risk | Flooding may occur during construction time; the present location is naturally ensured against flooding with an annuity of 10 years. |
| 3 | Impacts on Archaeological Sites | Low Risk | No damage to any archaeological site shall be expected. The pipe laying sites in Marneuli located in the areas of extensive on- going human impact. |
| 4 | Impacts on traffic | High Risk | Existing waste water system of Marneuli is almost totally replaced by the project. For the implementation of above mentioned will be necessary to cut trenches in the streets of the city which will restrict transportation by transport means or for pedestrians as well. Special problems will be created in the narrow streets of the city. |
| 5 | Landslides, slumps, slips and other mass movements. | Low Risk | No large scale earthworks are planned under the Project. |
| 6 | Impacts on flora and fauna | Low Risk | All Project sites are located within the area have been experiencing the severe human impacts. Therefore, no influence on flora and fauna shall be expected during implementation of the Project. |
| 7 | Pollution risk for ground waters | Moderate Risk | No major spills of fuel and lubricates at construction sites due to leakages are expected. The spills, which are likely to cause groundwater contamination, may occur during fuelling construction machinery at the construction sites and/or construction camps. |
| 8 | Pollution risk for air quality | Moderate Risk | Air pollution may occur in the inhibited areas, including town of |

| # | Pre-Construction Phase. Potential Impacts During Construction site preparation works | Risk | Sites | |
|----|--|----------|---|--|
| | | | Marneuli | |
| 9 | Poaching by construction workers | Low Risk | Algeti river. | |
| 10 | Hazardous Construction Wastes | Low Risk | Small quantities of hazardous wastes will be generated as a result of vehicle operations and the maintenance activities. | |
| 11 | Impact on existing infrastructure | Low Risk | Electric power transmission systems, existing water supply and drainage channel systems and channels. | |
| 12 | Poor sanitation and solid waste disposal in construction camps and work sites (sewerage, sanitation, waste | Low Risk | Camp will not be used as living facilities because it is expected that majority of the employees would be local persons. | |
| | management) | | The construction camp would be equipped with a bio toilet and other necessary infrastructure. | |
| 13 | Construction Related Impacts at the Quarrying Sites | Low Risk | 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. | |

E.2. DevelopingEnvironmental Documents

176. Prior to the onset of the construction, the Construction Contractor will be obliged to develop the following environmental documents:

177. The Site - Specific Environmental Management Plan(SSEMP) must cover the following issues:

- Define boundaries
- Identify sensitive receptors & environmental values
- Specify construction activities
- Conduct risk assessment
- Assign environmental management measures
- Prepare monitoring plan
- Prepare site plans
- Prepare environmental work plan

178. At the stage of risk assessment the ADB risk assessment methods must be used:

- 1. Following the specifics of the work to be accomplished, the Construction Contractor must develop the Site Specific Waste Management Plan. This document must describe the methods to prepare the construction site and manage the waste originated during construction (collection, transportation, recycling/reuse and placement).
- 2. Following the location of the construction site, the Construction Contractor prior to the onset of the construction must develop the Site Specific Noice Management Plan. This document must give the model of the sources and distribution of the noise originated at the construction stage, and possible impact on the adjacent facilities, as well as all mitigation measures and methods to monitor them.

179. All the above-mentioned documents must be developed by the Construction Contractor and submitted to the Project Implementing Unit (PIU) for approval. The Construction Contractor will be entitled to start the construction works only after the above-said documents are approved by PIU.

E.3Air Quality

E.3.1 Noise, Dust and Odour

Construction Phase

180. Noise and emissions of harmful substances are typical impacts of construction. Air quality will be affected during construction by emissions from vessels, equipment, and land vehicles in work activities at work locations. During the pipe replacement stage the rehabilitation works are to be carried out in Marneuli streets. The noise and dust generated in course of excavating the trenches will cause nuisance of the local residents that will further increase during summer season assuming growth of the local population on the account of holiday makers.

181. Also, pumping WWTP is located near the settled area, therefore construction process is expected to cause noise and generate dust.

182. Assessment of the noise, caused by construction activities is based on existing information about operation of various equipments at various stages of construction.

183. Noise level in 15 m as it is considered by the Federal Highway Administration of the ministry of transport of the USA (FHWA), California Department of transportation (CADOT) and SBAG is as follows:

| Noise source | Equivalent noise |
|----------------------------|------------------|
| | level |
| | dBA |
| Excavator | 84 - 85 |
| Bulldozer | 84 - 85 |
| Grader | 91 - 92 |
| Compressor | 80 - 88 |
| Pneumatic drilling hummers | 85 - 98 |
| Pile boring equipments | 96 - 107 |

Table 22: Noise levels (Administration of the ministry of transport of the USA)

| Noise source | Equivalent noise level dBA |
|----------------------------|----------------------------|
| Excavator | 72-92 |
| Bulldozer | 83-93 |
| Grader | 80-95 |
| Compressor | 75 - 88 |
| Pneumatic drilling hummers | 82 - 98 |
| Pile boring equipments | 72-82 |

Table 23: Noise levels (California Department of transportation)

184. As a rule, noise caused by moving equipments is reduced at some distance. Such reduction has logarithmic properties. In case of noise caused by construction activities, noise spread pattern from the noise point is used, that can be determined as: Noise level1-Noise level2=20 log r2/r1, meaning that by doubling of distance noise is reduced by 6dBA.

| Distance from noise source, m | Calculation level of the noise | Calculation level of the noise | | |
|----------------------------------|--------------------------------|-----------------------------------|--|--|
| | Average value - dBa | Maximum value - dBa | | |
| 10 | 80 | 90 | | |
| 20 | 74 | 84 | | |
| 40 | 68 | 78 | | |
| 80 | 62 | 72 | | |
| 160 | 56 | 66 | | |
| 320 | 50 | 60 | | |

Table 24: Noise levels

185. Noise sources generated by excavation for WS pipes during construction period in scope of city Marneuli are mainly engineering machinery and vehicles, and they are featured by their intermittent nature with mobility and high noise level (which is 80~90 dB from a distance of 5 meters).

186. The following measures are to be taken during construction engineering to reduce impacts on acoustic environment:

(1) Any construction engineering entity shall adopt advanced engineering equipment and technologies of low noise, and this requirement shall be a principal criterion for selecting contractors during the bidding process.

(2) Any operation by such equipment as a percussion piling machine or pneumatic hammer shall be prohibited.

(3) The working time and construction schedule must be arranged rationally, and all engineering entities shall make reasonable arrangements for working time, and engineering activities after 22:00 hours through 8:00 hours the next day shall be strictly prohibited, except as required by the proposed project.

187. Prior to startconstruction activities construction contractor should prepare Noice SSEMP for city Marneuli. Prepared plan should be submitted to SC for endorcemnet and to UWSCG for approval.

188. The existing and forecasted noise level at a distance of 80 meters from the point of use of construction equipments is not significant. In fact, after 120-130 m from the noise source, the noise level is acceptable without implementation of mitigation measures. It can be assumed according to rough calculations, that noise impact will not exceed 150 m and increase of noise level within 150 m is assessed as acceptable impact. There are houses within 150 m radius from the new WWTP; therefore, the contractor should implement all mitigation measures mentioned in the document.

189. As the figure shows (Figure), the design WWTP must be located on the left bank of the river Algeti, in the environs of the city of Marneuli. No buildings and premises or plantings are found in the Project zone (Figure and). The territory is owned by the state and is not used at present.



Figure9: WWTP Project Area



190. The nearest buildings located to the south of the WWTP are farm husbandries and greenhouses, as well as storage facilities and ancillary buildings, the structures are not used for residential purposes.

191. The nearest residential buildings located along the WWTP are 300-350 m away from it. According to the calculations, the noise leveldoes not exceed IFC/WB noise standars Standardfrom is in the frames of the norms from 300 m of the noise source. In addition, the surrounding territory of the project area is covered with plantations, representing natural noise mitigate zone and reducing noise level more.

1892Problems related to noise at the construction phase are basicly generated during installation of waste water pipes. According to the design proposal, the existing wastewater pipes are replaced approximately at every street of the town, or in the areas where there is no waste water system, the new ones shall be installed. Total length of the pipes is approximately 30 km and it covers mostly the whole town.

193. The basic sensitive receptors that will be affected by the noise generated as a result of trench excavation are schools, kintergardens and hospitals.

194. There are 9 secondary schools (8 public and one private), three kintergardens and three hospitals located in Marneuli

195. Information regarding the schools and the kintergardens is given in the tables 25 and 35

Table25. Schools in the Marneuli area

| N | Adress | Contact Person Phone | Period of Study | Distance from the Project Area (m) | Remarks |
|--|-------------------|--------------------------------------|-------------------------------------|---|--|
| School 1 | Azi Aslanov str 2 | Ketevan MerabiShvili 551096265 | 9 ⁰⁰ - 13 ⁰⁰ | 15 | execute construction works during non-labor days |
| School 2 | Kostava 6 | Shorena Khukhua 577973247 | 9 ^{00 -} 18 ⁰⁰ | 30 | execute construction works during non-labor days |
| School 3 | Rustaveli 63 | Gulnara Dargali 551095979 | 9 ^{00 -} 18 ⁰⁰ | 15 | execute construction works during non-labor days |
| School4 | Gorki 1 | Dilara Dargali 551097501 | 9 ^{00 -} 18 ⁰⁰ | 25 | execute construction works during non-labor days |
| School5 | Rustaveli 52 | Lela KharshilaZe 551096030 | 9 ^{00 -} 18 ⁰⁰ | 25 | execute construction works during non-labor days |
| School 6 | Muskhelishvili 1 | Lela Akhsabadze 551096171 | 9 ^{00 -} 18 ⁰⁰ | 20 | execute construction works during non-labor days |
| School 7 | Narimaniv 31 | Vakhtang Ibragimov 551096616 | 9 ^{00 -} 18 ⁰⁰ | 20 | execute construction works during non-labor days |
| School 8 | Rustaveli 96 | Elman Jafarli 551096636 | 9 ^{00 -} 18 ⁰⁰ | 20 | Under Rehabilitation |
| Ltd. Davit Agmashenebeli school-lyceum | Agmashenebeli 89 | | 10 ^{00 -} 15 ⁰⁰ | 15 | execute construction works during non-labor days |

Table 26.Kindergardens in the city Marneuli

| N | Adress | Contact Person Phone | Period of Study | Distance from the Project Are | ks |
|---|--------------|-----------------------------------|------------------------------------|--|---|
| 1 | Erekle 2 | Zainab Nadiradze 593614242 | 9 ^{00 -} 18 ⁰⁰ | 20 | execute construction works during non-labor days |
| 2 | 26 May | Ketevan Minadze 568715299 | 9 ^{00 -} 18 ⁰⁰ | 15 | execute construction works during non-labor days |
| 3 | Rustaveli 77 | Tamar Suleimanova 555223374 | 9 ^{00 -} 18 ⁰⁰ | 20 | execute construction works during non-labor days |

196. The following facilities are located in Marneuli:

- 1. Interregional hospital;
- 2. Birth house;
- 3. Medical center " Geo Hospital

197.All the three hospitals of Marneuli are located in the city center. From them the interregional hospital of Marneuli and the birth house are located on one of the main streets (Gorgasali Street), where the traffic is quite intense and the noise level is high enough. In noise point of view, an unfavorable situation takes place near the birth house that is located at the edge of the street (picture 12) and the safety barriers are excluded as well. The basic measurements have revealed that the noise level observed along the birth house exceed the allowed limit and it often reaches approximately 80 db(A) (during rush hours).

198. The best situation in noise point of view is near the medical center "geo hospital", though it is located in the city center of Marneuli, it is in the blind alley and only the vehicles heading to the medical center occure to enter the nearby areas. Therefore, the noise level 30-40 m. away from the medical center varies between 50-55 db, that is considered to be a very low indicator.

Figure 10.Birth houseFigure 11. Interregional hospital



Figure 12.Medical center "Geo Hospital"



Mitigation measures

199. Since the ambient noise in the area of the hospitals and city centre is already high, it is important that propoer noise barriers be erectedaround the construction site in consultation with the communities of the area. There are several standard procedures to be executed on WWTP site during construction phase, which will allow us to protect the local population from the noise during both stages – construction and operation. The following mitigation measures shall take place during construction phase of the treatment plant:

- Require adherence to engine maintenance schedules and standards to reduce airpollution.
- Use of defined, well planned haulage routes and reductions in vehicle speed where required;
- Periodically water down temporary roads on site;
- Cover trucks carrying cement, gravel, sand or other loose materials;
- Wet or cover trucks carrying stone/ sand/ gravel;

- Haul materials to and from the site in off peak traffic hours;
- Halting work during excessive winds.
- Immediately replacing defective equipment and removing it from the work site
- No truck movements in inhabited areas between 22:00 and 6:00.
- The population to be informed regarding the pending works.

200. As for the noise, generated during excavation of the trenches in Marneuli area, affecting the sensitive receptors disposed in the town, will require execution of additional mitigation measures.

201. It should as well be taken in consideration that the source of the noise generated during the trench excavation is not in a fixed position. The excavator conducting the trench excavation or pipe installation including backfilling, is permanently moved. During the meeting with the engineers, it turned out that movement speed of the construction equipment depends on the road surface type (soil, asphalt, concrete), relief and the existing infrastructure, and the speed varies between 10-25 m/h. On the basis of the fact that no concrete roads are observed in Marneuli, therefore reducing the digging speed to minimum and increasing noise level to maximum, we have to assume that the average speed of equipment movement during trench excavation is 20-25 m. that represents 160-200 m during 8-hour work day.

202. Therefore, during the project implementation phase we will have to wait averagely 2 days for increasing noise level of each sensitive receptor. On the first day, the noise will increase step by step and by the end of the day it will reach its maximum, and on the second day it will start to decrease from the maximum and will completely disappear by the end of the day.

203. In spite of short-term affect, it is essential, mostly for the above mentioned work phases involving sensitive receptors, planning and implementation of the following additional mitigation actions:

204. As a result of the meeting with the heads of educational institutions (such as schools, kindergartens), it was found out that the studying process, throughout Georgia take place during 5 days a week. No study process takes place on weekend in schools and kindergartens. Therefore, the request has to be included in the tender proposal, that the contractor construction company shall execute construction works during non-labor days;

206. As for implementation of the works nearby medical facilities, where patients shall be disposed, the following mitigation measures have to be processed and conducted:

207. Option 1: if the contractor shall conduct the works without using equipment (treanches should be dug with shovels) on the nearby area of the hospital, that will represent the best option. The method must be used for digging 400 m. long trench, for each facility approximately 200 m. (Marneuli interregional hospital and the birth house are located on the same street, in front of each other). Certainly, the method will increase the project price and duration of execution, but it will practically reduce to zero the noise generated as a result of works at the above mentioned areas.

208. Option 2: In case the construction contractor rejects using the proposed method because of financial problems, the contractor will have to execute the following mitigation measures along the construction works area:

- 1. Not to allow joint operation of two or more heavy technics 100 m away from the medical facility;
- 2. To use portable noise screens (barriers) that will be disposed on both sides of the construction technics, 2.– 2.5 m. away, in such way to protect direct sound emission to the medical center
- 3. To measure static noise level near health care facilities with noise measuring equipment continously;

- 4. In case the noise level exceeds the permissible level, the construction works must be stopped and additional mitigation actions must be executed:
- 5. The construction works will not be resumed unless the noise level reaches the norms.

Operational Phase

209. As already mentioned, noise propagation is expected in the operation phase, as well. The major mitigation measure will be a noise attenuating barrier, which will be installed prior to the onset of the construction works.

210. In order to minimise the odour nuisance of the untreated wastewater the inlet part of the WWTP is enclosed (integrated in the building).

211. As one can see from the Project description, WWTP technological line is of a quite high standard (See Chapter C.6). The full mechanical and biological treatment of the sewage sludge is mainly undertaken in the closed area minimizing the unpleasant smell typical to the given type of plant.

212. The digested sludge is stored temporarily. However, since the sludge is already digested, the odor nuisance is neglectable.

Mitigation Measures

213. Together with noise attenuating barrier the additionally standard approaches shall be employed to reduce the noise pollutions during maintenance works as follows:

- Periodically water down temporary roads on site;
- Immediately replacing defective equipment and removing it from the work site
- No truck movements in inhabited areas between 22:00 and 6:00.

214. Also, after the detailed design of WWTP will be developed, the construction company with relevant qualification has to define the level of noise and its spreading area at the operation stage. If it is required, additional changes have to be inserted in the design and relevant noise reducing barriers have to be arranged in order to avoid noise exceeding the allowed level for the buildings located along the WWTP. According to the Georgian Legislation, during the noise level survey, it has to be considered that the equipment will work 24/7 and one of the buildings located along is a Restoran.

215. Foul Odor Off-site Migration. Mitigations shall include the following: (i) close monitoring of the aerobic units to ensure the conditions are not an oxic (without enough oxygen), (ii) landscaping with trees and shrubs around the facility shall be done to position them as wind breaks, and (iii) conduct of WWTP^{*}s annual odor audit to identify operational measures that can prevent odor problems The role of reliable power supply to the mechanical equipment is very important in ensuring adequate odor control and management. The lack of power supply will cause the lack of air input to the aerobic units. If the situation persists for an extended period of time, the resulting an oxygen (without enough oxygen) condition will generate foul odor. In order to prevent this situation, an emergency power generator is foreseen in the Tender Documents. 216. Furthermore there are standby aggregates (as redundant technical solutions) for the mechanical equipment (e.g. pumps, blowers) in order to ensure sound WWTP-operation, and to avoid technical failures, which could lead to foul odor migration.

217. In the operation phase, in order to avoid the distribution of the unpleasant smell of the sewage sludge temporarily placed on the territory of WWTP and treated with high quality, the following measure is necessary:

- A zone of green plantations should be arranged between the sewage sludge location and the river.
- conduct of WWTP's annual odor audit to identify operational measures that can prevent odor problems The role of reliable power supply to the mechanical equipment is very important in ensuring adequate odor control and management.

E.4 Water Quality

E.4.1 Contaminations of Surface Water

Construction Phase

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

219. 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.

Mitigation Measures

220. 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 100m 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.
- 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

Operational Phase

2221. In general, operation of the WWTP will have large positive impact on the quality of the groundwater, the bottom sediment and the most of all on the water quality of the River Algeti;The operation of the WWTP will have positive impact on the restoration andmaintaining of the aquatic fauna in the River Algeti;There are large positive impacts on the Social Environment elements: improvedwater supply of the downstream populated areas due to good quality of thegroundwater, and improved health of the downstream population as a result of theimproved quality of drinking water.

222. The operation of the wastewater treatment plant involves various processes:

• Screening

- Sedimentation
- Aeration
- Final sedimentation
- Sludge thickening

223. The wastewater treatment will generate waste, which will comprise of the following:

- Screenings from coarse and fine screen;
- Grit from aeration;
- Sludge from biological treatment.

224. As far as operation failure of STPs are concerned, there should be provisions for zero tolerance on failures during operations. During normal operations once the processes are stabilized, one can't foresee a longer failure of operations, and the failures are largely due to failure of mechanical or electrical parts, which can be rectified very easily. And most of the instances, such failures not necessarily brings down full operation (e.g. failure of one aerator, or a pump), as there is always sufficient standby built in STP design. For this purpose, there has to be 100% power back-up, and sufficient spare parts to rectify any such failures within shortest possible time. The same has been included in the design of STPs. Since these STPs are being bid out on design-build-operate basis, the operator will have responsibility to operate and maintain the STP to meet the discharge standards. It is also proposed to procure routine spare parts, and any additional spare parts (that bidder will propose in his bid) before commissioning of STP as a part of construction cost, which will be financed from the loan.

225. The operation of the wastewater treatment plant will generate treated wastewater. The treated wastewater will be discharged into Algeti River near the location where at present the untreated wastewater is discharged. The quality of the surface water will significantly improve. The quality of the effluent is according to European and Georgian regulations and can be discharged into the surface water without harm. Georgian legislation requires the preparation of a Report on the Maximum Allowable Discharge into Algeti River. The permissible concentrations were determined as shown in the table below. They are based on calculations of the concentration of effluent in the receiving water body. The calculations take into account the background concentration existing in the water object for each indicator, the category of the water object, the maximum permissible concentrations of substances in the water and their assimilation capability. The report confirms the applicability of the norms for Algeti River. The design of the wastewater treatment plant is in line with these effluent quality parameters.

| N° | Ingredients | Permissible concen- tration, Mg/I |
|----|------------------|---|
| 1 | Suspended solids | 60 |
| 2 | BOD ₅ | 35 |
| 3 | COD | 125 |
| 4 | Total Nitrogen | 15 |
| 5 | Total Phosphorus | 2 |

Table 27: Maximum Permissible Discharge

226. The table below presents the decisive parameters for untreated wastewater (inflow WWTP), treated wastewater (outflow WWTP), Algetiriver, and the dilution of effluent and river water in comparison to the Georgian environmental standards. The loads were calculated for 2024 and 2044 and with an average discharge of 125 m³/s of Algeti river. The environmental standards are adhered to with the exception of suspended solids that are very high in the baseline quality already.

| Pollution load | BOD5 mg/l | COD mg/l | Suspended Solids mg/l | Total N mg/l | Total P mg/l |
|--|--------------|-------------|-----------------------------|-----------------|-----------------|
| Inflow WWTP | 420 | >700 | 500 | 680 | 21.9 |
| Outflow WWTP | 25 | 125 | 30 | 15 | 2 |
| Algeti river baseline | 31.0 | 88 | 25.0 | 35 | 1.2 |
| Operational case: Dilution of effluent and river water in 2024 | 20.9 | 88 | 24.9 | 34.9 | 1.2 |
| Operational case: Dilution of effluent and river water in 2044 | 30.9 | 88 | 25 | 34.9 | 1.2 |
| Environmental Standards | 35 | 125 | 60 | 15 | 2 |
| Failure of operation in 2024: Dilution of untreated wastewater and river water | 31.13 | 88.22 | 25.1 | 35.2 | 1.2 |

Table 28: Dilution of effluent

E.4.2Downstream Users

227. After the project implementation Wastewater water will be discharged in the river Algeti, that meets the river Mtkvariin Azerbaijan territory flows into the Caspian Sea. The river Algeti will pass the following villages from Marneuli to the river Mtkvaris: Sabirkendi (3871 residents), Algeti (5408 residents), Azizkendi (2810 residents), Pirveli Qvesalo (1600 residents), meore qvesalo (1650 residents).

228. Algeti river water is not used for drinking purposes in any of the villages; well water is used in every village for drinking. However the river water is drunk by the domestic animals. As at today the collected wastewater of Marneuli is discharged in the riverAlgeti without any treatment. Local Administration representatives informed us that wastewater is directly discharged in the river and the worst side of the fact is that not only private individuals discharge the wastewater but also all big and small companies or commercial structures located in Marneuli. As a result, high risk liquid waste is discharged in the river Algeti from hospitals, policlinics, car wash, gas station and etc.

229. Based on the information mentioned above it is obvious that the project implementation is fundamental/vital for the population located at the lower side of the river Algeti. It is expected to reduce the pollution level of the river significantly. The project efficiency is demonstrated at the level of modeling. In this case,. No permanent analysis of the river water was done, and therefore, we have no exact data about the present pollution of the river

E.4.3 Contamination Underground Water

230. Groundwater table depth within the Project zone is 5-6 meter therefore potential impact arises from implementation and maintenance of contractors' yard, transport, maintenance of vehicles and handling and storage of lubricants and fuel. The required provisions for contractor's yard are described in the chapter on impacts and mitigation measures concerning quality of soils.

E.5 Soils Quality and Topsoil Management

Construction Phase

231. During construction, impacts on soils are mainly due to earthworks and the operation of the contractor's yard.

232. The works for the transmission mains comprise material excavation, pipe laying and backfill of material including compaction. Material will be stored temporary alongside the trench and refilled after pipe lying. Therefore impacts associated with earthworks for trench laying are of temporary nature. The pipes will be placed in the trench manually. A sand layer of 30 cm thickness will be laid on top of the pipe, after which the trench will be refilled with excavated material and compacted manually. The excavation is expected to generate surplus material. Surplus material will be used as embankment fill as far as possible.

233. Construction of the pumping station and WWTP, as well as performance of trenching works for installation of waste water main may lead to disturbance or loss of topsoil. Therefore the Contractor shall implement the following measures:

- The top soil of about 1 ft depth (0.3 m) shall be removed and stored separately during excavation work, and after the construction of the main trunk the same soil shall be replaced on the top, in unpaved areas;
- Subject to advance consent of the local self-governance authorities, the excess topsoil remained after construction of the new pumping station and reservoir will be used at other Project sites or handed over to the appropriate authorities.

Mitigation Measures

234. The following practices will be adopted to minimize the risk of soil contamination and topsoil loss:

- The contractors will be required to instruct and train their workforce in the storage and handling of materials and chemicals that can potentially cause soil contamination.
- Solid waste generated during construction and at campsites will be properly treated and safely disposed of only in demarcated waste disposal sites.
- Construction chemicals will be managed properly
- Clearly labelling all dangerous products,
- Fuel tanks (diesel or oil) should be placed in a concrete pool which its perimeter walls will be at least 1.0 m high with the concrete or plastered masonry wall,
- A proper floor drain should be installed on the slab of the concrete pool for safely discharging the leakages.

Operational Phase

235. During operation phase, the soil may be contaminated due to water leakage from the damage pipe. In case such damage is not detected in a due time, the area may be "bogged".

236. Soil contamination may also occur during performance of the planned or emergency repair works.

237. Operation of the WWTP will generate sludge from the treatment processes. The sludge has to be removed regularly to maintain good operational performance. The cannot simply be disposed without proper treatment since it may cause land pollution.

238. Sludge disposal. After the sludge treatment, the sludge is stabilised, it is not digesting anymore and it has also been dewatered. As there is no industry in Marneuli, no heavy metals will be in the treated sludge. The sludge quality and consistency will allow its disposal on a landfill. Sludge quantities amount to:

- 21.2 m³/d in 2024
- 24.4 m³/d in 2044.

239. There is a temporary sludge storage area at the WWTP that has sufficient volume to store the sludge for 30 days. From time to time the sludge shall be transported to the landfill of the town of Marneuli. This is a certified landfill. It is regulated by the Solid Waste Management Company under the Ministry of Regional Development and Infrastructure. UWSCG will provide transportation from the WWTP to the landfill.

240. Another alternative for the disposal of the sludge is its use as fertilizer in the agriculture. As there is no industry in Marneuli the sludge quality is expected to be suitable for this usage. The WWTP is equipped with a storage place with a volume of about 1000 m³ where sludge is temporarily stored and can be collected by interested farmers. UWSCG would give away the sludge for free; transportation would have to be provided by the farmers. After some weeks of operation, when UWSCG will have a better understanding of the quality and quantity of the sludge, UWSCG will anunounce the possibility to collect sludge from the site of the WWTP. Depending on the seasonal demand for fertilizer, the UWSCG will manage the temporary storage at the WWTP in such a way that a potential demand can be best served.

241. Sludge and soil on which it is used must be sampled and analyzed. Sludge shall be analyzed for heavy metals every 12 months. The limit values are given in the Table 22.

| | Limit values for concentrations of heavy metals in soils | Limit values for heavy metal concentrations in sludge | Limit values for amounts of heavy metals which may be added annually to agricultural land |
|---------|---|---|--|
| | mg/kg of dry matter | mg/kg of dry matter | kg/ha/yr |
| Cadmium | 1-3 | 20 – 40 | 0.15 |
| Copper | 50 - 140 | 1,000 - 1,750 | 12 |
| Nickel | 30 -75 | 300 – 400 | 3 |
| Lead | 50 - 300 | 750 – 1,200 | 15 |
| Zinc | 150 - 300 | 2,500 - 4,000 | 30 |
| Mercury | 1 - 1.5 | 16 - 25 | 0.1 |

Table 29: Limit Values Heavy Metals

Mitigation Measures

242. Water pressure in the pipelines must be continuously monitored during entire operation phase. In addition, the relevant mitigation measures shall be implemented during maintenance works.

243. Depending on the class of WWTP, it is required to develop a plan for disposal of sludge to the dump site. The plan has to be agreed with the Ministry of Environment and Natural Resources of Georgia and as well with the waste management company of Georgia.

E.6 Biological Environment

Impacts during Construction

244. The impacts on flora and fauna during implementation of contractor's yard will be minimised through site selection and installation. The following measures need to be implemented to avoid any impacts on flora and fauna:

- Avoid tree cutting
- In unavoidable cases, plant two trees of same species for each tree that is cut for construction
- The trench shall not be kept open in the night/after working hours. This will avoid any safety risk to wild animals.

Impacts During Operation

245. Operation of the waste water supply components of the subproject will not have any significant negative impact on the biological environment.

E.7 Traffic

Impacts during Construction

246. The rehabilitation of the waste water network will be mainly conducted along roads existing in the town. Although work will not require land acquisition it could still have economic impacts, if the presence of trenches, excavated material and workers discourage customers from visiting shops and other businesses, which lose income as a result. These losses however will be short in duration. Implementation of the following best construction measures will reduce the inconvenience and disturbance:

- **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;
- **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;
- **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.

247.Another aspect of the work that has economic implications is the transportation of material to the site and surplus soil from the site to locations where it can be put to beneficial use as recommended. There will be truck movements carrying material. Although this is not significant, considering the narrow roads, it could disrupt traffic in the Town. Dust generated during the transport may also impede the commercial and trade activities, which are predominantly located along the main roads. The transportation of material/waste shall be implemented by the Civil Contractor in liaison with the town authorities, and the following additional precautions should be adopted to avoid effects on traffic:

- Plan transportation routes in consultation with Municipality and Police
- Schedule transportation activities by avoiding peak traffic periods.
- Use tarpaulins to cover loose material that is transported to and from the site by truck
- Control dust generation while unloading the loose material (particularly aggregate and sand) at the site by sprinkling water/unloading inside a barricaded area
- Clean wheels and undercarriage of haul trucks prior to leaving construction site

Impacts During Operation

248. As the operation and maintenance activities would be conducted within the existing facilities no impact is envisaged on economic resources. Repairs and leaks of the waste water pipes will be minor and localized. In fact, the improvements to the waste water system will bring various benefits. Availability of good infrastructure facilities will add to the quality of life, and there will be more people interested to live and visit, which will bring new investments and boost economic development.

E.8 Hazardous Construction Wastes

249. Small quantities of hazardous wastes will be generated as a result of vehicle operations and the maintenance activities.

Mitigation Measures

250. There are no specific hazardous waste treatment facilities in Georgia, so the common construction practice accepted by the authorities is to dispose of these types of wastes at the municipal landfills. However, prior to disposal appropriate consultation and agreement of MoENRP is required, and controlling will be required to obtain the necessary approvals. To ensure good practice they will also be required to store, transport and deposit all hazardous materials in secure watertight containers.

E.9 Other Wastes from Construction Activities

E.9.1 Inert Waste

251. Inert construction waste is accumulated during laying the new pipes and replacing the old ones. Such waste is first of all: asphalt and ground.

252. In total a length of around 121 kilometres of distribution network has to be newly laid and in total a length of around 4 kilometres of distribution network has to be re-placed.

253. Under the project, approximately 126-km-long trenches must be excavated during laying the new water supply pipes and replacing the old ones. The width of the trenches depends on the pipe diameter and varies from 70 to 100 cm. After the excavation of trenches approximettly 16.065 m³ (126000m X 0.85m X 0.15 m = 16.065 m³) will be accumulated.

254. Under the preliminary design, after the installation of the pipes, a 30-cm-thick fine sand will be placed over the pipes to protect them leading to the accumulation of additional 32.130 m³soil.

255. Total 48.195 m³ inert waste will be accumulated during the excavation of trenches on the territory of the city of Marneuli. The said waste will be transported and placed on the landfill in Marneuli.

E.9.2 Municipal Waste

256. 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 0.24m³ 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.

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

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

258. 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.9.3 Medical Waste

259. 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 (Batumi municipal waste operator).

E.9.4 Non-Hazardous Construction Waste

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

261. 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.10 Impacts on Archaeological Sites

262. 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 since pipes will run along and inside existing roads as far as technically feasible. 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

263. 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.

264. 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.

265. At the construction stage archaeological monitoring should be ensured by the contractor under the supervision of the Ministry of Culture, Monument Protection of Georgia. The budget necessary for the archaeological supervision and other agreed works should be fixed under the construction works appraisal.

E.11Socio-Cultural Resources

Impacts during Construction

266. There are various social-cultural resources (such as school, church, recreation and entertainment centre, etc.) in the town.No sewage pipes are planned to install adjacent to the principal historical monuments of the city (See Fig. 4). The said historical monuments are distanced from the Project sites by 50-70 m. The construction impact will include noise and dust, and interrupted access due to movement of heavy vehicles transporting material and waste. Mitigation will therefore be needed to protect socio-cultural resources and to enable usage by local people and visitors to continue throughout the construction work. This will be achieved through several of the measures recommended above (under the impacts on air quality), including:

- Limiting dust by removing waste soil quickly; by covering and watering stockpiles, and covering soil with tarpaulins when carried on trucks
- Providing wooden walkways/planks across trenches for pedestrians and metal sheets where vehicle access is required
- Increasing the workforce in to complete the work quickly

267. There is invariably of safety risks when substantial construction such as this is conducted in an urban area, and precautions will thus be needed to ensure the safety of both workers and citizens. The Contractor will be required to formulate and implement health and safety measures at construction sites, which should include such measures as:

- Following standard and safe procedures for all activities such as provision of shoring in deeper trenches (> 2 m)
- Excluding public from the site enclosing the construction area and provide warning and sign boards, and security personnel
- Providing adequate lighting to avoid accidents
- Ensuring that all workers are provided with and use appropriate Personal Protective Equipment helmets, hand gloves, boots, masks, safety belts (while working at heights etc.)
- Maintaining accidents records and report regularly
- Traffic control. Irregular control of trucks by local police (radar control, safety control). Speed limits to be introduced within construction areas and on access roads.
- Yellow / orange warning tape to protect workers and pedestrians from falling into building pits, to prevent pedestrians from entering the construction site. Warning signs to prevent accidents within the construction site and on access roads

268. *Economic Benefits.* There could be some short-term socio-economic benefits from the construction work if local people gain employment in the workforce. To ensure that these benefits are directed to local people, the Contractor should be required to employ as much of his labour force as possible from the local communities in the vicinity of construction sites. Drawing of majority of workforce from local communities will avoid problems that can occur if workers are imported, including social conflicts and issues of health and sanitation due to labour camps. If temporary labour camps are to be provided, Contractor should ensure that they are maintained well with proper water supply and sanitation facilities. In unavoidable case of sourcing labour from other areas, provide adequate housing facilities so that there are no impacts and conflict with the local people. Following measures shall be followed:

- Establish temporary labour camps in consultation with the local authority
- Construction camps shall be located away from water bodies
- No clearance of trees vegetation shall be allowed for establishment of camp

- Provide all basic amenities (water sanitation, waste collection & disposal, first aid facilities, etc.)
- Contractor shall provide fire wood and no worker shall be allowed to cut any tree
- Ensure regular and clean maintenance of the camp

E.12 Construction Camps

269. 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. The site for the work yard will be selected by the contractor in agreement with the Municipality, UWSCG and the supervisor.

270. 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);
- Sewage management plan for provision of sanitary latrines and proper sewage collection and disposal system to prevent pollution of watercourses or groundwater;
- 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 save distance to the water body. Such facilities will be bounded and provided with impermeable lining to contain spillage and prevent soil and water contamination.
- These plans will be approved by the Engineer prior to beginning of construction activities.

271. Prior to establishment of the work camp(s) the contractor shall conduct consultations with local authorities to identify sources of potable water for the workforce that will not compete with the needs of the local population. Potable water for the workforce shall comply with the national quality standards. Construction water should be sourced from the local water supply.

E.13Construction Related Impacts at the Quarrying Sites

272. 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

273. 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 MoENRP only on a basis of preliminary assessment (including limits and conditions for reinstatement). The Regional Services of the MoENRP and Environmental Inspectorate are in charge to control compliance of the quarrying company's performance. The role of the UWSCG within this plan should be to ensure timely and permanent involvement of the MoENRP in construction supervision.

274. The measures aimed on mitigation of the dust and emission impacts, as well as potential river contamination due to improper fuelling 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.14 Existing Asbestos Pips

275. At construction stage, according to the contract is considered the installation of newpipes in the whole area of the city. During excavation works of trenches it is possibleto damage as existing sewer pipe network, also other legally or illegally water supplypipes. A large part of the existing pipes contains asbestos and asbestos dust in caseof damage may occur, and which is very dangerous for health.

276. Best practice only requires the removal of asbestos cement pipe that is exposed and will be disturbed during repair or replacement activities.

277. When a section of asbestos cement pipe is being repaired or replaced, the remaining portions of that pipeline are not required to be removed, provided that they are not exposed by excavation activity.

278. Additionally, if a section of asbestos cement pipe that is being actively used (e.g., a utility conduit) is exposed by excavation but will not be impacted by the repair or replacement work, it may be left in place and backfilled.

Mitigation Measures

279. It is necessary to implement whole set of mitigation measures:

- Special training for the personnel of the contractor;
- Environmental specialist of the consulting company must develop a special procedure and present to the water company which will be used in the process of cutting of the trenches-in case of the connection with the existing Asbestos pipes;
- Environmental specialist of the contractor must attend the process of cutting of the trenches;
- In case of finding asbestos pipes, the excavator must stop working and cutting of the trenches must be continued by means of the blade;
- In case of the damage of Asbestos pipes the construction works must be stopped. Environmental specialist of the consulting company should be immediately informed about this and the fact should be written down by environmental specialist of the contractor; • Further works to be implemented only after issuance of the permission.

E.15Cumulative Impacts

280. On the territory of Marneuli, there are the following ongoing infrastructural projects or the ones planned in the near future:

- Improvement of Marneuli Water Supply System Sub-project;
- Improvement of Marneuli Wastewater System Sub-project
- Construction of new 500 kW Marneuli Substation;

281. Implementation of the first two projects is planned in the city of Marneuli and its adjacent area, while the construction of the new substation is planned east of Marneuli, 4 km from the city.

282. Marneuli Wastewater and Water Supply Systems sub-projects are considered as different sub-projects and within the scope of each of the sub-projects, two different tenders are planned to declare to select construction companies. Within the scope of the two sub-projects, the installation of the wastewater and water supply pipelines will be accomplished on the same territory of the city of Marneuli. Within the scope of the Water Supply System Improvement Sub-project, new water supply pipelines are planned to install and the failed pipelines are planned to replace, while within the scope of another sub-project, the new wastewater pipelines are planned to install and the failed pipelines are planned to replace. As per the technical documentation developed within the scope of both sub-projects, the water supply and wastewater pipelines are planned to install side by side. Consequently, if within the scope of these two sub-projects two different tenders are declared as it is planned, and the winning companies start installing the pipelines without agreeing with one another, this will mean that in the same streets first, one company will accomplish the planned activities, in particular, they will dig out the trenches, install the pipes, fill in the trenches and lay the asphalt, and after some tome, another company will do absolutely the same actions in the same streets.

283. A similar situation was observed in the city of Kutaisi, when two different companies accomplished the water supply and wastewater projects without any agreement with one another. Within the scope of the water supply sub-project in the city of Kutaisi, the paved roads were demolished in some streets of the city and water supply pipes were installed. Under the decision of the City Hall, in order to protect the area against the erosive processes, they laid a 16-mm-thick concrete layer in some streets. After some months, another sub-project to improve the wastewater system of Kutaisi started planning to demolish the laid concrete layer and install the relevant pipes.

284. Following the above-mentioned, aiming at avoiding the said risks, it is necessary to accomplish any of the options listed below:

- 1. Marneuli Water Supply and Wastewater System Sub-projects to be merged as a single lot and one tender is to be declared with one winning contractor.
- 2. Installation of the water supply and wastewater pipelines of both projects to be assigned as a separate lot, with the replacement of the outdated pipes and tender for it to be declared as an independent lot.
- 3. The contractors winning both sub-projects to develop the working schedule and submit it to Sakrebulo of the city of Marneuli and UWSCG.

285. The third infrastructural project being accomplished on the territory adjacent to Marneuli by "Georgian State Electrosystem" has already started. As already mentioned, the Project is being implemented 4 km east of the city of Marneuli. This sub-project will not coincide with the water supply or wastewater sub-projects and will not take place near the construction camps or construction sites. However, within the scope of the project accomplished in the field of power supply, the construction techniques move across the city of Marneuli. Consequently, all three projects have a cumulative impact due to the movement of the heavy techniques across the city of Marneuli.

286. Within the scope of each sub-project, as per the preliminary estimation, the movement of the heavy techniques along the streets of the city of Marneuli was considered as a high-risk impact. Consequently, the joint implementation of all three sub-projects in case of incorrect regulation, may complicate the traffic in the city of Marneuli or make it impossible.

287. Above all, within the scope of the water supply and wastewater sub-projects, the traffic in all streets of the city of Marneuli will be hampered or totally limited even though for a short time, but permanently.

288. As all three projects will be implemented under the financial assistance of Asian Development Bank, it is desirable to hire one more traffic safety specialist, who, together with a representative of the City Hall, will coordinate the regulation of this issue.

E. 16Climate Change Impact

289. The information related to the existing threats in respect of climate change in Marneuli Municipality was provided by the Georgian local self-governing national association. They evaluated this problem within the limits of the project financed by the USAID.

E.16. 1 Natural Threats

290. As the data of the above-stated group suggest, the natural threats in the Municipality include: intense rain, flood/flashflood, mudflow, drought and hail. Flood/flashflood, river-bank erosion and hail have been more frequent in recent year.

291. The workgroup has not provided any information about the areas damaged by the catastrophes. As per their information, the natural calamities of the recent years cause much damage to agriculture. In particular, the flood and hail in 2011-2012 damaged much harvest in many villages. For example, hail in the villages of Kutliari, Tamarisi, Tsereteli, Kulari and Akhali 265. Diokani damaged approximately 221 ha of the arable and sowing lands and 460 families. Most of them are in village Tamarisi (75 ha) and village Kulari (99 ha).

292. As per the information of the employees of the Municipality Board, the damage inflicted by hail in 2012 was 200 000 Gel, and damage caused by the flood in 2011 amounted to 100 000 Gel. In 2010, approximately 100 000 Gel was spent for bank reinforcement and cleaning works of Algeti banks. Marneuli Municipality has no catastrophe early warning system, and the entities responsible for reacting to emergencies are the State Commission and Rescue Service. As per the information of the Board, the Municipality has the Emergency Management Plan covering fire, drought and hail. The local authority (Rescue Service) has no sufficient resources to react to natural calamities.

E.16.2 Conclusions

293. Based on the analysis of the survey results of the employees of Marneuli Municipality Board, the vulnerability of Marneuli Municipality to the climate changes can be formed as follows:

294. Natural threats: the natural threats in Marneuli Municipality include: intense rain, flood/flashflood, mudflow, drought and hail. Flood/flashflood, river-bank erosion and hail have been more frequent in recent year. However, as it seems, the natural calamities are made more frequent due to the anthropogenic impact, such as destruction of the wind break belts, cutting down the forests, etc. As per the information of the employees of the Municipality Board, the damage inflicted by hail in 2012 was 200 000 Gel, and damage caused by the flood in 2011 amounted to 100 000 Gel. In 2010, approximately 100 000 Gel was spent for bank reinforcement and cleaning works of Algeti banks.

295. The expected climate changes in Marneuli Municipality are not assessed yet. However, following the general trends, we may consider that the climate changes in the future will further aggravate the above-listed issues and will make Marneuli Municipality more vulnerable to the natural threats.

296. **Agriculture:** at present, agriculture is a leading economic branch in Marneuli Municipality promoted by favorable climatic conditions, and water and soil resources. However, in recent years, the agricultural lands have been degraded mostly due to overgrazing; in addition, the washout of the river banks causes the loss of arable and sowing lands.

297. The analysis of the provided information evidences that the number of cattle owned by the people in the Municipality is not high if compared to the available hey-making and pasturing

resources in the region. However, the cattle-breeders experience the lack of hey-making meadows and pastures well evidenced by the erosion of the hey-making meadows and pastures due to overgrazing. As the locals state, the problem is aggravated by the increasing number of cattle driven to the summer pastures from other administrative units, as well (this is particularly true with sheep); however, the number of such cattle is not known to the Board. Despite this, the cattlebreeders do nothing to care of or maintain the hey-making meadows and pastures. In addition, the grazing rates are not developed for the pastures, i.e. no rates as to how much and how long the cattle must graze some or other pasture are fixed.

298. Agricultural service in the Municipality able to identify the problems in the field of agriculture and react to them is underdeveloped.

299. **Forest resources:** the forest resources in Marneuli Municipality are poor. The major problems with the forest resources are forest cutting, including illegal cutting and serious destruction of the wind break belts since the 1990s. In addition, virtually, no restoration or growing of forests is accomplished.

300. Water resources and water use: there are bulk of surface and underground waters in Marneuli Municipality; the water resources or their quality are not monitored. As the employees of the Municipality Board consider, the intensity of floods has reduced for the last 2 years, but the discharge of the rivers has increased during the floods. However, they have no objective proof of this.

301. The water resources in the Municipality are sufficient to fully meet the existing demand. However, the problem of water supply still exists in the Municipality (including the problem of drinking water) following the poor condition of water supply/irrigation systems. The water supply and irrigation systems need rehabilitation.

302. The settlements of the Municipality have no discharge water collecting and treatment structures what may cause the pollution of water resources.

303.Local government bodies: in the Municipality, certain activities of adaptation to the climatic changes are being accomplished. However, such activities are quite small-scaled and are mostly reactions, i.e. they are oriented in the elimination of the results. A number of preventive measures are undertaken in the Municipality: rehabilitation of the irrigation systems, rehabilitation of the water supply, etc. In order to mitigate the climate changes, the awareness of the methods to improve the waste management was improved. As a rule, the Board of the Municipality is not fully informed about the issues determining the sensitivity of the Municipality to the climate changes, as well as natural catastrophes, agriculture water resources, water supply and forest resources. This limits their possibility to analyze the expected threats and plan and realize preventive measures.

E. 16.3 GHG Emissions from Waste Water Systems

304. Wastewater can be a source of methane (CH₄) when treated or disposed anaerobically. It can also be a source of nitrous oxide (N₂O) emissions. Domestic wastewater is defined as wastewater from household water use, while industrial wastewater is from industrial practices only⁷.

305. Methane(CH₄) Wastewater as well as its sludge components can produce CH₄ if it degrades anaerobically. The extent of CH₄ production depends primarily on the quantity of degradable organic material in the wastewater, the temperature, and the type of treatment system. With increases in temperature, the rate of CH₄ production increases. This is especially important in uncontrolled systems and in warm climates as it is in Marneuli case. Below 15°C, significant CH₄

⁷Because the methodology is on a per person basis, emissions from commercial wastewater are estimated as part of domestic wastewater. To avoid confusion, the term municipal wastewater is not used in this text. Municipal wastewater is a mix of household, commercial and non-hazardous industrial wastewater, treated at wastewater treatment plants.

production is unlikely because methanogens are not active. However, when the temperature rises above 15 C⁰, CH₄ production is likely to resume. The principal factor in determining the CH₄ generation potential of wastewater is the amount of degradable organic material in the wastewater. Common parameters used to measure the organic component of the wastewater are the Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). Under the same conditions, wastewater with higher COD, or BOD concentrations will generally yield more CH₄ than wastewater with lower COD (or BOD) concentrations.

306. Nitrous oxide (N_2O) is associated with the degradation of nitrogen components in the wastewater, e.g., urea, nitrate and protein. Domestic wastewater includes human sewage mixed with other household wastewater, which can include effluent from shower drains, sink drains, washing machines, etc. After being processed, treated effluent is typically discharged to a receiving water environment. Direct emissions of N_2O may be generated during both nitrification and denitrification of the nitrogen present. Both processes can occur in the plant and in the water body that is receiving the effluent.

| Types of treatment and disposal | | | ment and disposal | CH ₄ and N ₂ O emission potentials |
|---------------------------------|-------|------------------------|--|--|
| | ated | River dischar | ge | Stagnant, oxygen-deficient rivers and lakes may allow for anaerobic decomposition to produce CH ₄ . Rivers, lakes and estuaries are likely |
| | itre | | | sources of N ₂ O. |
| | n | Sewers (close | ed and under ground) | Not a source of CH_4/N_2O . |
| | | Sewers (open) | | Stagnant, overloaded open collection sewers or ditches/canals are likely significant sources of CH ₄ . |
| | | | Centralized aerobic wastewater treatment plants | May produce limited CH ₄ from anaerobic pockets. |
| Collected | | | | Poorly designed or managed aerobic treatment systems produce CH ₄ . |
| | | | | Advanced plants with nutrient removal (nitrification and denitrification) are small but distinct sources of N ₂ O. |
| | eated | ment | Sludge anaerobic treatment in centralized aerobic wastewater treatment plant | Sludge may be a significant source of CH_4 if emitted CH_4 is not recovered and flared. |
| | μ | eati | Aerobic shallow ponds | Unlikely source of CH ₄ /N ₂ O. |
| | | Aerobic tr | | Poorly designed or managed aerobic systems produce CH ₄ . |
| | | | Anaerobic lagoons | Likely source of CH ₄ . Not a source of N ₂ O. |
| | | Anaerobic treatment | Anaerobic reactors | May be a significant source of CH_4 if emitted CH_4 is not recovered and flared. |

Table30: CH₄ AND N₂O EMISSION POTENTIALS FOR WASTEWATER AND SLUDGE TREATMENT AND DISCHARGE SYSTEMS
Wastewater Treatment

307. Wastewater treatment systems are designed to remove soluble organic matter, suspended solids, pathogenic organisms, and chemical contaminants in wastewaters before the water can be discharged into natural water systems. Wastewater treatment systems used to treat household wastewater and sewage are referred to as municipal wastewater treatment systems. Wastewater treatment systems used to treat wastewater generated at an industrial facility are referred to as industrial wastewater treatment systems.

308. When considering CO_2 emissions from wastewater treatment systems, there are two primary classes of biological treatment units: aerobic treatment units and anaerobic treatment units. Regardless of the type of biological treatment employed, the biochemical reactions are similar, with organic carbon compounds being oxidized to form new cells, CO_2 and/or CH_4 , and water. For those wastewatertreatment plants in the project towns with a capacity of over30,000 Population Equivalents (PE), the activated sludge technology with separateanaerobic sludge digestion is chosen. This technology was compared to alternativesin the feasibility study and determined to be the most feasible option.

E.16.4 Recommendations

313==09. For the purpose of adaptation to the climatic changes in the Municipality, the following measures are recommended:

- Restoration of the wind break belts (what was the priority of the self-government, too), what will reduce the impact of winds and promote the regulation of the temperature regime during high temperatures.
- Prevention of the erosion of hey-making meadows and pastures. This can be done by using several methods. First of all, the exact number of grazing cattle on some or other pastures is desirable to fix, and the fixed rates are to be observed. In addition, it is desirable to introduce alternating grazing mode; the number of heads of the introduced cattle must be identified and limited and the cattle-breeders must shift to partially troughfeeding (what will have its affect on the milk yield.
- Restoration of the eroded pastures. For this purpose, grass may be sown, grazing on the eroded sections must be limited, etc.
- Evaluation of the riverbed management methods to identify the most efficient methods to reduce the risks of the expected catastrophes.
- Obtaining the information about the volume of the inert material obtained from the rivers; fixing the facts of the riverbank washout and high-risk sites; submitting this information to the body issuing the license for mining the inert materials so that to review the available resources of the inert material and regulate the mining volumes as necessary. Managing the database about the natural threats and damage inflicted by them, as well as about the agriculture, water resources, forest resources and waste management to provide a full picture of the challenges to the Municipality and plan due responses.

F. Analysis of Alternatives

F.1 Sewage system

310. The sub-project comprises the rehabilitation and extension of an existing sewer system. The location of the WWTP and, consequently, the general layout was maintained and no alternative sewer layouts were investigated.

F.2 Wastewater Treatment Plant

311. Different treatment processes of the WWTP were compared. While the construction of the new WWTP will be tendered as design-build contract and the contractor will be responsible for the detailed design of the plant, in the following, different technical options for the treatment process were compared and a rough preliminary design was presented. The new WWTP will remove the carbon compounds and also nutrients and phosphorus contained in the wastewater to the greatest possible extent. For this purpose, a number of different wastewater treatment processes applied in various WWTPs across the globe, adapted to the particular conditions of each site and wastewater quality are known. Examples are the activated sludge and biofilm process or the membrane technology.

312. The membrane technology, the bio filtration and the anaerobic process are sophisticated wastewater treatment processes that require much experience in the design and in the construction of the plants. Particularly the operation of such systems demands a highly qualified and experienced work force in order to ensure the proper treatment of the wastewater.

313. Other treatment alternatives are the activated sludge (aeration) and the biofilm process (trickling filter). These treatment methods have been successfully applied for many decades and in many countries of the world. These two processes have a good treatment performance and a high buffer capacity with regard to the wastewater quality as well as the wastewater inflow quantities. Furthermore, the treatment process is easy to operate and monitor. Most maintenance works can be carried out by the staff of the wastewater treatment plant. For these reasons, the aeration and biofilm processes were chosen for a more detailed comparison of technical options. In order to determine the most feasible option for the WWTP the following three alternatives of the aeration and biofilm process were investigated and compared in technical and financial terms:

- Aeration tank with secondary sedimentation
- Sequencing-Batch-Reactor(SBR) process
- Trickling filter (biofilm process)

314. Dimension of each alternative was based on the design criteria and the allowable effluent quality. As a result, the aeration system with the secondary sedimentation was considered the most economical solution for the WWTP Marneuli. In the table 21 you can see the dimension of each alternative was based on the design criteria and the allowable effluent quality. As a result, the aeration system with the secondary sedimentation was considered the most economical solution for the WWTP Marneuli.

Table 31: Design Criteria and the Allowable Effluent Quality

| | Financial Aspects | | Environmental Aspects | | | |
|--|----------------------|-----------|--------------------------------------|---------------------|------|--|
| Technology | Investment | O&M-costs | Effluent Quality / Operability | Land Requirement | Odor | |
| Aeration Tank with Secondary Sedimentation | + | + | ++ | 0 | + | |
| SBR | - | - | 0 | + | + | |
| Trickling Filter | 0 | + | + | + | 0 | |

315. Two possible options of WWTP location were discussed. The two proposed areas are located at the left bank of the river Algeti, 500-600 m. Away from each other (picture12).

316. Therefore, several background indicators (such as geology, hydrology, flora, fauna) will be adequate for using both territories. Such results were obtained during background (noise, radiation, water quality) measuring phase.

317. In case of using the first option, no trees shall be cut, as there are no plantations under the construction zone.

318. On the other hand, the business facilities located under the surrounding areas shall be affected significantly in case of using the first option, particularly a restaurant

319. Therefore, after analyzing both - environmental and social issues, option #2 is preferable.



Figure 12.WWTP locations alternatives

G. Information Disclosure, Consultation, and Participation

320. Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others that are identified during project implementation will be brought into the process in the future. Stakeholders of this project include:

- People who live, and work near construction sites of facilities in Marneuli
- UWSCG as implementing agency
- Other government regulatory institutions
- Municipality of Marneuli
- NGOs and CBOs working in the affected communities;
- Other community representatives (prominent citizens, religious leaders, elders, women's groups);
- The beneficiary community in Marneuli in general; and
- The ADB, as funding agency

321. Stakeholder consultation and participation was an important process in the preparation of this IEE. The process engaging stakeholders and affected people during theconduct of the IEE included joint sites visits of IA, design and supervising consultants, onsite discussions with local population and public hearings. Fig. 14 and 13 below shows the picture of consultation with owner of the restoran and restorant workers.

Figure 13 and 14: Meeting with the restorant owner and workers



322. At the stage of developing the IEE document, a number of meetings were held with the representatives of Marneuli water company to consider theelements of the Project design and actions to be accomplished in the field of environmental protection (Figure 14 and 15).

323. The Public Hearing was held on April 23, 2015 in Marneuli City Hall and commenced at 14:00. The Public Hearings was organized with representatives from the local government of Marneuli, local population and representatives of UWSCG and Design Company Kocks.

324. This IEE Report in Georgian language will be distributed to the interested public. Report will be available for review in Tbilisi (at UWSCG Head Office), and Marneuli (at UWSCG Service Centre and the Town Hall). It will also be disclosed to public by making it available on websites of UWSCG, MoRDI and ADB, together with the IEEs prepared for the other subprojects.

Figure 16and15: Meeting with Marneuli UWSCG's representatives



325. By giving advertisements in advance at Marneuli Service Centre, attendance of a wide range of related people to the meetings was encouraged. During the public hearing, citizens were informed about the activities to be carried out within the scope of the Marneuli sub-project, The following topics were discussed during the meeting:

- project context and rationale
- expected start and end of the project
- benefits of the project to local population and to the country as a whole
- the environmental issues and mitigated measures related to the project

326. Local residents and the representatives of UWSCG held discussions about particular issues during the meeting. The Minutes of the Meeting is presented in Annex 1.

327. During public consultation the main issue raised by local population was employment. To solve this problem have got desition toput in the contract contructors resposobilities at workers hiring stage in case similar qualification to give priority local representatives.

H. Grievance Redress Mechanism

328. For the effective implementation of a GRM system under the USIIP, UWSCG issued special order (#122) on 30 April 2014. The "Establishment of GRM within the Framework of the Asian Development Bank Funded Projects" signed by the head of UWSCG gives clear instructions to every involved stakeholder how to act when affected people are impacted by the project.

329. After issuance of the special order, a GRM was first set up by UWSCG in Marneuli under the REG-01 project of USIIP. The GRM allows affected people to appeal any disagreeable decision, practice or activity arising from project implementation.

330. Any affected person can apply at a UWSCG **<u>local service centre</u>** through different ways, either by going to the service centre, sending a letter to the service centre, or calling a hotline. The operators of the service centre can respond by going directly to the affected person if they are disabled to get the written grievance from them.

331. GRM in Marneuli will operate in three stages:

332. During the **first stage**, complaints are discussed within two weeks of being received by the local service centre of UWSCG (e.g. Marneuli office), based on the verbal or written complaint. In the first stage of grievance review and resolution, an authorized representative of the local service centre is responsible for ensuring the registration of the claim and its further processing. He/she engages in the grievance review and resolution process representatives (managers and environmental specialists) of Construction and Supervision Companies, and the representatives of UWSCG central office as required. At the local service centre, the affected person is provided with a queue number and then registers the grievance at the service desk.

333. The service centre operators, who are trained⁸ in USIIP/Reg-01project, register all relevant grievances with support of an <u>online task management system</u>, which tracks information on the grievance review process and the responsible person. Moreover, the operators fill the ADB complaints log with the registered grievance that coincides with local internal forms. This **electronic intranet system**⁹ allows the UWSCG Tbilisi Office to immediately see claims. Therefore, claims submitted to any regional service centre can be monitored by the Head of the Investment Projects Management Office (IPMO), as well as the Head of the Environmental and Resettlement Division, Maka Goderdzishvili.

334. When a grievance is solved positively in the first stage, the grievance is closed through an Agreement Protocol, which is reflected in the Document – Task Management System.

335. The grievance enters a **second stage** if it is not solved. In that case, the authorized representative of the local service centre will help the claimant prepare a package of grievance

⁸ UWSCG and Supervision Consultant (Eptisa) conducted trainings for service center operators covering general procedures of GRM functioning in order to ensure proper coordination of different departments.

⁹The **eDocument - Task Management System** was developed by LEPL Financial-Analytical Service of the Ministry of Finance of Georgia. It is an innovative electronic document and task management mechanism for electronically processing of documents. Used by almost all the major budgetary organizations in Georgia, the eDocumentservice offers an opportunity to manage, find, and trackdocuments for information-intensive organizations. The system significantly simplifies the process of organizing and managing documents, tasks, information and processes. It thereby enables State companies, organizations and agencies to increase their efficiency and productivity. The many benefits of the eDocument service include: a) significant saving of time; b) effective management of tasks; c) flexible installation procedures; d) synchronized with MS Office; e) control of tasks implementation process; f) group working opportunities on assignments; g) automatic scanning; h) high quality security; i) electronic signature and electronic conformation; k) control of various versions of documents; and j) control of accomplished and uncompleted documents.*eDocument service is used by almost all the major budgetary organizations in Georgia.*

application documents for official submission to the Grievance Redress Committee (GRC). The package contains the following information:

- Name, ID, address and contact details of the claimant
- Description of the essence of the complaint
- Supporting documents and evidences (photos, maps, drawings/sketches, conclusion of experts or any other documents confirming the claim)
- Brief description of the actions proposed for the grievance resolution at the first stage and the reasons why these actions were denied
- Minutes of meetings conducted at the first stage

336.The GRC should make a decision within two weeks after the registration of the grievance. The GRC is staffed as follows: (i) Representative of self-government – the head of committee; (ii) Director/ Manager of UWSCG service centre; (iii) Investments Project Management Division representative of the company; (iv) Representative of local authoritative NGO (according to the claim reference); (v) Stakeholders' female representative;(vi) Stakeholders' informal representative; and (vii) Heads of local municipalities.

337. The GRC will review the package of grievance documents, set a date for a meeting with the claimant, discuss the claim at the meeting, and set up a plan for further actions (actions, responsible persons, schedule etc.). Upon the resolution of the case, the GRC will prepare a brief resume and protocol and the protocol signed by complainant and all parties will be registered in a grievance log.

338. There is a **third stage** in case there is a failure to resolve the grievance. In this case, GRC will help the claimant to prepare the documents for submission to the Rayon (municipal) court. They can also apply to ADB at the address below:

Complaints Receiving Officer, Accountability Mechanism Asian Development Bank Headquarters 6 ADB Avenue, Mandaluyong City 1550, Philippines Email: amcro@adb.org, Fax +63-2-636-2086

339. **Public awareness:** Affected people will be fully informed of their rights and of the procedures for addressing complaints, whether verbally or in writing, during comprehensive public awareness activities (door-to-door campaign, consultation meetings and media campaign) to be carried out by the supervision consultant and UWSCG/DREP/PR Division.

I. Environmental Management Plan

I.1 Introduction

240.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 laws of the country 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 changes in the actions required.

341. 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.

I.2 Environmental Impacts, Mitigation and Monitoring Plans

242. The environmental impacts associated with Tranches 1 and 2 projects - the Development Program, have been detailed above in the relevant sections of this EIA. Mitigation measures required to address the impacts identified in the EIA have been summarized in each of the relevant sections covering the physical, biological and socio-economic environment affected by the project. The impacts identified and the specific mitigation measures proposed to address them have been consolidated into the **environmental mitigation plan** presented in Table 33, which includes time frames, responsibilities and where applicable, estimated costs for each measure.

343. The environmental mitigation plan includes a number of standalone construction-related management plans on: health and safety; waste; sewage; soil (including topsoil and vegetation); site drainage; traffic control; noise; air pollution; dust and cultural/archeological finds. In addition, it specifies the need for the Contractor to provide method statements on spillage control and the location of fuel storage, filling stations and vehicle washing sites to be provided to ARS for approval.

344. An **environmental monitoring plan** is presented in table 34 which outlines the activities and responsibilities associated with monitoring the effectiveness of the proposed mitigation plan and ensuring compliance with the recommendations of the EIA.

I.3Implementation Arrangements and Responsibilities

345. The main institutions that will be involved in implementation of the EMP are **UWSCG** the program executing agency (EA), the Design and Supervision Consultant (DSC) theContractor and to a lesser extent the Ministry of Ecology and Natural Resources (MENR).

346. A Project Implementation Unit (PIU) established within UWSCG will be responsible for the day to day management of the project including implementation of the EMP. The PIU currently has one Safeguards Specialist who is responsible for management of the environmental and social aspects associated with development of **all donor funded water sector projects for which** is the responsible Executing Agency (EA).

347. The PIU (Safeguards Specialist) responsibilities in respect of implementation of the EMP are as follows:

(i) Ensure that all relevant EMP requirements (including environmental designs and mitigation measures) are duly incorporated into the project bidding documents.

- (ii) Obtain necessary permits and/or clearance, as required, from MENR and other relevant government agencies, ensuring that all necessary regulatory clearances are obtained before commencing any civil work on the project.
- (iii) Ensure that contractors have access to the EMP and EIA report.
- (iv) 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.
- (v) Approve the Site Specific Environmental Management Plan (SEMP) before Contractor takes possession of construction site
- (vi) Monitor the contractor's implementation of the EMP in accordance with the environmental monitoring plan.
- (vii) Submit six monthly Environmental Monitoring Reports to ADB.
- (viii) In case unpredicted environmental impacts occur during the project implementation, prepare and implement as necessary an environmental emergency program in consultation with MENR, any other relevant government agencies, and ADB.

348. The **DSC** will include a part time international environmental specialist and fulltime site-based national environmental specialist to assist the PIU supervise and monitor implementation of the EMP during construction.

349. A Non Compliance Notice will be issued to the contractor if the DSC 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 DSC. Non-compliance will be ranked according to the following criteria:

- 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.
- 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.
- 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.

350. 351. 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).

352. 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 project

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

- (i) Preparing the site specific environmental management plan (SEMP) for approval by the Employer (PIU) prior to the Contractors taking possession of the construction site (see below)
- (ii) Ensuring the SEMPis 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)
- (iv) Establishing and maintaining site records of:
 - weekly site inspections using checklists based on SEMP,

- environmental accidents/incidents including resolution activities
- environmental monitoring data,
- non-compliance notifications issued by the DSC
- Corrective action plans issued to the DSC in response to non-compliance notices.
- Community relations activities including maintaining complaints register
- Monitoring reports
- Routine reporting of SEMP compliance and community liaison activities (see below).
- Adhoc reporting to the Employer's Engineer of environmental incidents/spillages including actions taken to resolve issues

I.4 Site Specific Environmental Management Plan (SEMP)

354.Following the award of the contract and prior to construction commencing the Contractor will review the EMP and develop this into a detailed Site Specific Environmental Management Plan (SEMP) that amplifies the conditions established in the EMP that are specific for the site and the tasks involved. 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 site activities. This information will be presented on a series of site plans covering the whole project site showing all environmental management requirements for all activities in the construction phase. Site plans will include:

- (i) Indication of North and scale
- (ii) Existing and planned supporting infrastructure (e.g., access roads, water supplies, and electricity supplies)
- (iii) Location of planned work (ROW/alignment, camp layout)
- (iv) Contours (as applicable)
- (v) Drainage systems
- (vi) Locations of sensitive receptors and environmental values

355. 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 XXXX PIU for approval at least 10 days before taking possession of any work site.

I.4 Site Induction

356. Following approval of the SEMP by the UWSCG PIU, the Contractor will be required to attend a site induction meeting with the DSC'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 DSC's International Environmental Specialist advises the DSC Team Leader that the Contractor is now cleared to take possession of the Site and may commence moving equipment to the Site.

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

Reporting

358. The Contractor will prepare a monthly concise report (Maximum 3 pages and appendices, if required) in respect of compliance with EMP/SEMP requirements that will be submitted to the PIU through the DSC. The report will contain the following sections.

- (i) Details of any environmental incidents
- (ii) Status of all non-conformance identified during audits and inspections that are identified by non compliance notices.
- (iii) Complaints from the public and proactive community relations activities
- (iv) Monthly Accident Report
- (v) Waste volumes, types and disposal

- (vi) Details of any contaminated areas that have been identified and rehabilitated.
- (vii) Details of any archaeological discoveries.
- (viii) Details of any ecological issues.
- (ix) Other relevant environmental issues.
- 359. The Contractor will have a duty to immediately report to the Engineer if any serious environmental breach has occurred during construction e.g. clearing of sensitive areas, serious oil spills etc.

360.**ADBs responsibilities** in regard to implementation of environmental safeguards requirements for the project include: undertaking periodic monitoring of the EMP implementation and due diligence as part of an overall project review mission; and if required, provide advice to constructon company in carrying out its responsibilities to implement the EMP for the project.

I.6 Implementation Costs

361. The Costs for Environmental Management of the project shall mainly consist of the (i) monitoring of works by the EMS who will be employed by the SC; (ii) baseline and regular parametric measurements of noise, dust and emission (water quality testing may not be needed unless water supply sources will be affected by the construction works). All of the implementation of mitigation measures shall be part of the contractual works and obligation of the Contractor.

362. The cost for the environmental management for construction period is tentatively estimated.

| Item | Quantity 10 | Unit Cost | Total Cost | Remarks |
|--|----------------|-----------|------------|---|
| Baseline Parametric Measurements | 6 | 200 USD | 1,200 | To be conducted by the Contractor for air emissions, dust, vibratio measurements |
| Monthly Parametric Measurements (at least 3 sites)Noise, dust, vibration. | 108 | 200 USD | 21 600 | Tests to be conducted by the Contractor at 3 sites x 36 months monthly monitoring. Noise, dust and vibration should be monitored on the regular bases as well as during the peak operation of Construction Equipment and Machinery. |
| Environmental Management Specialist (SC) | 36 months | 2,500 USD | 90.000 | The costs are included in the contract signed between UWSCG and SC and no additional costs will occur. |

Table 32: Environmental Management Cost

¹⁰To be established by CS Consultant and international environmental specialist.

| Item | Quantity 10 | Unit Cost | Total Cost | Remarks |
|--|----------------------------|--------------|------------|--|
| Environmental specialist (Contractor) | 36 month | 1500 USD | 54.000 | The costs will be included in the contract signed between UWSCG and Contractor. |
| E&HS Trainings | 36 (on monthly dase) | 500 USD | 15300 USD | Training should be conducted for all persons involved in construction process |
| Study of the landslide-prone areas and buildings and premises on the adjacent territories | 1 | 15000 | 15000 | Study should be conducted before construction activities started. |
| Traffic Specialist | 12 month | 2.500 | 30.000 | Specialist will be hired in scope of three projects took place in Marneuli at the same time and will prepare pln for the traffic management |
| Construction dust and noise temporary barriers | 1 | 10000 USD | 100.00 | To be installed by Contractor at the WWTP construction site |
| Miscellaneous | | | 31680 | 10% for above Items |
| Subtotal | | | 348480.00 | Total for above |

| Potential Negative Impacts | Mitigation measures | Responsibil ity | Location | Cost |
|---|--|--|--------------------------|---------------------------------|
| Pre-Construction | | | | Part of Construction Cost |
| Biological study of the project area | Prior to start construction activities, construction contractor should carry out the biological study of the project area. Results of the work submitted for consideration UWSCG. | Env. Specialist of the contractor | WWTP area | 6 000 USD |
| Preparation of "Inert Waste Management Plan" | Prior to start construction activities, construction contractor should choose the areas for disposal inert waste and prepare "Inert waste management plan". Prepared plan should be submitted to UWSCG for approval. | Env. Specialist of the contractor | WWTP area; WW network | Included in Project price |
| SSEMP | Prior to start construction activities, construction contractor should prepare SSEMP and submit toSC for endorcemnet and to UWSCG for approval. | Env. Specialist of the contractor | Project Area | Included in Project price |
| Preparation of "Noise Management Plan" | Prior to startconstruction activities construction contractor should prepare Noice SSEMP for city Marneuli. Prepared plan should be submitted to SC for endorcemnet and to UWSCG for approval. | Env. Specialist of the contractor | City Marneuli | Included in Project price |
| Possible removal of Terrestrial habitat. Loss of the top soil | If at the stage of the detailed biological study, there are rare or red-listed species are fixed in the project area, the Construction Contractor is obliged to: Replant the rare or red-listed species found in the Project area and return them to their original site after the completion of the Project. Attempt to avoid cutting down the trees in the Project zone (by considering the Project alternatives). | Env. Specialist of the contractor | WWTP | Part of construction cost |

| Potential Negative Impacts | Mitigation measures | Responsibil ity | Location | Cost |
|---|---|--|---|---------------------------------|
| | • Develop a compensatory planting plan and submit it to the relevant bodies for approval, if it is unavoidable to cut down the trees. | | | |
| Social Issues | Put in the contract contructors resposobilities at workers hiring stage in case similar qualification to give priority local representatives. | CS | Contract documents | Project prise |
| Construction | | | | |
| Ambient Air and Local Dust ¹¹ | Cover or damp down by water spray on the excavated mounds of soil to control dust generation; Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process; Bring the material (aggregate and sand) as and when required; Ensure speedy completion of work and proper site clearance after completion; Damp down unsatisfied /bad condition roads to avoid dust generation while using for transport of waste/material Use tarpaulins to cover loose material that is transported to and from the site by truck Control dust generation while unloading the loose material (particularly aggregate and sand) at the site by sprinkling water/unloading inside barricaded area Clean wheels and undercarriage of haul trucks prior to leaving construction site Don't allow access in the work area except workers to limit soil disturbance and prevent access by fencing | Env. Specialist of the contractor | Excavation areas for trenches at Marneuli town and WWTP construction area | Part of construction cost |
| | The Contractor shall coordinate with local Traffic Management Department to minimize construction traffic impact in the following topics: Temporary parking restrictions, | Env. Specialist of the contractor | Transportation routes of construction materials | Part of construction cost |

¹¹Environmental 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 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

| Potential Negative Impacts | Mitigation measures | Responsibil ity | Location | Cost |
|--|--|--|--|---------------------------------|
| | Pedestrian and cyclist diversion routes where construction prevents access, Temporary traffic signals, One way scheme, Maintaining local residential access at all times, General traffic diversion routes where roads are closed. Sound barriers should be erected at schools and hospitals if the distance to the construction site is less than 50 m | | | |
| Noise Pollution ¹² | Ner sensitive receptors contractor construction company shall execute construction works during non-labor days To use portable noise screens (barriers) that will be disposed on both sides of the construction technics, 2.– 2.5 m. away, in such way to protect direct sound emission to the medical center Maintain machinery and vehicle silencer units to minimize noise Keeps noise generating activities associated with construction activities to a minimum and within working hours. Notify the residents of Marneuli town close to the Project area prior to commencement of the construction phase. Vehicles and machinery that are used intermittently should not be left idling condition for long period of time. Equipment used on site will be quietest reasonably available. Haul routes for construction traffic entering and leaving the site will be selected to ensure noise levels at noise sensitive receptors are kept at a minimum. | Env. Specialist of the contractor | Excavation areas for trenches at Marneulii town and WWTP construction area | Part of construction cost |
| Impact on surface water bodies due to construction ¹³ | In case of heavy rain, protect open trenches from entry of rain water by raising earthen bunds with excavated soil Confine construction area including the material storage (sand and aggregate) so that runoff from upland areas will not enter the site Ensure that drains are not blocked with excavated soil | Env. Specialist of the contractor | Project area | Part of construction cost |
| Soil Contamination | • The contractors will be required to instruct and train their workforce in the storage and handling of materials and chemicals that can potentially cause soil contamination. | Env. Specialist of the | Construction site | Part of construction |

 ¹²The Georgian standards for noise control as approved by the Decree of the Minister for Health, Labour and Social Affairs (297n of August 16, 2001) upon the 'Approval of Environmental Quality Standards', which specify the tolerable and maximum admissible levels of noise for different zones
 ¹³Rules of the Protection of the Surface Waters of Georgia from Pollution

| Potential Negative Impacts | Mitigation measures | Responsibil ity | Location | Cost |
|-------------------------------|--|--|-----------------------------------|---------------------------------|
| | Solid waste generated during construction and at campsites will be properly treated and safely disposed of only in demarcated waste disposal sites. Construction chemicals will be managed property Clearly labelling all dangerous products, Fuel tanks (diesel or oil) should be placed in a concrete pool which its perimeter walls will be at least 1.0 m high with the concrete or plastered masonry wall, A proper floor drain should be installed on the slab of the concrete pool for safely discharging the leakages. | contractor | Camp | cost |
| Impact on Flora and Fauna | Avoid tree cutting In unavoidable cases, plant two trees of same species for each tree that is cut for construction The trench shall not be kept open in the night/after working hours. This will avoid any safety risk to people, domesticated, stray or wild animals. The Contractor shall ensure that the work site be kept clean, tidy and free of rubbish that would attract animals. | Env. Specialist of the contractor | Construction sate | Part of construction cost |
| Impact on Traffic | Informing all residents and businesses about the nature and duration of any work well in advance so that they can make necessary preparations if necessary; Providing wooden walkways/planks across trenches for pedestrians and metal sheets where vehicle access is required Increasing workforce to complete the work in minimum time in these stretches Initial situation of private properties has to be re-established after construction | Env. Specialist of the contractor | Construction site | Part of construction cost |
| Hazardous Materials | Comply with all national, regional and local legislation with regard to the storage, transport, use and disposal of petroleum, chemical, harmful and hazardous substances and materials. Establish an emergency procedure for dealing with spills or releases of petroleum. Storage of all hazardous material to be safe, tamper proof and under strict control. Petroleum, chemical, harmful and hazardous waste throughout | Env. Specialist of the contractor | Construction site Storage Area | Part of construction cost |

| Potential Negative Impacts | Mitigation measures | Responsibil ity | Location | Cost |
|--|--|--|--|---------------------------------|
| | the site must be stored in appropriate, well maintained containers.Any accidental chemical / fuel spills to be corrected immediately. | | | |
| Solid Waste | 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. 2. | Env. Specialist of the contractor | Project area | Part of construction cost |
| | The personnel involved in the handling of hazardous and non- hazardous waste will undergo specific training in: | | Storage Area | |
| | Waste handling Waste treatment; and Waste storage. | | Construction camp | |
| Loss of top soil | • Top soil of about 1 ft depth (0.3 m) shall be removed and stored separately during excavation work, and after pipeline construction the same soil shall be replaced on the top. | Env. Specialist of the contractor | Pipeline work in pasture lands, agricultural land, | Part of construction cost |
| Erosion due to excavation/refilling | Ensure proper compaction of refilled soil and there shall not be any loose soil particles on the top; the material shall be refilled in layers and compacted properly layer by layer. In the steep slopes, local grass species shall be planted on the refilled trenches. | Env. Specialist of the contractor | All construction sites | Part of construction cost |
| Impact on air quality due to emissions from construction equipment/vehicles | Ensure that all equipment & vehicles used for construction activity are in good condition and are well maintained Ensure that all equipment & vehicles confirms to emission and noise norms | Env. Specialist of the contractor | Marneuli town, WWTP construction area | Part of construction cost |
| Socio-economic benefits from employing local people in construction work | To the extent possible labour force should be drawn from the local community | Env. Specialist of the contractor | All construction sites | Part of construction cost |

| Potential Negative Impacts | Mitigation measures | Responsibil ity | Location | Cost |
|---|---|--|---------------------------|---------------------------------|
| Impacts due to import of labour and establishment of temporary labour camps | In unavoidable case of sourcing labour from other areas, provide adequate housing facilities so that there are no impacts and conflict with the local people: Establish temporary labour camps in consultation with the local authority Shall be located away from water bodies No clearance of trees vegetation shall be allowed for establishment of camp Provide all basic amenities (water supply and sanitation, waste collection & disposal, first aid facilities, etc.) Contractor shall provide fire wood and no worker shall be allowed to cut any tree Ensure regular and clean maintenance of the camp | Env. Specialist of the contractor | Temporary labour camps | Part of construction cost |
| Safety risk – public and worker | Follow standard and safe procedures for all activities – such as provision of shoring in deep trenches (>2 m) Exclude public from the site – enclose construction area, provide warning and sign boards, security personnel Provide adequate lighting to avoid accidents Ensure that all workers are provided with and use appropriate Personal Protective Equipment - helmets, hand gloves, boots, masks, safety belts (while working at heights etc.); Maintain accidents records and report regularly Trench construction shall be taken up in small segments, so that work (excavation, pipe laying and refilling) in each segment is completed in a day. No trenches shall be kept open in the night/after work hours. | Env. Specialist of the contractor | All construction sites | Part of construction cost |
| Historical, archaeological chance finds during excavation | Contractor shall 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. This should involve: Having excavation observed by a person with archaeological field training; 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 to ensure its removal or protection in situ. | Env. Specialist of the contractor | All construction sites | Part of construction cost |

| Potential Negative Impacts | Mitigation measures | Responsibil ity | Location | Cost |
|--|---|--|--|---------------------------------|
| Cumulative impacts – repeated disturbance to roads and people | Schedule the construction activities in harmony with the other on- going works Schedule works before road work | Env. Specialist of the contractor | Works on waste water supply network in the town | Part of construction cost |
| Climate Change | Restoration of the wind break belts in the area adjacent to the Project zone what will reduce the soil erosion potential and will help regulate the temperature regime during the high air temperatures; Extend river protection works by erection double gabion walls as currently been contracted at the opposite edge of the future WWTP location; This would be the most efficient measure to avoid gushing of water in WWTP land during floods; | Env. Specialist of the contractor | Construction area | Part of construction cost |
| | Operation Phase | | | |
| risk of accidental release of untreated wastewater at the WWTP | As far as operation failure of STPs are concerned, there should be provisions for zero tolerance on failures during operations. During normal operations once the processes are stabilized, one can't foresee a longer failure of operations, and the failures are largely due to failure of mechanical or electrical parts, which can be rectified very easily. And most of the instances, such failures not necessarily brings down full operation (e.g. failure of one aerator, or a pump), as there is always sufficient standby built in STP design. For this purpose, there has to be 100% power back-up, and sufficient spare parts to rectify any such failures within shortest possible time. The same has been included in the design of STPs. Since these STPs are being bid out on design-build-operate basis, the operator will have responsibility to operate and maintain the STP to meet the discharge standards. It is also proposed to procure routine spare parts, and any additional spare parts (that bidder will propose in his bid) before commissioning of STP as a part of construction cost, which will be financed from the loan. Before operation Phase will be started the "Emergency plan" Should be proposed. | UWSCG | Well fields, water network | Part of operating costs |
| | provision of dual power supply; spare parts for key components; regular inspection and proper maintenance of the WWTP; automated on-line, real-time monitoring of influent and | | | |

| Potential Negative Impacts | Mitigation measures | Responsibil ity | Location | Cost |
|--|--|--------------------|--------------------------------|----------------------------|
| | effluent quality; 4. | | | |
| Foul Odor Off-site Migration from WWTP | close monitoring of the aerobic units to ensure the conditions are not anoxic(without enough oxygen), landscaping with trees and shrubs around the facility shall be done to position them as wind breaks, and conduct of WWTP"s annual odor audit to identify operational measures that can prevent odor problems | UWSCG | WWTP | Part of operating costs |
| Disturbance/ nuisance/ noise due to operation activity | Consulting company has to define the noise level and its spreading area generated at the stage of WWTP operation; Additional changes will have to be included in the design if required and also noise reducing barriers will have to be arranged | UWSCG | pumping stations, WWTP area | Part of operation costs |
| land pollutioncause from sludgedispose | Plan for Sewage sludge disposal on the dump site has to be prepared before starting the operation. The plan has to be agreed with the Ministry of Environment and natural resources of Georgia and also waste management company. | UWSCG | Marneuli Municipal Landfill | Part of operation costs |

I.5 Monitoring

362. Monitoring describes (a) monitoring measures with technical details, including parameters to be measured, methods to be used, sampling locations that will signal the need for corrective actions; and (b) monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures and document the progress and results of mitigation.All parameters (Water quality, noise) should be monitored against standards.

363. A program of monitoring will be required to ensure that all concerned agencies take the specified action to provide the required mitigation, to assess whether the action has adequately protected the environment, and to determine whether any additional measures may be necessary. Regular monitoring of implementation measures by Civil Contractors will be conducted by the SC, on behalf of Implementing Agency. Monitoring during operation stage will be conducted by the UWSCG.

364. Most of the mitigation measures are fairly standard methods of minimizing disturbance from building in urban areas (maintaining access, planning work to minimize public inconvenience and traffic disruptions, finding uses for waste material, etc). Monitoring of such measures normally involves making observations in the course of site visits, although some require more formal checking of records and other aspects. The regular control and inspection during general construction activities in Marneuli is needed.

Table 34: Environmental Monitoring Plan for general construction activities in Marneuli

| Item | Parameter | Frequency | Action Level | Response When | Responsibility | | | | | |
|--|----------------------|---|--|---|----------------|--|--|--|--|--|
| Ш. | | III. | | Action Level Exceeded | | | | | | |
| | Pre construction | | | | | | | | | |
| Tender documentation | Environmental Issues | Once before bid announcement | Environmental audit of bidding documents to ensure relevant sections of the EMP have been included | The bidding document shall reflect all environmental mitigation measurements | SC | | | | | |
| Contract documentation with constriction contractor | Environmental Issues | Once before contract signature | Environmental audit of contract documents to ensure relevant sections of the SSEMP have been included | The contract document shall reflect all environmental mitigation measurements | SC | | | | | |
| Contract documentation with construction contractor | Environmental Issues | Once before contract signature | Environmental audit of contract documents to ensure relevant sections of Noice SSEMP for city Marneuli have been included. | The contract document shall reflect all environmental mitigation measurements | SC | | | | | |
| Contract documentation with construction contractor | Social Issues | Once before contract with construction company signed | Ensure relevant section of contructors resposobilities to hire local population have been included in contract. | 50 % of workers shoul be hired from local population. | SC | | | | | |
| Construction company prepared all necessary environmental management plans and conducted all requested investigations | Environmental Issues | Once before contract signature | Environmental audit of the environmental plans prepared by construction contractor | All environmental plans were prepared and approved by relevant organizations. | SC | | | | | |
| Construction | | | | | | | | | | |
| Ambient Air | Dust | Continual | Visual assessment during the Works | If dust levels are above acceptable visual levels,Simplement dust suppression | SC | | | | | |
| | | | Impact Monitoring | techniques (wetting down area) and/or assess weather | | | | | | |

| Item | Parameter | Frequency | Action Level | Response When | Responsibility |
|-----------|-----------------------------|---|---|---|----------------|
| н. | | ш. | | Action Level Exceeded | |
| | | | Compliance Monitoring | conditions and maybe temporarily cease works until conditions ease | |
| Noise | (15 minute) Noise Levels | Monthly Periodic attended Monitoring at hourlyintervals at nearestpotentially sensitivereceivers (shools, hospitals). | 55 dBA in residential areas; 70 dBA in industrial areas | If noise action level is exceeded then review workpractices and noisecontrol procedures, including maintenance of equipment, installation of silencers, provision of noise barriers and modification of workhours. | SC |
| Dust | Dust Levels | Dally (At the nearest receptors.) Dust should be monitored on the regular bases as well as during the peak operation of Construction Equipment and Machinery | Measurement | The surrounding areaPermanently must watering | SC |
| Vibration | Vibration Level | Vibration should be monitored on the regular bases as well as during the peak operation of Construction Equipment and | Measurement (The vibrations must be within the national legislation's requirements ¹⁴) | If vibration action level is exceeded then review work practices and vibration control procedures, | SC |

¹⁴ Degree #397 /n "om Approval of Environmental Quality Norms"

| Item | Parameter | Frequency | Action Level | Response When | Responsibility |
|-------------------------------------|--|--|--|--|----------------|
| н. | | III. | | Action Level Exceeded | |
| | | Machinery | | | |
| Water Quality | Quality/ Contaminant concentrates | Continue In rain weather after 10-15 minits rain stats. | Guideline / licence requirements (whichever is Applicable) Impact Monitoring Compliance Monitoring | If contaminant concentrations/licence conditions are exceeded, review disposal options and decide on most applicable. Report any accidences of licence (of applicable) to issuing authority. | SC |
| Waste Management Implications | Segregation, Storage and transport of wastes | Monthly inspection | Visual assessment during the Works; Field inspection, Report of waste volumes generated. Report and record all leakages and spills Impact Monitoring. Compliance Monitoring | Solid waste cycled as 0 % of movement of solids or liquid waste through the soil, rocks, water, atmosphere. | SC |
| Ground Ecological Resources | Soil Monitoring and Erosion Control Fauna and Flora | Continual | Assess adequacy of sedimentation/environmental controls on-site Impact Monitoring Minimal ecological impacts Impact Monitoring | If controls have failed or are found inadequate, cease works immediately and repair to an acceptable standard Required to ensure the recommended mitigation measures are properly implemented. | SC SC |
| Landscape | Surface | Once at the | Minimum disturbance of the original landscape. Impact | Required to ensure the recommended mitigation | SC |

| Item | Parameter | Frequency | Action Level | Response When | Responsibility |
|--|---|-----------------|-----------------------------------|--------------------------|----------------|
| н. | | III. | | Action Level Exceeded | |
| and Visual | treatment of | Completion | Monitoring | measures are properly | - |
| | temporary | of work | | Implemented | |
| | structures | | | | |
| | | | Operation | | |
| | | | IV. | | |
| WWTP quality monitoring, inflow | BOD5, COD, Nitrogen, Phosphorus | weekly | Compare with design parameters | | UWSCG |
| WWTP quality monitoring, aeration tank | Oxygen | daily | Compare with design parameters | Adjust treatment process | UWSCG |
| WWTP quality monitoring, aeration tank | Sludge volume | daily | Compare with design parameters | Adjust treatment process | UWSCG |
| WWTP quality monitoring, aeration tank | Dry matter contents | Thrice per week | Compare with design parameters | Adjust treatment process | UWSCG |
| WWTP quality monitoring, aeration tank | Dry matter contents of return sludge | Weekly | Compare with design parameters | Adjust treatment process | UWSCG |
| WWTP quality monitoring, aeration tank | Microscopical analysis | Twice per week | Compare with design parameters | Adjust treatment process | UWSCG |
| WWTP quality monitoring, outflow | Temperature, pH, suspended solids | daily | compare with permission | Adjust treatment process | UWSCG |
| WWTP quality monitoring, outflow | BOD5, COD, NH4-N, NO3-N, Pgesamt | weekly | compare with permission | Adjust treatment process | UWSCG |
| WWTP quality | NO2-N | monthly | Compare with design | Adjust treatment process | UWSCG |

| Item | Parameter | Frequency | Action Level | Response When | Responsibility |
|---|---|-------------|---|---|----------------|
| Н. | | ш. | | Action Level Exceeded | |
| monitoring, outflow | | | parameters | | |
| WWTP quality monitoring, outflow | Coliforms | monthly | Monitor development | | UWSCG |
| WWTP quality monitoring, sludge treatment | temperature, pH | daily | Compare with design parameters | Adjust treatment process | UWSCG |
| WWTP quality monitoring, sludge treatment | dry matter contents | monthly | Compare with design parameters | Adjust treatment process | UWSCG |
| WWTP quality monitoring, sludge treatment | loss on ignition | monthly | Compare with design parameters | Adjust treatment process | UWSCG |
| WWTP quality monitoring, sludge treatment | sludge gas | daily | Compare with design parameters | Adjust treatment process | UWSCG |
| WWTP quality monitoring, sludge treatment | sludge production (watered, de-watered) | as required | Compare with design parameters | Adjust treatment process | UWSCG |
| WWTP quality monitoring | energy consumption | daily | Compare with design parameters | Adjust treatment process | UWSCG |
| WWTP quality monitoring | Methane | monthly | Check occurrence | Check sludge treatment installations | UWSCG |
| Chkhoushiriver water quality monitoring | Suspended particles, BODoverall, COD, Total Nitrogen, Total Phosphorus | weekly | Sample taking, water analysis, compare with baseline data | Compare with effluent quality, adjust treatment process | UWSCG |
| WWTP operation | Noise | monthly | Compare with Georgian standards for noise control | Inspect installations | UWSCG |

| Item | Parameter | Frequency | Action Level | Response When | Responsibility |
|--|--|-----------------------|---|---|---------------------|
| Н. | | III. | | Action Level Exceeded | |
| WWTP operation | Odor | monthly | Compare with normal odor levels | Inspect installations | UWSCG |
| Infrastructure | Breaks / Deteriorations/ Leakage | Monthly inspection | Visual Assessment Public Complaints Compliance Monitoring | If breaks/ failures occur, close isolation valves (or plug manholes)immediately and repair / replace to an acceptable standard. | Operational Unit |
| Algeti River during failure of WWTP | O ₂ | Twice per day | | | Operational Unit |

K. Conclusion and Recommendation

K.1 Recommendation

365. The environmental impacts of infrastructure elements proposed in the waste water system improvement subproject in Marneuli have been assessed and described in the previous sections of this document. Potential negative impacts were identified in relation to design, location, construction and operation of the sub project components. Mitigation measures have been developed to reduce all negative impacts to acceptable levels.

366. Mitigation measures were discussed with engineering specialists, and some measures have already been included in the designs.

367. Regardless of these and various other actions taken during the IEE process and in developing the project, there will still be impacts on the environment when the infrastructure is built and when it is operating. Appropriate monitoring measures to guarantee the long term and sustainable operation of the waste water system are presented in a monitoring plan.

368. When operating, waste water components will have overall beneficial impacts to human health and the environment as it will provide the inhabitants of Marneuli with a new waste water system.

369. The main beneficiaries of the improved system will be the citizens of Marneuli, who will be provided with a new waste water system. This will improve the quality of life of people as well as raising the standards of both individual and public health as the improvements in hygiene should reduce the incidence of disease. This should lead to economic gains as people will be away from work less and will spend less on healthcare, so their incomes should increase.

370. Mitigation will be assured by a program of environmental monitoring conducted during both construction and operation to ensure that all measures are provided as intended, and to determine whether the environment is protected as envisaged.

371. The recommendation of this Environmental Assessment process is that all mitigation, enhancement and monitoring activities proposed here shall be implemented in full. This is essential to ensure that the environmental impacts are successfully mitigated; this is the responsibility of UWSCG.

K.2 Conclusion

372. The environmental impacts of the proposed waste water components have been assessed by the Initial Environmental Examination reported in this document.

373 .An Environmental Management Plan (EMP) has been prepared and will be implemented during the project implementation. The EMP identifies the potential environmental impacts arising from the project along with a set of the mitigation measures to reduce the impacts to acceptable levels. It also includes the institutional arrangements for implementing the EMP to ensure its effectiveness.

374. The overall conclusion of the IEE is that provided the mitigation and enhancement measures are implemented in full, there should be no significant negative environmental impacts as a result of location, design, construction or operation of the subproject. There should in fact be positive benefits through major improvements in quality of life and individual and public health once the scheme is in operation... Project will stimulate economic growth. The Waste water good quality is a prerequisite for tourism development. Standard of individual and public health will improve as a result of the project. Project will generate new job opportunities

Appendix 1

"United Water Supply Company of Georgia", LLC

Public Hearing Meeting

Construction of Sewerage System and Wastewater Treatment Plant in Marneuli (Tranche V)

Initial Environmental Examination

(Marneuli City Hall; 23 March, 2015; 14:00 PM)

Minutes of Meeting

The following persons attended the meeting:

- 1. Ketevan Chomakhidze– "United Water Supply Company of Georgia, LLC" (UWSCG), USIIP, Environmental Specialist;
- 2. Irakli Legashvili Environmental Specialist, Supervision Consultant Company "Eptisa"
- 3. Irakli Kaviladze Expert of DC Kocks

The following local representatives of Marneuli attended the meeting:

- 1. Giorgi Mtivlishvili Resident of Marneuli
- 2. Teona Tkemaladze Municipality of Marneuli
- 3. Namazov Rafail Municipality of Marneuli
- 4. Vasil Namazov Resident of Marneuli
- 5. Shafi Agatov Resident of Marneuli
- 6. Shakhin lusupov Resident of Marneuli
- 7. Abas Abasov Municipality of Marneuli
- 8. Ismail Asugramov Municipality of Marneuli
- 9. Tabriz Aliev Resident of Marneuli
- 10. Ismail Bairamov Resident of Marneuli
- 11. Kakhaber Chigovadze Municipality of Marneuli

The Public Hearing was held on March 23, 2015 in Marneuli City Hall and commenced at 14:00. The Public Hearings was organized with representatives from the local government of Marneuli, local population and representatives of UWSCG and Design Company Kocks.

By giving advertisements in advance at Marneuli Service Centre, attendance of a wide range of related people to the meetings was encouraged. During the public hearing, citizens were informed about the activities to be carried out within the scope of the Marneuli sub-project, environmental effects of the project and measures to be taken against these effects. Opinions, ideas and suggestions of the local residents and related people were received during the meeting.

It should be noted that prior to the presentation, representative municipality of Marneuli expressed his attitude to the proposed sub-project and stressed the importance of rehabilitation

of the sewerage system for the city. He underlined that currently only 60% of the local population is connected to sewerage network and untreated sewerage is a major environmental concern for the city.

Consultation with affected population was undertaken: to ensure their informed participation in the design, implementation and monitoring of the project measures and their impacts on the environment, as well as the efforts to minimize and the mitigate impact when avoidance is not possible; to introduce the project benefits to the local population that accrue to them as a result of project implementation; to incorporate all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

The following topics were discussed during the meeting:

- project context and rationale
- expected start and end of the project
- benefits of the project to local population and to the country as a whole
- the environmental issues and mitigated measures related to the project

The power point presentations were held by Ketevan Chomakhidze and Irakli Kaviladze. They presented full information for local residents and attendees about projected activities and described the project nature and estimated impacts as a result of this project implementation.

Local residents and the representatives of UWSCG held discussions about particular issues during the meeting.

| Ν | Questions from Local residents | Answers from UWSCG and Kocks |
|---|--|--|
| 1 | How many streets will be involved in the project and will it completely cover the city? | Representatives of the UWSCG and Kocks explained the local population that project will cover the whole Marneuli with 100% connection of the local population to the sewerage network. |
| 2 | In Marneuli planed conduction of two projects WW and WS at the same time. Will be this fact taken into account during preparation of projects implementation schedule to avoid digging of the streets of marneuli twice? | A similar situation was observed in the city of Kutaisi, when two different companies accomplished the water supply and wastewater projects without any agreement with one another. Within the scope of the water supply sub-project in the city of Marneuli, the paved roads were demolished in some streets of the city and water supply pipes were installed. Under the decision of the City Hall, in order to protect the area against the erosive processes, they laid a 16- mm-thick concrete layer in some streets. After some months, another sub-project to improve the wastewater system of Marneuli started planning to demolish the laid concrete layer and install the relevant pipe In case of Marnneuli we will avoid this problem using good planning for the projects. |

The following questions were asked from the local population.

| 3 | What type of impact on environment is associated with the project? And what mitigation measures will be taken? | surplus/waste soil for beneficial purposes; (ii) using measures to reduce/control dust generation; (iii) providing prior public information; (iv) planning transport routes/schedules carefully and awareness creation in drivers; (v) following standard and safe procedures for public and worker safety; (vi) avoiding nighttime construction activities; (vii) avoiding tree cutting through location alignment changes; and (viii) avoiding hazards during construction by securing the site at critical segments. |
|---|---|--|
| 4 | Who is responsible for repair and maintenance of pipes in case of damage? | United Water Supply Company of Georgia |
| 5 | Who will supervise and monitor construction and operation of the project? | UWSCG and Supervision Consultant "Eptiza" |
| 6 | Who is responsible for the restoration after completion of the rehabilitation works and who will do it? | UWSCG is responsible for the rehabilitation works while contractor will carry out restoration works |
| 7 | What is duration, date of start and completion of the construction of the project? | Project will start in 2016 and finish in 2018. |
| 8 | Who is implementing and sponsoring the Project? | Project is co-financed by the Asian Development Bank (ADB) and the Government of Georgia and implemented by the United Water Supply Company of Georgia (UWSCG). |

Representative of MarneuliUWSCG expressed his opinion, if the proposed water supply and sanitation sub-projects will interfere with projects to be implemented by the municipality in 2015, Including miner road, water supply and sanitation rehabilitation works. And asked to provide accurate time schedule of the planned works within the proposed sub-projects.

მარნეულის წყალარინების სიტემის რეაბილიტაციის პროექტი

წინასწარი ეკოლოგიური კვლევის ანგარიშის საჯარო განხილვა

Marneuli Sanitation System Rehabilitation Project Initial Environmental Examination (IEE) Public Hearing

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