Environmental Management Plan

Loan 2860 (SF)
March 2014

ARM: Water Supply and Sanitation Sector Project – Additional Financing

Improvement of Water Supply System of Aygezard, Verin Artashat, Mrganush, Byuravan, Nshavan, Hovtashen, Mrgavet and Reconstruction of Abovyan Village External Water Main

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WATER SUPPLY AND SANITATION SECTOR PROJECT - ADDITIONAL FINANCING

Date of preparation – 29/04/2013

SUBPROJECT III IMPROVEMENT OF ARARAT REGION SETTLEMENTS WATER SUPPLY SYSTEMS

L2860-ICB-1-02/3 IMPROVEMENT OF WATER SUPPLY SYSTEMS IN AYGEZARD, VERIN ARTASHAT, MRGANUSH, BYURAVAN, NSHAVAN, HOVTASHEN, MRGAVET AND RECONSTRUCTION OF ABOVYAN VILLAGE EXTERNAL WATER MAIN

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LIST OF ABBREVIATIONS

RA MoNP – RA Ministry of Nature Protection
RA MoH - RA Ministry of Health
RA MoT&C – RA Ministry of Transport and Communication
RA MoC – RA Ministry of Culture
JV – Joint Venture
LSGB - Local Self-Governmental Bodies
EIA – Environmental Impact Assessment
AWSC ADB PMU – Armenian Water and Sewage Company/ Project Management Unit of Asian Development Bank
EMP - Environmental Management Plan
IEE- Initial Environmental Examination
DD - Detail Design
1. BACKGROUND OF THE PROJECT

WSSP Project will improve public health and environment for about 400,000 people (households and other consumers) living in 18 towns and up to 92 villages through safe, reliable and sustainable water supply. The outcome of the Project is improved access to safe, reliable, and sustainable WSS services managed on commercial principles and environmentally sound practices.

The Project will also support poverty reduction by (i) reducing the incidence of waterborne diseases and costs of medical care; (ii) improving the time poverty of women due to labor intensive housework such as water collection, which may allow them to participate more in social and economic activities; (iii) providing safer and more reliable water supply; and (iv) improving the quality of life of households in all the project towns and villages by improving their access to safe and sustainable drinking water.

Similar to the original WSSP, the Additional Financing Project will fund two project components which include: (i) municipal infrastructure rehabilitation and improvement; and (ii) management improvement and development which include gender features.

2. ENVIRONMENTAL AND SOCIAL SAFEGUARD DOCUMENTS

In accordance with the ADB Environmental policy (November, 2002) the Subproject is ranked to B category which does not need extended EIA, excluding aslo Environmental expertise, according to the RA law on “Environmental Impact Assessment” (issued on November 20, 1995.) and the RA Government decree “Threshold of environmental impact activities subject to expertiz” (N-193, 30 March 1999).

As a B Category Project ADB Policy requered development of Initial Environmental Examination/IEE reports for each Subproject (1 report) and site specific Environmental Management Plan/EMP (separetly report for each lote of the subproject).

3. INTRODUCTION

This report is developed for the Subproject “Improvement of W&W Systems” in Aygezard, Verin Artashat, Mrganush, Byuravan, Nshavan, Hovtashen, Abovyan, Mrgavet villages of Ararat región, RA, the design of which has been carried out by the JV of HGSN and JINJ LLCs. The rehabilitation of water supply systems involves activities on reconstruction and repair of water supply distribution systems, as well as construction of new waterlines, regulating and water measuring junctions.

1 The number of towns and villages may change subject to further detailed assessments.
As a result of construction work, as well as further operation and maintenance of the water supply systems there might be negative impacts on the environment.

It is expected that the impacts during construction works will be minimal and temporary, probably involving vegetation cut, soil erosion, pollution of air, soil and water resources by lubricants and chlorine compositions, as well as household and construction waste.

In general, at the Operation Stage the negative impacts on the environmental decrease because of improper execution of operation requirements.

The activities aimed at improvement will be considered environmentally friendly in case of water resource conservation, as well as their rational and sustainable use.

The social and economic effect as a result of water supply system improvement are expected to be long-term, mostly positive, excluding potable and waste waters mix, minimization of water pollution risk, prevention and exclusion of infection disinfection disease agents penetration into potable water, as well as water supply extension, providing sustainable water supply and effective water use.

The EMP Part 5 introduces description of possible impacts and its facilitating measures required at different stages of Water Supply Systems Rehabilitation Project. The EMP Part 5 introduces description of possible impacts and its facilitating measures required at different stages of Water Supply Systems Rehabilitation Project.

- **Design stage**

The design works on water systems have been performed by the JV of HGSN and JINJ, which has been selected as a Consultant who provides services on civil works and public awareness campaign within the framework of “Water Supply and Sanitation Sector Project – Additional Financing”. The EMP includes articles on climatic conditions, relief, natural soil types, hydrology and biodiversity of the very package, requirements on obtaining the RA MoNP and other Ministries’ agreements, as well as fulfillment of executive parties’ contractual commitments during all stages of implementation. The Design documentation includes adequate environmental and social articles and separate Matrix of the very EMP Subproject. The Project Consultant covenants to follow the appropriate statements of the RA Environmental and social legislation, as well as ADB instructions and strategy requirements.

- **Construction stage**

The list of measures required to mitigate the environmental impact during construction stage is separately provided in the EMP matrix (APPENDIX A).

The Contractor should strictly follow the requirements on environmental impact mitigation measures, which are involved in the EMP.

- **Operation stage**

The Contractor should strictly follow the requirements on environmental impact mitigation measures, which are involved in the EMP.

4. **SCOPE OF WORKS**
4.1. Description of existing water supply systems

The total length of water supply distribution systems in Aygezard, Verin Artashat, Mrganush, Byuravan, Nshavan, Hovtashen, Abovyan, Mrgavet rural communities is about 67 km. The community water supply is carried out from 2 groups- “Garni” and “Jermanis” water springs.

Garni Zod” Ø400 and “Garni Yeraskh” Ø700 conduits start from the chlorination station, constructed below the spring area, which before reaching the mentioned settlements, supply a number of settlements in Artashat and Ararat regions as well.

The water supply of Aygezard, Verin Artashat, Mrganush communities is realized from the DRR-s of Norashen village with the capacity of 1 x 1000m³, fed from “Garni-Yeraskh” Ø530 steel conduit coming from DRR-s.

The water supply of Byuravan, Nshavan, Abovyan, Mrgavet communities is realized from DRR-s of Arevshat village with the capacity of 3x2000m³, fed from “Garni-Zod” steel and cast iron conduits. Regulating wells are installed on the conduits, at the initial and final points of the village.

There is no drinking water and distribution net in Hovtashen village. The water is supplied to the population for household needs and irrigation from deep wells through a distribution network constructed from pipes with the diameter of Ø50-100.

Water supply of the settlements is carried out by water supply distribution networks, which are in poor condition. The internal network is entirely laid from steel pipes, which are in deteriorated state. Most of the distribution networks are deteriorated in the settlements, there are huge leakages. In the feeding systems of the following communities not calculated water amount is up to 88%. The water calculation is not a complete system.

During the last years, repair works have been carried out at the expense of Mrganush, Byuravan communities, particularly the deteriorated sections of the internal network waterlines have been reconstructed with polyethylene pipes.

An artesian borehole has been excavated in Hovtashen community financed by the World Bank in 2010.

4.2. Description of the proposed rehabilitation works

The aim of this Subproject is to rehabilitate the water supply systems of Aygezard, Verin Artashat, Mrganush, Byuravan, Nshavan, Hovtashen, Abovyan, Mrgavet settlements, provide the inhabitants with safe potable water and improve water distribution and estimation systems.

The population number in Aygezard, Verin Artashat, Mrganush, Byuravan, Nshavan, Hovtashen, Abovyan, Mrgavet villages according to 01.01.2012, is 17542 in total. The total number of consumers in the rural communities is 3090.

Taking into account the population prospective growth by 2040, which assumes 0.43% annual growth, the rural communities dwellers number is supposed to be 19833 men.

For the settlements, considering also the leakages, the mean daily water demand rate is assumed to be 200 l/day per man.
The average hourly discharge of maximal daily water demand of the rural communities makes $Q_{av.h} = 260$ l/sec.

Based on the technical and economical calculations done in the Preliminary Design, as well as submitted justifications, in the Detailed Design there have been developed activities on the water supply distribution net reconstruction.

According to the detailed design, the works designed for the improvement of water supply system in Aygezard, Verin Artashat, Mrganush, Byuravan, Nshavan, Hovtashen, Abovyan, Mrgavet rural communities are as follows:

- Construction of de50-de200 diameter 43970 lm long polyethelyne waterlines;
- Construction of valve junctions-65 sets;
- Construction of entry lines of private hoses- 21055lm;
- Constructiono of water metering junctions of private houses-1985 sets.

The aggregative indexes of the designed works in the Subproject rural communities are introduced in Table
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</thead>
<tbody>
<tr>
<td>Reconstruction of water supply internal network by polyethylene pipes of de50-de200 diameter</td>
<td>lm</td>
<td>8825</td>
<td>9261</td>
<td>2915</td>
<td>4540</td>
<td>5400</td>
<td>7080</td>
<td>4216</td>
<td>1710</td>
<td>43947</td>
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<tr>
<td>Tasting, washing, disinfection of the above mentioned pipes</td>
<td>lm</td>
<td>8.8</td>
<td>9.3</td>
<td>2.9</td>
<td>4.5</td>
<td>5.4</td>
<td>7.1</td>
<td>4.2</td>
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<td>43.9</td>
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<tr>
<td>Construction of valve junctions</td>
<td>set</td>
<td>11</td>
<td>8</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>8</td>
<td>5</td>
<td>9</td>
<td>65</td>
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<tr>
<td>Construction of entry lines of private houses</td>
<td>lm</td>
<td>5280</td>
<td>1880</td>
<td>2200</td>
<td>2400</td>
<td>3145</td>
<td>2640</td>
<td>2590</td>
<td>920</td>
<td>21055</td>
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<tr>
<td>Construction of water metering junctions of private houses</td>
<td>set</td>
<td>508</td>
<td>188</td>
<td>196</td>
<td>216</td>
<td>309</td>
<td>248</td>
<td>250</td>
<td>70</td>
<td>1985</td>
</tr>
<tr>
<td>Reconstruction, washing and disinfection of water supply external network with polyethylene pipes of de300-de600 diameter</td>
<td>lm</td>
<td>-</td>
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<tr>
<td>Replacement of entry lines of apartment and public buildings</td>
<td>pcs</td>
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</tbody>
</table>
According to the agreement between the Contractor, Consultant and communities, the mentioned beneath works should be implemented by the construction completion, in spite of the pipeline diameter and its function.

1. Restoration of the asphalt concrete in traffic roads, providing the same quality cover,

2. Backfilling of the trenches in the destroyed and half-destroyed streets with asphalt cover, paving with crushed stone layer of 10-15cm thickness, with compaction.

5. BASE LINE ENVIRONMENTAL CONDITIONS

5.1 Geographical location and climate of Aygezd, Verin Artashat, Mrganush, Byuravan, Nshavan, Hovtashen, Abovyan, Mravet rural communities of RA Ararat region

The studied area of Ararat region in RA, is situated on a surface with escarpments, with wavy, average and low elevation in Ararayan semidesert, moutain-valley landscape zone. The Subproject settlements are 3-7km away to the northwest from the region center-Artashat town, and 25km away to the southwest from Yerevan.

The climate of the studied area is characterized by hot summer and rather cold windless winter, where the average monthly temperature in July is +21°C, in January from 0° to 5°C. The air absolute maximal temperature is 42°C, and the absolute minimal is -30°C .The average annual atmospheric rainfalls make 238-348 mm and the air relative humidity makes 35%. The snow cover reaches 36cm, pressure: 50kg/m². The ground freezing depth is 0.43m depending the absolute altitude. In this area the western and the north-western winds with velocity of 0.8m/sec dominate.

The studied area of RA Ararat region is situated within the terrace of Araks River of the central zone of Ararat valley. The fraily slopping relief is formed on the alluvial and lake sediment, within the accumulative, sedimentary and silty rocks.

Considering the geo-morphological aspect, the area represents low mountains, plateus and submountains with a relief cut from erosion and characterized by fairly folded base of carbonate, volcanic-sediment rocks.

Among exogenic-geological phenomena there are surface erosion, change and deepening of the gullies formed due to the rainfalls in permanent and temporary flows, some technogenic phenomena, etc.

The inhabited area of the settlements is situated on 830-900m elevation.

5.2 Biodiversity

The soil types are presented by particularly deeply alkalized or salinized soils, saline-alkaline lawn and irrigated lawn dark soils formed on contemporary channel and lake-alluvial sediments. The lands in the region are mainly used in agriculture.
In the geological structure there are late pliocene-pleistocene lake, river, torrent sediments, late Eocene basalts, andesite, tuff-sand stones, clays, marls and sheeted lime stones of lower Eocene, volcanic flaws of basalts. Clay thick layers, which are covered by contemporary lake-alluvial-deluvial formations with various thicknesses, are spread in the concavity Araks riverside.

The river Araks with its Metsamor and Azat tributaries is the main water artery From the hydrogeological aspect the area is rich in ground water. Clays located on the river and lake water-bearing sediments serve as waterproof for the horizon of ground water. They occur at different depths, starting from 0-5m to 100m and more. In separate areas the ground water cause waterlogging and salinization.

There are no negative physical and geological phenomena in the area.

The region is situated in 9 magnitude potential seismicity zone and has 0.3-0.4g accelaration.

**Flora** The area belongs to Yerevan floristic region where the vegetation is introduced by semidesert and desert plant species.

The natural vegetation cover of the area is mainly introduced by semidesert vegetation-including ephemerals, among which dominant species are: Artemisia fragrans Willd, Kochia prostrata, Schrad Aegilops etc./

There is a water flora and surrounding vegetation in the area, which is the result of creation of the drainage ditches and artificial water pond system. From the variety of vegetation types there are Rosaceae, Poaceae, Asteraceae, Fabaceae, Polygonaceae and Brassicaceae species. There are no trees in this area, which may be associated with closeness of ground salty water and air dryness.

The area species, which need to be preserved, are Euphorbia vedica, Acorus calamus L., Connvolvulus commutatus Boiss, Lactuca Takhtadzani Sosn, Astragalus paradoxus etc.

As (EN) endangered species registered in RA Red Book for Plants (2010) there are SALSOLA TAMAMSCJANAE, TANARIX OCTANDRA, Rheum ribes.They make large number in the studied area, bur are rare in the area of Armenia.

Among wild useful plant species there are Tanacetum vulgare, Rubia tinctorum, Valeriana officinalis, Reganum harmala.

**Fauna** The investigated area is located in the salinized semidesert zone, but surrounded by artificial water pond system, which provides the considerable diversity of fauna in this area. Among invertebrate species 5 types of mollusks are met in the area: Zonitoides nitidus, Planorbis planorbs, Gyraulus acronicus, Pupilla signata, Euglesa casertana; among insects – some representatives of Coenagrionidae and Libellulidae. Among vertebrates 2 types of amphibious have been observed, they are: Bufo /Pseudopedalia/ variabilis and Pelophilax ridibundus, which belong to widespread species of RA area.
In the region among mammals there is a barbastelle hedgehog *Erinaceus* (Hemiechinus) auritus Gmelin; a sharp-eared night bat *Myotis blythi* Tomes; a Mediterranean bat *P.* (P) kuhl Kuhl; a small horseshoe bat *Rhinolophus hipposideros* Bechst; a fox *Vulpes vulpes* L.; a jackal *Canis aureus*; a wolf *Canis lupus* L.; a wild boar *Sus scrofa* L.; a Percian mouse *Meriones persicus* Blanf.; Cricetulus migratoris Pall, etc.


Among the species of mammals recorded in the Red Book are: a barbastelle hedgehog *Erinaceus* (Hemiechinus) auritus Gmelin; a marbled polecat *Vormela peregusna* Guldenstaedt; a small jerboa *Allactaga elater* Liichtenstein are registered.

6. ENVIRONMENTAL AND SOCIAL IMPACTS

Due to the works aimed at the improvement of water supply systems of Aygezard, Verin Artashat, Mrganush, Byuravan, Nshavan, Hovtashen, Abovyan, Mrgavet villages of Ararat region in RA, the expected positive environmental and population health effects are as follows:

- water resource protection and sustainable use,
- excluding mixing of drinking, irrigation and sewerage water,
- preventing, excluding penetration of infectious disease viruses into drinking water,
- reduction of drinking water pollution hazard,
- providing high drinking water quality,
- improvement of health condition of population,
- water loss reduction,
- increasing duration of water supply to population
- introduction of water metering system,
- increasing water consumption efficiency.

PEE reveals, that the implementation of works aimed at water supply systems improvement in Aygezard, Verin Artashat, Mrganush, Byuravan, Nshavan, Hovtashen, Abovyan, Mrgavet rural communities of Ararat region in RA will have no harmful effects on the selected for this purpose area – either landscape or flora and fauna.

The possible negative effects might be mainly caused by the implementation of construction works, with little damage and carrying temporal character. To prevent or mitigate negative impacts there have been developed mitigation measures, which are involved in the EMP.

EMP is the integral part of the bidding document and based on the PEE the expected negative impacts are as follows:

- air pollution,
- noise,
- traffic and pedestrian roads damage and loading,
- soil erosion and soil eroding processes,
• environment pollution by construction and household waste,
• soil and water resources pollution by fuels and lubricants,
• soil and water resources pollution by chlorine.

Subproject implementation will have positive social effects directly improving the population life quality of targeted communities providing sustainable and reliable water supply and water resource rational use for about 17542 people.

7. ENVIRONMENTAL IMPACT MITIGATION MEASURES

The possible harmful impacts on the environment and people’s health, caused by the works aimed at the W&W internal system improvement of Aygezard, Verin Artashat, Mrganush, Byuravan, Nshavan, Hovtashen, Abovyan, Mrgavet rural communities depend on construction works of trenches for waterline and pits for regulating and water measuring junctions.

To prevent soil erosion and eroding processes measures protecting the slopes should be performed on the inclined areas designed for laying pipes, providing minimal time for keEEEng open the trenches and pits made for the pipelines and control and water measuring junctions.

The protection measures of slopes should be performed to prevent soil eroding processes on the areas close to the riverbeds.

After construction work completion the sites should be recovered by performing the mentioned beneath activities:

- removing the excess soil mass and building material from the construction sites,
- recovering the asphalt–concrete pavement, providing its previous good condition and quality,
- providing restoration with gravel with compaction on the streets with damaged and half-destroyed asphalt-concrete pavement, as well as on dirty roads.

To prevent the topsoil layer damage or landscape degradation, the topsoil should be stored on the previously assigned for this purpose site, thereafter used for the restoration of areas. The construction site should be cleaned from the household and construction waste providing previous view and state of the landscape.

To prevent difficulties regarding the feeding and movement or damage of animals, temporary pathways should be designed in the sections of the external conduits, during the construction works. In order to prevent the influence of noise, vehicles and equipment should be acquired by additional mufflers.

To prevent the soil and water resources pollution by fuels and lubricants, the latter should be stored on the area isolated from soil and water resources, in special tanks. Special containers should be prepared for the utilized lubricants, which thereafter will be disposed in landfills or places for reprocessing.
To prevent the environment pollution by construction waste and excess soil mass they should be disposed on special sites, according to the agreements signed beforehand between community head and disposal site superintendent.

To avoid pollution of water and soil resources by chlorine, the works related to chlorine washing and disinfection should be arranged considering special calculations. While working with the chlorine the established technological procedures should be maintained. After washing the pipes, the chlorine outflow to the surface water unit, or land area, should be controlled according to the designed mode and calculation.

Water quality change. While performing the environment monitoring, the supervision on water quality and residual chlorine should be arranged.

To minimize dust emission caused by construction works the site should be regularly watered.

To prevent noise impact the schedule should be developed on limiting the night works on the residential areas, avoiding noisy vehicles and equipment use, installing mufflers, if necessary.

To minimize the population disturbance caused by roads damage and loading, the special parking lots for trucks should be provided, and the construction works should be performed by stages, arranging population awareness campaign, including provision of special traffic signs, providing bypasses, or barriers.

To provide population and builders’ safety and prevent risks during the construction, the unauthorized persons’ entrance to the construction site should be controlled, warning signs should be placed in the accident-prone sectors, regular inspection of equipment by qualified specialists should be performed, including safety audits, first aid and safety courses organization for builders.

The affected parties and local population should be appropriately informed through public consultations on the coming activities, their schedules and all measures involved in the EMP, since information lack can bring forth discontent causing complains. Providing the communities’ participation in the Subproject will minimize the disturbance caused by construction works to the social life of community.

Potable water quality change: EMP should involve monitoring of water quality and residual chlorine level.

To provide water quality in Aygezard, Verin Artashat, Mrganush, Byuravan, Nshavan, Hovtashen, Abovyan, Mrgavet rural communities the AWSC should perform routine sampling from the springs feeding the communities, testing, the water for all criteria required by MoH.

Water quality monitoring is also performed by the State Hygiene Anti-IEEdemic Inspectorate according to the document “Potable water. Requirements on water quality of centralized water supply systems. Sanitation rules and norms of quality inspection № 2-III-A2-1" (recorded on 28.12.2002), which specifies the potable water quality requirements, including the rules of quality inspection of water produced and supplied through water distribution systems to the residential areas.

Since water disinfection is performed by chlorine, the monitoring of residual chlorine level is also of great importance.
8. INSTITUTIONAL FRAMEWORK OF ENVIRONMENTAL MANAGEMENT

To perform the proposed mitigation measures, the obligations on their arrangement have been allocated between the agencies, as follows:

- **Executive agencies, which are responsible for implementation of the measure.**
  1. To perform this special task the implementing unit (JV of HGSN and JINJ) in the Designing stage should provide the obtaining of all required agreements and permissions from the corresponding public administrative and local self-governing bodies before civil works distribution according to the bidding terms.
     - environmental expertise (if necessary),
     - consent of Protection Agency of Historical and Cultural Heritage, in case of expected impact on the latter.
  2. The implementing agencies in the construction stage (Contractors) will covenant to physically implement the specified in the EMP facilitating measures, as well as obtain all permissions and consents relating to the civil works implementation, which are as follows:
     - local municipal bodies’ written consents on the specified sites for household and construction waste disposal,
     - consent of Historical and Cultural Heritage Protection Agency, in case of historical, cultural or ancient monuments occurrence during civil works implementation.
  3. Before civil works startup the mentioned beneath permissions and certificates should be obtained by ADB/PMU, if necessary:
     - certificate on land use right registration,
     - water use permission, if necessary.

- **Controlling agencies, which are responsible for controlling the executive units to provide implementation of the EMP measures by the latter.**
  1. The environment and safety specialists of “AWSC” CJSC/ADB PIU will be responsible to supervise the implementation of mitigation measures specified in EMP. The mentioned experts will regularly perform site visits to supervise the proper implementation of works and corresponding activities on mitigating the impacts. During the visits the probable omissions will be revealed by the check list, as well as violations of mitigation measures implementation by Contractors.

“AWSC” CJSC /ADB PIU is also entitled to require and checkup the availability and validity of all permissions, complete implementation of mitigation measures and monitoring according to the EMP in terms of ADB environmental instructions and the RA nature protection and social legislation.
2. The JV of HGSN and JINJ are also to carry out the supervision over the implementation of mitigating measures during civil works implementation. The environmental specialist of the Consultant should make visits to control the implementation of EMP.

- **State monitoring agencies, which are responsible for observing the extent and efficiency of EMP implementation and mitigation measures, and making corrections in the project, if needed.**

The state monitoring agencies are as follows:
- Inspectorate of the State Environmental RA MoNP,
- State Hygiene and Anti-IEEdemic Inspectorate of the RA MoH,
- Historical and Cultural Heritage Protection Agency of the RA MoC, if necessary,
- The RA local self-governance bodies,
- The RA MT&C,

Costs envisaged for implementation of environmental measures included in the EMP are included in the detailed design.

Implementation of mitigating measures for environmental impacts will be controlled regularly through visits to the construction sites. With the help of the specially developed check list the gaps and drawbacks will be discovered.

In case of not implementing or infringing the implementation of the mitigating measures, after warning, the followed payment will be terminated until the infringement is completely eliminated.

**9. ENVIRONMENTAL MANAGEMENT PLAN**

The EMP will be based on the results of PEE developed by the subproject and will include appropriate mitigation measures.

EMP consists of two components.
1. Mitigation measures and institutional responsibilities for implementation;
2. Environmental monitoring.

The **Contractor** should strictly follow the environmental mitigation measures prescribed in the EMP. The costs foreseen for the implementations of all the measures prescribed in the EMP are included the total cost of the Contract and reflected in the bill of quantities.

- Notice on the failure to implement measures prescribed by the Technical Supervision Company (TSC) or the Client would be sent to the **Contractor** as precaution.

- After one precaution the next recorded violation would trigger charging of liquidated damages in amount of 0.1 % of the total cost of the contract. The penalties do not relieve the Contractor from remedying the violation. The recorded violation should be remedied in two working days period. Penalty fees would be retained from the next Performance Certificate and after the completion of the construction activities the liquidated damages for the recorded violation will be retained from the guarantee amount.

- In case of three liquidated damages the Contract could be terminated unilaterally
The environmental management matrix for Aygezard, Verin Artashat, Mrganush, Byuravan, Nshavan, Hovtashen, Abovyan, Mrgavet villages is presented in Appendix A.

### Appendix A

**ENVIRONMENTAL MANAGEMENT MATRIX**

<table>
<thead>
<tr>
<th>Works and possible impacts</th>
<th>Proposed mitigating measures</th>
<th>Monitoring</th>
<th>Responsible bodies</th>
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</table>
| 1. Air pollution, noise and traffic congestion | - Install fencing around construction site,  
- Regularly water the construction site and roads,  
- Limit night work in residential areas,  
- Avoid usage of machines/equipment with extra noise; installation of silencers if needed. | Daily site inspection       | Contractor, Consultant, PIU |
| Dust and noise during the construction works | - Provide safe area for trucks,  
- Do not accumulate and burn waste on the construction site.  
- Carry out construction in stages; give adequate notice of construction activities to the population,  
- Provide effective road signs, bypasses or barriers; provide areas for parking,  
- Provide community participation in subproject works, which will minimize disruption to community social activities. | Daily site inspection       | Contractor, Consultant, PIU, LSGB |
| Disturbance to population because of overloaded roads |                                                                                  |                             |                                 |
## 2. Environmental pollution

| • Soil erosion | - In the inclined sites of the waterline routes implement measures for retaining the inclinations to prevent soil erosion and sand spreading,  
- Minimize the time during which trench and pit excavations for pipelines, regulation and water metering junctions are open. | Daily inspection of construction and contract techservices stages | Constructor, Consultant, PIU |
| • Damage to soil fertile layer or landscape degradation | - To store soil fertile layer in the specially provided areas and to use them in future with area restoration purposes.  
- To clean, to level the area after completion of construction works, and to bring the landscape to its original view. | | Contractor, Consultant, PIU, LSGB |
| • Environment pollution with construction waste | - Remove construction waste to corresponding landfill of the community, having in advance a contract agreement with the community heads or landfill operators.  
- Rehabilitate disturbed surfaces as soon as possible after completion of construction activity, according to the design. | Inspection of measures required after implementation of construction works | Contractor, Consultant, PIU, LSGB |
| • Land and water resources pollution with fuels and lubricants | - Store oil, fuels and lubricants on a sealed surface, away from land water resources,  
- For collection of used oil special containers furnished with leakage collecting system to be provided. | Daily inspection of construction site. | Contractor, Consultant, PIU |
| • Land and water resources pollution with chlorine | - Organize works for washing the water supply distribution network with chlorine, according to calculations and technological terms.  
- Implementation of chlorine discharge to surface water body or land area after washing the pipes, according to the established regulation and calculations. | Inspection of measures required after implementation of construction works | Contractor, Consultant, PIU |

## 3. Health and Safety

| • Hazards for workers and the | - Fence the construction site,  
- Control access of unauthorized persons to site, | Daily inspection throughout construction stage. | Contractor, Consultant, PIU, population |
 population | - Place warning signs in dangerous places,  
- Carry out regular examination of equipment by highly qualified staff, as well as make regular safety audits,  
- Provide first aid and safety training to construction staff | Monthly inspection of accident reports and complaints register. |

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**Appendix B**

### Field visits checklist

<table>
<thead>
<tr>
<th>General information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ամիս/ամսաթիվ D/M/Y</td>
</tr>
<tr>
<td>Ենթածրագիր / Subproject</td>
</tr>
<tr>
<td>Տեղակայում / Location</td>
</tr>
<tr>
<td>Շինարակագործություն / Construction contractor</td>
</tr>
<tr>
<td>Մարզ / Marz</td>
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</tbody>
</table>

### Design

<table>
<thead>
<tr>
<th>Required permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Բնապահպանական փորձ, եզրակացություն / EEC</td>
</tr>
<tr>
<td>Հողհատկացման գրավոր համաձայնություն / written consent on land acquisition</td>
</tr>
<tr>
<td>Պատմամշակութային փորձագործություն / assessment of impact on cultural heritage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Υ</td>
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<tr>
<td>Шиnairetyun</td>
<td>Construction</td>
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<tr>
<td>Անհրաժեշտ թույլտվություններ  (Required permissions)</td>
<td>Շինարարության տեխնիկական գործիչների հանրապետության / written consent on disposal of construction waste</td>
<td>Այո</td>
</tr>
<tr>
<td></td>
<td>Մասնագիտակցության հակասությունների դեպքում փախստավորություն / written consent in case of sudden discovery of cultural heritage</td>
<td>Այո</td>
</tr>
</tbody>
</table>

| Հասարակության իրանկություն (Public awareness) |
|----------------|----------------|
| Սամանումների վերակազմակերպման համար համաձայնություն / written consent on disposal of construction waste | Մասնագիտակցության մասնագիտություն շինարարական աշխատանքների համար համաձայնություն / community’s participation in construction works according to the project design | Այո | Ոչ | N/A |

| Սպառություն (Safety) |
|----------------|----------------|
| Բանվորների անվտանգություն (Safety of workers) | Շինարարության վերակազմակերպման համար համաձայնություն / written consent on disposal of construction waste | Մասնագիտակցության վերակազմակերպման համար համաձայնություն / written consent on disposal of construction waste | Այո | Ոչ | N/A |
| Համայնքի մասնակցություն շինարարական աշխատանքների համար համաձայնություն / community’s participation in construction works according to the project design | Մասնագիտակցության վերակազմակերպման համար համաձայնություն / written consent on disposal of construction waste | Այո | Ոչ | N/A |

| Տեխնիկական միջոցների պարբերական զննումներ շինարարական աշխատանքների համար համաձայնություն / regular study of equipment used for construction for safety matter | Մասնագիտակցության վերակազմակերպման համար համաձայնություն / written consent on disposal of construction waste | Այո | Ոչ | N/A |

<p>| Բնակչության անվտանգություն (Safety of population) |
|----------------|----------------|
| Երթևեկության սահմանափակման կամ խախտման ժամանակ համապատասխան ճանապարհային նշանների կամ պատնեշների տեղադրում, շրջանցի կազմակերպում / Installation of road signs or fences, organization of a bypass during interrupted or limited traffic | Մասնագիտակցության վերակազմակերպման համար համաձայնություն / written consent on disposal of construction waste | Այո | Ոչ | N/A |</p>
<table>
<thead>
<tr>
<th>Շինարարության/աշխատանքային գրավորություն</th>
<th>Operation on area/construction site</th>
<th>Ու</th>
<th>Ո/Չ</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Մեքենաների համար ապահով տարածքի առկայություն շինանյութ տեղափոխող բեռնատարների վրա ծածկիօգտագործում</td>
<td>Use of cover for the vehicle transporting construction waste</td>
<td>Այո</td>
<td>Ո/Չ</td>
<td>N/A</td>
</tr>
<tr>
<td>Յուղերի և քսուկների համապատասխան պահեստների առկայություն շինանյութ տեղափոխման / availability of storage for oils and lubricants at the appropriate part of the construction site</td>
<td>Այո</td>
<td>Ո/Չ</td>
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<tr>
<td>Օդի ժամանակավոր աղտոտում</td>
<td>Temporary air pollution/dust</td>
<td>Այո</td>
<td>Ո/Չ</td>
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</tr>
<tr>
<td>Փոսորակների ժամանակին հետլիցք / timely coverage of holes by soil</td>
<td>Այո</td>
<td>Ո/Չ</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Շինարարության տարածքի խոնավեցում ջրի շիթով / moisturing of the construction site by water</td>
<td>Այո</td>
<td>Ո/Չ</td>
<td>N/A</td>
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</tr>
<tr>
<td>Հողի էռոզիա</td>
<td>Soil erosion</td>
<td>Այո</td>
<td>Ո/Չ</td>
<td>N/A</td>
</tr>
<tr>
<td>Փոսորակների ժամանակին հետլիցք / timely coverage of holes by soil</td>
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</tr>
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<td>Այո</td>
<td>Ո/Չ</td>
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<table>
<thead>
<tr>
<th>Օղ աղտոտում</th>
<th>Water pollution</th>
<th>Ու</th>
<th>Ո/Չ</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Օղ աղտոտում քսանյութերով և վառելանյութերով / water pollution caused by fuel and lubricants</td>
<td>Այո</td>
<td>Ո/Չ</td>
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<tr>
<td>Issue</td>
<td>Answer Options</td>
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<tr>
<td>----------------------------------------------------------------------</td>
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<td></td>
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<tr>
<td>Leakage of chlorine after wash up of the pipes according to the scheduled regime</td>
<td>Yes, No, N/A</td>
<td></td>
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</tr>
<tr>
<td>Noise close to settlements</td>
<td>Yes, No, N/A</td>
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</tr>
<tr>
<td>Implementation of the works during working hours, otherwise in projected manner</td>
<td>Yes, No, N/A</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Construction waste disposal</td>
<td>Yes, No, N/A</td>
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<tr>
<td>Drinking water pollution</td>
<td>Yes, No, N/A</td>
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</table>