ASIAN DEVELOPMENT BANK FUNDED

WATER SUPPLY AND SANITATION SECTOR PROJECT - ADDITIONAL FINANCING

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SUBPROJECT III IMPROVEMENT OF ARARAT REGION SETTLEMENTS WATER SUPPLY SYSTEMS

L2860-ICB-1-02/2 IMPROVEMENT OF WATER SUPPLY SYSTEMS IN MASIS, BURASTAN, AZATAVAN, BAGHRAMYAN, BERKANUSH, DALAR, MRGAVAN, SHAHUMYAN AND DIMITROV VILLAGES

ENVIRONMENTAL MANAGEMENT PLAN
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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 - Detailed 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 also 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 required development of Initial Environmental Examination/IEE reports for each Subproject (1 report) and site specific Environmental Management Plan/EMP (separately report for each lot of the subproject).

3. INTRODUCTION

This report is developed for the Subproject of the Improvement of W&W Systems in Masis, Burastan, Azatavan, Baghramyan, Berkanush, Dalar, Mrgavan, Shahumyan, Dimitrov villages of Ararat region, RA, the design of which has been performed by JV of “HGSN” and “JINJ” LLCs. The water supply systems rehabilitation involves activities on reconstruction and repair of water distribution systems, as well as construction of new water pipelines, regulating and water metering junctions.

1 The number of towns and villages may change subject to further detailed assessments.
As a result of construction work implementation, 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 work implementation will be the least and temporary, probably involving vegetation cut, soil erosion, air and water resource pollution by lubricants, household and construction waste.

At the Operation Stage the environmental impact, mainly expected because of improper execution of operation requirements, will decrease.

The improvement activities will be considered environmentally friendly in case of water resource conservation, as well as 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 disease agents penetration into potable water, as well as water supply extension, providing sustainable water supply and rational water use.

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

- **Designing 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 for design, construction supervision of 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 is in charge 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).

- **Operation stage**

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

During the Construction Stage the Operation should be performed in accordance with the Operational Rules and Standards.
4. SCOPE OF WORKS

4.1. Description of existing water supply systems

The total length of water supply distribution pipelines in Masis, Burastan, Azatavan, Baghramyan, Berkanush, Dalar, Mrgavan, Shahumyan, Dimitrov rural communities is 84.7km. The community water supply is performed from 2 groups of springs- “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 Masis, Burastan, Azatavan, Baghramyan, Berkanush, Dalar, Mrgavan, Shahumyan, Dimitrov villages is performed from the DRRs of Arevshat village with the capacity of 3x2000m³, fed from “Garni-Yeraskh ” conduit. The steel conduit of Ø325 diameter, which comes from DRRs, is separated into 2 branches near Dimitrov village-Ø325 steel and Ø400 cast-iron conduits. Both of them pass through the territory of the villages.

The water supply of Shahumyan village is performed from the DRRs of Kaghtsrashen village of 2 x 2000m³ capacity, fed from “Garni Zod” conduit, from where water reaches the village through the steel pipe of Ø325 diameter. Three regulating wells are installed on the conduits at the beginning of the village.

The water supply in the residential areas is carried out through water supply distribution nets, which are in poor condition. The internal network is laid entirely with steel pipes, which are deteriorated. In most of the settlements the distribution pipelines are deteriorated, there are huge leakages up to 75-80%. The system consumed water recording is not performed completely.

Within the last few years, repair works have been carried out at the expense of Masis, Burastan, Shahumyan, Dalar, Mrgavan and Dimitrov communities, particularly the deteriorated sections of the internal network waterlines have been reconstructed with polyethylene pipes.

4.2. Description of proposed rehabilitation works

This very Subproject aims at the reconstruction of Garni-Yeraskh, Garni-Zod external conduits, as well as rehabilitation of water supply system of Masis, Burastan, Azatavan, Baghramyan, Berkanush, Dalar, Mrgavan, Shahumyan, Dimitrov settlements providing the inhabitants with safe potable water and improving water distribution and accounting systems.

The population number in Masis, Burastan, Azatavan, Baghramyan, Berkanush, Dalar, Mrgavan, Shahumyan, Dimitrov villages, according to 01.01.2012, makes 22831 in total. The total number of the consumers in the rural communities is 5264.

Taking into account the population prospective growth by 2040, which assumes 0.43% annual growth, the number of rural communities dwellers is supposed to be 25719 men.
For the settlements, considering also the leakages, the average daily water demand rate is assumed to be 200 l/day per capita.

The average hourly discharge of maximal daily water demand of the rural communities makes $Q_{av.h} = 117.4$ 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 rehabilitation.

By this very Detailed Design the works provided for the improvement of water supply system in Masis, Burastan, Azatavan, Baghramyan, Berkanush, Dalar, Mrgavan, Shahumyan, Dimitrov villages and the reconstruction of Garni-Yeraskh, Garni-Zod external conduits:

- Reconstruction, washing and disinfection of external networks steel pipes of de300-de600mm diameter-1482lm,
- Construction of polyethylene waterlines of de50-de200 diameter-50977 lm,
- Construction of valve junctions- 77 sets,
- Construction of entry lines of private houses-31680 lm,
- Installation of private houses water metering junctions-3056 sets.

The aggregative indexes of the designed works in the Subproject rural communities are introduced in Table 1.
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<tbody>
<tr>
<td>Reconstruction of de50-de200 diameter polyethylene pipeline of water supply internal network</td>
<td>Im</td>
<td>3330</td>
<td>5057</td>
<td>9897</td>
<td>3628</td>
<td>4628</td>
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<td>2050</td>
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<td>11088</td>
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<td>50977</td>
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<tr>
<td>Testing, washing, disinfection of the above mentioned system</td>
<td>Ilkm</td>
<td>3.33</td>
<td>5.06</td>
<td>9.9</td>
<td>3.63</td>
<td>4.63</td>
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<td>2.05</td>
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<tr>
<td>Construction of valve junctions</td>
<td>set</td>
<td>7</td>
<td>8</td>
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<td>77</td>
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<tr>
<td>Construction of entry lines of private houses</td>
<td>Im</td>
<td>1880</td>
<td>4005</td>
<td>5235</td>
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<td>3825</td>
<td>1500</td>
<td>1710</td>
<td>5600</td>
<td>4730</td>
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<td>31680</td>
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<tr>
<td>Installation of water metering junctions of private houses</td>
<td>set</td>
<td>188</td>
<td>393</td>
<td>504</td>
<td>300</td>
<td>365</td>
<td>150</td>
<td>162</td>
<td>551</td>
<td>443</td>
<td>-</td>
<td>-</td>
<td>3056</td>
</tr>
<tr>
<td>Reconstruction of de300-de600 diameter polyethylene pipeline of water supply external system, washing, disinfection</td>
<td>Im</td>
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<td>363</td>
<td>1119</td>
<td>1482</td>
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<tr>
<td>Replacement of the connections of apartment and public buildings</td>
<td>unit</td>
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</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. To restore the asphalt concrete pavement of roads which were previously in favorable condition, providing the same cover quality.

2. To perform backfilling of the trenches in the destroyed and half-destroyed streets paved with asphalt concrete, then 10-15 cm gravelling with compaction.

5. BASELINE ENVIRONMENTAL CONDITIONS

5.1 Geographic location and climate of Masis, Burastan, Azatavan, Baghramyan, Berkanush, Dalar, Mrgavan, Shahumyan, Dimitrov rural communities of Ararat region, RA

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

The area is characterized by hot summer, with 21°C average monthly temperature in July and cold windless winter with January 0-5°C average monthly temperature. The air absolute maximal temperature is 42°C, and absolute minimal -31°C. The average annual atmospheric rainfalls make 238-348mm, and relative humidity is 35%. The snow average cover reaches 36 cm, pressure is 50kg/m$^3$. The soil freezing depth is 0.43m, subject to the absolute elevation. West and North-West winds with 0.8m/sec. velocity dominate in the region.

The studied area of RA Ararat region is situated within the concavity of Araks River in the central zone of Ararat valley. The fairly slopping relief is formed on the alluvial and lake sediments, 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, sediment-volcanic rocks.

Among exogenic-geological phenomena there is 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 at 830-900m elevation.

5.2 Biodiversity

The soil types are presented mainly by saline-alkaline and irrigated dark meadow soils, deeply alkalized or salinized, formed on contemporary gully and lake-alluvial sediments. The lands in the region are mainly used in agriculture.
The geological structure represents Upper Pliocene-Pleistocene lake-river, flood deposits, Upper Eocene basalts, andesites, 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-proluvial formations with various thicknesses, are spread in the concavity Araks river.

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. The ground water availability depends on clays, which are situated in the lake-river water bearing deposits. It is situated at different depths, starting from 0-5m, 100 and deeper levels. In some areas ground water causes bogging and salination.

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

The region has 0.3-0.4g acceleration and is situated in 9 scale seismicity zone.

**Flora** The flora of the investigated area belongs to Yerevan floristic region, introduced by semidesert and plant species.

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

Water and near-water vegetation is the result of drainage canal and artificial pond systems. The following species are typical to the area: rose family-Rosaceae, true grasses-Poaceae, sunflower family-Asteraceae, bean family-Fabaceae, knotweed family-Polygonaceae and mustard flowers-Brassicaceae. Trees are missing within the area due to its proximity to the salt ground water and dry air.

The area species, which need to be preserved, are milkweed-Euphorbia vedica, sedge rush-Acorus calamus L., bindweed-Convolvulus commutatus Boiss, Lettuce-Lactuca Takhtadzani Sosn, Astragalus paradoxus etc.

As (EN) endangered species registered in RA Red Book for Plants (2010) there are SALSOLA TAMAMSCHJANAE, TANARIX OCTANDRA, Rheum ribes. Though these species are numerous in this region, but they are rare in Armenia.

Among wild useful plant species there are ginger plant-Tanacetum vulgare, European madder-Rubia tinctorum, heliotrope- Valeriana officinalis, harmala shrub-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. From the invertebrate animals, the following species of molluscs are observed in the area; Zonitoides nitidus, Planorbis planorbis, Gyraulus acronicus, Pupilla signata, from the insects the species of dragon-flies; some representatives of Coenagrionidae and Libellulidae.. Among vertebrates 2 types of amphibious have been studied, these are: marsh frog-Bufo
/Pseudopedalia/ variabilis and lakefrog-Pelophylax ridibundus, which belong to widespread species of the area.

The types of mammals spread in the region include long-eared hedgehog Erinaceus (Hemiechinus) auritus Gmelin, common bat-Myotis blythi Tomes, P. (P) kuhli Kuhl, Rhinolophus hipposiderus Bechst, red fox-Vulpes vulpes L., jackal-Canis aureus, wolf-Canis lupus L., otter-Lutra lutra, L., brown hare-Lepus europaeus Pall., wild pig-Sus scrofa L., Persian jird-Meriones persicus Blanf, gray hamster-Cricetulus migratoris Pall. etc.

Among the species recorded in the Red Book there are demoiselle-Anthropoides virgo.L, Charadris alexsarinus L.,Armenian Gull- Larus armenicus Buturlin, fish-hawk- Pandion haliaetus L. gray goose-Anser anser L., roody shelduck-Tadorna ferruginea Pall, blue-cheeked bee-eater-Merops Superciliosus L. and Eurpean roller-Coracias garrulus L.

The following species of mammals are registered in the RA Red Book as well; Long-eared hedgehog Erinaceus (Hemiechinus) auritus Gmelin, marbled polecat-Vormela peregusna Guldenstaedt, Dahl's Jird -Meriones dahli Shidl, small five-toed jerboa-Allactaga elater Lichtenstein.

6. ENVIRONMENTAL AND SOCIAL IMPACTS

Due to the implementation of works aimed at the improvement of water supply systems of Masis, Burastan, Azatavan, Baghramyan, Berkanush, Dalar, Mrgavan, Shahumyan, Dimitrov villages and the reconstruction of Garni-Yeraskh, Garni-Zod external conduits, the expected positive environmental and population health effects are as follows:

- water resource protection and sustainable use,
- excluding missing 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.

IEE reveals that the implementation of works aimed at water supply systems improvement in Masis, Burastan, Azatavan, Baghramyan, Berkanush, Dalar, Mrgavan, Shahumyan, Dimitrov rural communities will have no harmful effects on the selected for this purpose area - either landscape, or flora and fauna. The negative effects might be mainly caused by construction works implementation, with little damage and carrying temporal character. In order to prevent negative impacts, or facilitate them there have been developed facilitating measures which are
involved into the EMP.

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

- air pollution
- noise
- traffic and pedestrian roads damage and loading
- soil erosion and soil eroding processes
- impacts on biodiversity
- 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 providing sustainable and reliable water supply and water resource rational use for about 22831 men.

7. ENVIRONMENTAL IMPACT MITIGATION MEASURES

The probable harmful impacts on the environment and people’s health, caused by the works aimed at the W&W internal system improvement of Vedi, Ararat towns, GMF Banavan, Ararat and Vosketap rural communities, depend on construction works of water pipeline trenches and pits for control and water measuring junctions.

To prevent soil erosion and eroding processes the preventive measures should be performed on slopes protection on the inclined areas designed for the pipe laying, providing minimal short time of keeping open the trenches and pits made for the pipelines and control and water measuring junctions.

The slopes protection measures 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:

- remove the excess soil mass and building material from the construction sites,
- recover the asphalt – concrete pavement, providing its previous good condition and quality,
- provide graveling with compaction on the streets with damaged and half-destroyed asphalt -concrete pavement, as well as on dirt roads.

To prevent the topsoil layer damage, or landscape degradation, the topsoil should be stored on the assigned site, there after used for the areas restoration. The construction site should be
cleaned from the household and construction waste providing the landscape previous state.

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 *water and soil resources pollution* by chlorine, the works on chlorine washing and disinfection should be arranged considering special calculations. Chlorine handling needs treating the appropriate way, following the established technological procedures. 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 potable water quality in Masis, Burastan, Azatavan, Baghramyan, Berkanush, Dalar, Mrgavan, Shahumyan, Dimitrov rural communities, the AWSC should perform routine sampling from the springs feeding the communities, testing the water for all criteria required by the MoH. Water quality monitoring is also performed by the State Hygiene Anti-Epidemic 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 facilitating measures, the commitments 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 procurement of all required agreements and permissions from the corresponding public administrative and local self-governing bodies before civil works distribution according to the tender 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 units in the construction stage (Contractors) will covenant to physically implement the specified in the MEP facilitating measures, as well as procure 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 accidental occurrence during civil works implementation.
  3. Before civil works startup, if necessary, the mentioned beneath permissions and certificates should be procured by ADB/PMU:
     - 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 supervision over the implementation of mitigation measures specified in EMP. The mentioned experts will regularly perform sites visits to supervise the proper implementation of works and corresponding activities on mitigating the impacts. During the checkups 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 demand and check up the availability and validity (expiration date) of all permissions, complete implementation of impact facilitating 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.

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

The state agencies, which are to carry out monitoring, are as follows:

- State Environmental Inspectorate of the RA MoNP
- State Hygiene and Anti-Epidemic Inspectorate of the RA MoH,
- Historical and Cultural Heritage Protection Agency of the RA Ministry of Culture, if necessary
- The RA local self-governance bodies
- The RA Ministry of Transport and Communication.

The amounts 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 next payment will be terminated until the infringement is completely eliminated.

9. **ENVIRONMENTAL MANAGEMENT PLAN**

The EMP will be based on the results of IEE prepared by 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 value 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 in written as a warning.

- After the Notice to Correct, the next recorded violation would trigger charging of liquidated damages in the amount of 0.1% of the total value of the contract. The liquidated damages do not relieve the Contractor from remedying the violation. The recorded violation should be remedied in two working days period. Liquidated damages 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 Retention Money.

- In case of three liquidated damages the Contract could be terminated unilaterally.

The environmental management matrix for Masis, Burastan, Azatavan, Baghramyan, Berkanush, Dalar, Mrgavan, Shahumyan, Dimitrov villages and Garni-Yeraskh, Garni-Zod external conduits reconstruction is presented in Appendix A.

### ENVIRONMENTAL MANAGEMENT MATRIX

<table>
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<tr>
<th>Works and possible impacts</th>
<th>Proposed mitigating measures</th>
<th>Monitoring</th>
<th>Responsible bodies</th>
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<tbody>
<tr>
<td>1 Air pollution, noise and traffic congestion</td>
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</tbody>
</table>
| • Dust and noise during the construction works | - 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 |
| • Disturbance to population because of overloaded roads | - 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 |
## 2 Environmental pollution

- **Soil erosion and eroding**
  - In inclined sites of the pipeline route 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 tecservices 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
<table>
<thead>
<tr>
<th>Hazards for workers and the population</th>
<th>Fence the construction site.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control access of unauthorized persons to site.</td>
</tr>
<tr>
<td></td>
<td>Place warning signs in dangerous places.</td>
</tr>
<tr>
<td></td>
<td>Carry out regular examination of equipment by highly qualified staff, as well as make regular safety audits.</td>
</tr>
<tr>
<td></td>
<td>Provide first aid and safety training to construction staff.</td>
</tr>
<tr>
<td>Daily inspection throughout construction stage. Monthly inspection of accident reports and complaints register.</td>
<td>Contractor, Consultanat, PIU, population</td>
</tr>
</tbody>
</table>

**Appendix B**

Field visits checklist

<table>
<thead>
<tr>
<th>General information</th>
<th>D/M/Y</th>
<th>Subproject</th>
<th>Location</th>
<th>Construction contractor</th>
<th>Marz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required permissions</td>
<td>Yes/No</td>
<td>N/A</td>
<td>Yes/No</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Written consent on land acquisition</td>
<td>Yes/No</td>
<td>N/A</td>
<td>Yes/No</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Հայտնության համաձայնություն</td>
<td>Assessment of impact on cultural heritage</td>
<td></td>
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<tr>
<td>Yes</td>
<td>Ό</td>
<td>Ό/Չ</td>
<td>N/A</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Կառուցվածք</th>
<th>Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required permissions</td>
<td>Written consent on disposal of construction waste</td>
</tr>
<tr>
<td>Yes</td>
<td>Ό</td>
</tr>
<tr>
<td>Written consent on disposal of construction waste in case of sudden discovery of cultural heritage</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Ό</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Համայնքի մասնակցություն</th>
<th>Community's participation in construction works according to the project design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Ό</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Անվտանգություն</th>
<th>Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability of safety uniforms (earflaps, mask)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Ό</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Երթևեկության սահմանափակում</th>
<th>Installation of road signs or fences, organization of a bypass during interrupted or limited traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Ό</td>
</tr>
<tr>
<td>Management measures during construction</td>
<td>Այո</td>
</tr>
<tr>
<td>-----------------------------------------</td>
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</tr>
<tr>
<td>Operation on area/construction site</td>
<td></td>
</tr>
<tr>
<td>Որոշ ամբողջականության պայմանագրերը / regular sprinkling to area/construction site</td>
<td>Yes</td>
</tr>
<tr>
<td>Որոշ ամբողջականության պայմանագրերը / availability of safe place at the construction site for vehicles</td>
<td>Yes</td>
</tr>
<tr>
<td>Որոշ ամբողջականության պայմանագրերը / availability of storage for oils and lubricants at the appropriate part of the construction site</td>
<td>Yes</td>
</tr>
<tr>
<td>Թեղատեղ առանցքային Բուսականության Համակարգչամարմնավորում / moisture of the construction site by water</td>
<td>Yes</td>
</tr>
<tr>
<td>Պատմական տեղանքի / temporary air pollution/dust / use of cover for the vehicle transporting construction waste</td>
<td>Yes</td>
</tr>
<tr>
<td>Պատմական տեղանքի / temporary air pollution/dust / moisturing of the construction site by water</td>
<td>Yes</td>
</tr>
<tr>
<td>Հողի էռուզիա / soil erosion / prevention measures at the slope places according to the project design</td>
<td>Yes</td>
</tr>
<tr>
<td>Հողի էռուզիա / soil erosion / timely coverage of holes by soil</td>
<td>Yes</td>
</tr>
<tr>
<td>Հողի էռուզիա / soil erosion / repair of damaged surface after completion of construction works</td>
<td>Yes</td>
</tr>
<tr>
<td>Որոշ ապամոնական բարակություն / ջրասատեղական համակարգի / ջրասատեղական համակարգի / water pollution caused by fuel and lubricants</td>
<td>Yes</td>
</tr>
<tr>
<td>Խողովակների լվացումից հետո քլորի արտահոսք համապատասխանում որակի ջրի նորմերին / Leakage of chlorine after wash up of the pipes according to the scheduled regime</td>
<td>Այո</td>
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</tr>
<tr>
<td>Noise close to settlements / Noise close to settlements</td>
<td>Այո</td>
</tr>
<tr>
<td>Construction waste disposal / Construction waste disposal</td>
<td>Այո</td>
</tr>
<tr>
<td>Operation / Operation</td>
<td>Այո</td>
</tr>
<tr>
<td>Drinking water pollution / Drinking water pollution</td>
<td>Այո</td>
</tr>
<tr>
<td>Աղմուկ բնակավայրերի տարածքին մոտ / Noise close to settlements</td>
<td>Այո</td>
</tr>
<tr>
<td>Արգելավայրներ և ինքնավար թափոնների տեղադրում / Transportation and disposal of construction and consumer waste in appropriate community landfill</td>
<td>Այո</td>
</tr>
</tbody>
</table>